



PROCEDURE

Market Manual 7: System Operations

**Part 7.1: System
Operating
Procedures**

Issue 23.0

This document 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.

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

Document ID	MDP_PRO_0040
Document Name	Part 7.1: System Operating Procedures
Issue	Issue 23.0
Reason for Issue	Issue released in advance of Baseline 31.0
Effective Date	February 5, 2014

Document Change History

Issue	Reason for Issue	Date
For document change history prior to 2010, refer to versions 18.0 and prior.		
17.0	Issue released for Baseline 23.1	June 2, 2010
18.0	Issue released for Baseline 25.0	March 2, 2011
19.0	Issue released for Baseline 27.0	March 7, 2012
20.0	Issue released for Baseline 28.0	September 12, 2012
21.0	Issue released for Baseline 29.0	March 6, 2013
22.0	Issue released for Baseline 30.0	September 11, 2013
23.0	Issue released in advance of Baseline 31.0 for the implementation of SE-109: Outage Management Process Redesign and Market Rule Amendment MR-00404-R00.	February 5, 2014

Related Documents

Document ID	Document Title
N/A	

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Table of Changes

Reference (Section and Paragraph)	Description of Change
Section 4.2.6	Deleted reference to short notice requests.

Market Manuals

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

Market Procedures

The "System Operations Manual" is Volume 7 of the *market manuals*, where this document forms "Part 7.1: System Operations Procedures".

A list of the other component parts of the "System Operations Manual" is provided in "Part 7.0: System Operations Overview", in Section 2, "About This Manual".

Structure of Market Procedures

This market procedure is composed of the following contents:

1. **"Introduction"**, which contains general information about the procedure, including an overview, a description of the purpose and scope of the procedure, and information about roles and responsibilities of the parties involved in the procedure.
2. **"Operating Authorities"**, which describes the roles of *IESO* and the different types of *market participant* in system operation.
3. **"Communication Protocol"**, which details the information requirements and communication channels that are required for reliable system operation.
4. **"Security and Reliability"**, which defines the responsibilities and authorities of the *IESO* and *market participants* relative to equipment management and operating activities.
5. **"Appendices"**, which describe a typical *security limit* and define the *IESO-controlled grid*. This section may also include such items as forms, standards, policies, and agreements.

Conventions

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

– End of Section –

1. Introduction

1.1 Purpose

This procedure focuses on what is necessary to ensure the *reliability* of the *IESO-controlled grid*.

For the purpose of this document, the definition of the *IESO-controlled grid* is that set out in the *operating agreements* between the *IESO* and *transmitters*. This definition is included in Appendix C.

These procedures are to be read in conjunction with the *market rules*. They describe how a particular *market rule* 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 that are not covered in this manual.

This document should be read in conjunction with “Part 7.4: IESO-Controlled Grid Operating Policies” that set out the *IESO* policies for secure and reliable operation of the *IESO-controlled grid*.

With regard to all parts of the System Operations Manual, it is recognized that there may be situations in which an alternative procedure may be mutually agreeable to a *market participant* and the *IESO*. This is acceptable provided that the alternative is documented in an *operating agreement* in place between the *IESO* and the specific *market participant* and meets the intent of the *market rules*.

Terminology is intended to be consistent with the *market rules*. Any terms that are not defined in the *market rules* are included in the glossary at the end of this manual.

1.2 Scope

This document is intended to be consistent with *NERC* (North-American Electric Reliability Council), *NPCC* (Northeast Power Coordinating Council) *IESO* policies, and the *market rules*.

The *IESO* has no jurisdiction over work protection. Consequently, work protection is outside the scope of this document.

These procedures do not address the commercial or market aspects of system operation. For the commercial or market aspects of system operation please refer to the "Market Operation Manual:Part 4.0" series.

Procedures to deal with a partial or total system shutdown, widespread environmental problems, civil unrest, etc are contained in the "Ontario Electricity Emergency Plan".

1.3 Overview

This document sets out the activities that are undertaken by the *IESO* and other parties to ensure the *reliability* of the *IESO-controlled grid*. The procedure addresses the following areas:

- the operating authorities of the *IESO* and *market participants*;
- the communication protocols to be followed by the *IESO* and *market participants*;
- setting *security limits*;
- operating states of the *IESO-controlled grid*;

- *demand* management activities undertaken by the *IESO* and *market participants*;
- load shedding activities undertaken by the *IESO* and *market participants*; and
- testing or simulation of *emergency* procedures.

1.4 Roles and Responsibilities

Responsibility for system operations is shared among the *IESO* and *market participants* as set out in the following sections of this procedure.

1.5 Contact Information

As part of the participant authorization process, *applicants* are able to identify a range of contacts within their organization that address specific areas of market operations. For system operations, these contacts will most likely be; the *authority centre*, dispatch or control centre, facility location operator or the restoration plan coordinator as indicated in the Participant Life Cycle (PLC). If the *market participant* has not identified a specific contact, the *IESO* will seek to contact the Main Contact in the PLC that is established during the participant authorization process. The *IESO* will seek to contact these individuals for activities within this procedure, unless alternative arrangements have been established between the *IESO* and the *market participant*.

If you wish to contact us, you can contact *IESO* Customer Relations via email at customer.relations@ieso.ca or via telephone, mail or courier to the numbers and addresses given on our web-site www.ieso.ca. Outside of our business hours, telephone messages or emails for Customer Relations may be left in relevant voice or electronic *IESO* mail boxes, our Customer Relations staff will respond as soon as possible.

- End of Section -

2. Operating Authorities

Reference: "Market Rules", Chapter 5, Section 3

The *IESO* is authorised to direct the operation and maintain the *reliability* of the *IESO-controlled grid*¹, in accordance with the Section 2 of "Part 7.4: IESO-Controlled Grid Operating Policies".

The *IESO* may delegate portions of this responsibility to *transmitters* in accordance with an *operating agreement*. (Reference: Chapter 5, Section 3.2.1. of the *market rules*)

Each *market participant* is authorised to direct the operation of any of its *facilities* that are not a part of the *IESO-controlled grid*. Furthermore, a *market participant* may refuse, with explanation, an instruction from the *IESO* if executing it would risk damaging the *market participant's* equipment, or risk public, employee or environmental safety.

A *market participant* is authorised to take independent action if there is an imminent risk to public, employee or environmental safety, or to the safe operation of equipment; for example, a live conductor that has fallen. The *IESO* shall be informed of independent actions as soon as possible thereafter.

Any abnormal/unusual requirements not addressed by the *market rules* or this document are to be referred to the *IESO* for disposition.

– End of Section –

¹ This includes directing embedded *facilities* within the *IESO control area* that may, from time to time, affect the *reliability* of the *IESO-controlled grid*.

3. Communication Protocol

References: Market Rules (Chapter 5, Sections 3.5.1.2, 3.6.1.3 and 12, and Market Rules Chapter 2, Appendix 2.2)

3.1 Introduction

The *IESO* will maintain communications with other parties in relation to the operation of the *IESO-controlled grid* in accordance with Section 3 of “Part 7.4: IESO-Controlled Grid Operating Policies”.

Timely communication between the *market participants* and the *IESO* is vital for secure and reliable operation of the *IESO-controlled grid*. Comprehensive oral reports of relevant facts are necessary for reliable system operation. Whenever one party’s planned operations may adversely impact the secure and reliable operation of the *IESO-controlled grid*, prior communication is required. This principle holds for planned and, if time permits, contingent operations. Knowledge of adverse operating conditions or unusual occurrences often suggests precautions against disturbances and allows for the implementation of strategies to ensure the *reliability* of the *IESO-controlled grid*. Accordingly, the *IESO* and *market participant* operating staff shall endeavour to maintain an ongoing interchange of information on significant operating events, including planned and *forced outages*, routine switching, system tests, etc.

Although this document stipulates communication requirements for *IESO-controlled grid* operation, it is not intended that dialogue between any of the operating entities at any time be restricted; rather, it is encouraged. *Market participants* should not hesitate to approach and discuss with the *IESO* any *reliability* aspect of operation. Similarly, *market participants* may be approached by the *IESO* to contribute information based on their intimate knowledge of transmission, distribution, connected wholesale, or *generation facilities*.

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 *emergency* situations, or during a failure of normal communication channels, the *IESO* will normally communicate directly with the relevant facility location operator. After the situation has stabilised, subsequent calls may be directed to, or include the *authority centre* (Chapter 2, Appendix 2.2 of the *market rules*).

When contingencies that meet the reporting requirements set out in Section 3.4 of this procedure occur, the facility location operator of the *facility* 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 *facility* location operator of the *facility* suffering the contingency, as required to return the *IESO-controlled grid* to a *normal operating state*.

Any contingencies that do not meet the reporting requirements set out in Section 3.4 of this procedure may be reported directly to the *transmitter* and/or own *authority centre* by the *facility* location operator of the *facility* suffering the contingency without first contacting the *IESO*.

This document outlines the minimum conditions, developments and items that must be communicated to enable 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 exercise due diligence in accordance with *good utility practice*.

3.2 General Requirements

Each *market participant* must provide *attended communications facilities* in accordance with Appendix 2.2 of the "Market Rules". These specifications balance the importance of the communication link between the *IESO* and different classes of *market participant* with the cost of the *facilities*. If these *facilities* fail, the *IESO* and the affected *market participant* shall expeditiously try to establish contact via any other feasible medium (fax, cellular telephone, satellite phone, e-mail, etc).

Unless stated otherwise, communication is assumed to be between *IESO* shift operating personnel and the shift operating personnel of the relevant *market participants*.

Each *market participant* shall advise *IESO* Customer Relations or Registration and Compliance Support of changes in any relevant telephone numbers. *IESO* Registration and Compliance Support staff will update the participant contact information in the *IESO* registration tools.

All voice communications between the *IESO* shift operators and *market participants* are taped by the *IESO* and retained for regulatory, *settlement*, dispute resolution, compliance monitoring and other audit purposes (Chapter 5, Section 12.4.2 of the *market rules*).

When issuing a Reliability Directive to a market participant, the *IESO* and the market participant will communicate as defined in section 3 of "Part 7.4: *IESO*-Controlled Grid Operating Policies".

The *IESO* maintains an electronic operating log, also retained for regulatory, *settlement*, dispute resolution, compliance monitoring and other audit purposes.

Communications by *market participants* shall, whenever possible, use approved standard operating terms, approved abbreviations and definitions (reference, Market Manual 7.6, Glossary of Standard Operating Terms) in accordance with *good utility practice* (Chapter 5, Section 12.4.1 of the *market rules*).

The *IESO* shall communicate directly with reliability coordinators, *transmitters*, and balancing area operators in neighbouring utilities in accordance with *NERC* and *NPCC* procedures, and authorized *interconnection agreements* and their associated joint operating instructions, e.g. Standard Operating Practices (Chapter 5, Section 5.1.2.7 of the *market rules*).

3.3 Routine Operations (Normal Operating State)

This is the state described in Chapter 5, Section 2.2 of the "Market Rules." Equipment is functioning normally or within known limitations, power transfers are within *security limits*, the *outage* plan is being executed, there is no significant weather concern, etc.

3.3.1 Independent Electricity System Operator

The *IESO* shall communicate promptly with *generators*, *transmitters*, *distributors* and *connected wholesale customers* on matters of *IESO*-controlled grid operation that affect areas under their jurisdictions.

Communications from the *IESO* to other *market participants* will normally be via approved communication to their *authority centre*, in accordance with the *market rules*. However, the *IESO*

will communicate directly with the facility location operator of a *facility*, where required, for matters relevant to the *reliability* of the *IESO-controlled grid*.

3.3.2 Transmitters

Transmitters shall 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.

Transmitters shall report to the *IESO* any actual or planned change in status of any of their *facilities* that are included in the *IESO-controlled grid*. These reports shall include times and shall be made as soon as possible. Examples are: 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* (Chapter 5, Section 3.4.1.4 of the *market rules*).

Transmitters that have operating control of portions of *distribution systems* shall abide by any communications requirements specified for *distributors*.

All communication by the *transmitter* shall be made by telephone to the *IESO* shift operating staff.

3.3.3 Generators

Generators that are connected to the *IESO-controlled grid*, or *embedded generators* that are designated by *IESO* to have an impact² on the *reliability* of the *IESO-controlled grid*, shall promptly report to the *IESO* all matters that affect the operation of the *IESO-controlled grid*. Such communication by the *generator* shall be made by telephone to the *IESO* shift operating staff (Chapter 5, Sections 3.6.1.3 and 3.6.1.4 of the *market rules*).

A *generator* that intends to synchronize a *generation unit* to the *IESO-controlled grid* or *embedded facility*, must notify the *IESO* at least two hours in advance of the intended synchronization time unless an under-generation system advisory notice is issued, in which case the *generation unit* will be subject to the conditions of the System Advisory Notice. A *generator* intending to de-synchronize a generation unit follows the same process except one-hour notification prior to intended de-synchronization time is required. Designated generation units that are able to synchronize to the *IESO-controlled grid* and follow dispatch instructions in 5 minutes (quick start units) are not required to provide this synchronization notice. These quick start units would require 5-minute notification prior to de-synchronize. Reports to the *IESO* shall also include event times, for example; *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, etc. *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 (Chapter 7, Sections 11.2 and 11.3 of the *market rules*).

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

Generators that operate portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters*.

² Usually because the embedded *generation unit* affects a *security limit*. The designation will be recorded via the Participant Life Cycle tool.

3.3.4 Distributors and Connected Wholesale Customers

Distributors and connected wholesale customers shall promptly report to the *IESO* any matter that affects the reliable operation of the *IESO-controlled grid*. Such communication by a *distributor* or *connected wholesale customers* shall be made by telephone to the *IESO* shift operating staff (Chapter 5, Sections 3.7.1.2 and 3.7.1.3 of the *market rules*).

These reports shall include event times. Examples are: status of low voltage static capacitors of 15MVAR 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 10MVAR 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* of 20MW or greater, planned unavailability and return to service times of equipment included in the *IESO-controlled grid*, etc.

The *IESO* must be informed, in advance, of any unusual planned single-point load pickup greater than 100MW on the *IESO-controlled grid*, or greater than 50MW on the *IESO-controlled grid* that is electrically North of Essa TS in Barrie. This is not intended to include large industrial loads that routinely change their *demand* by amounts that exceed these levels where the *IESO* is previously aware of this fact.

Distributors that operate portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters*.

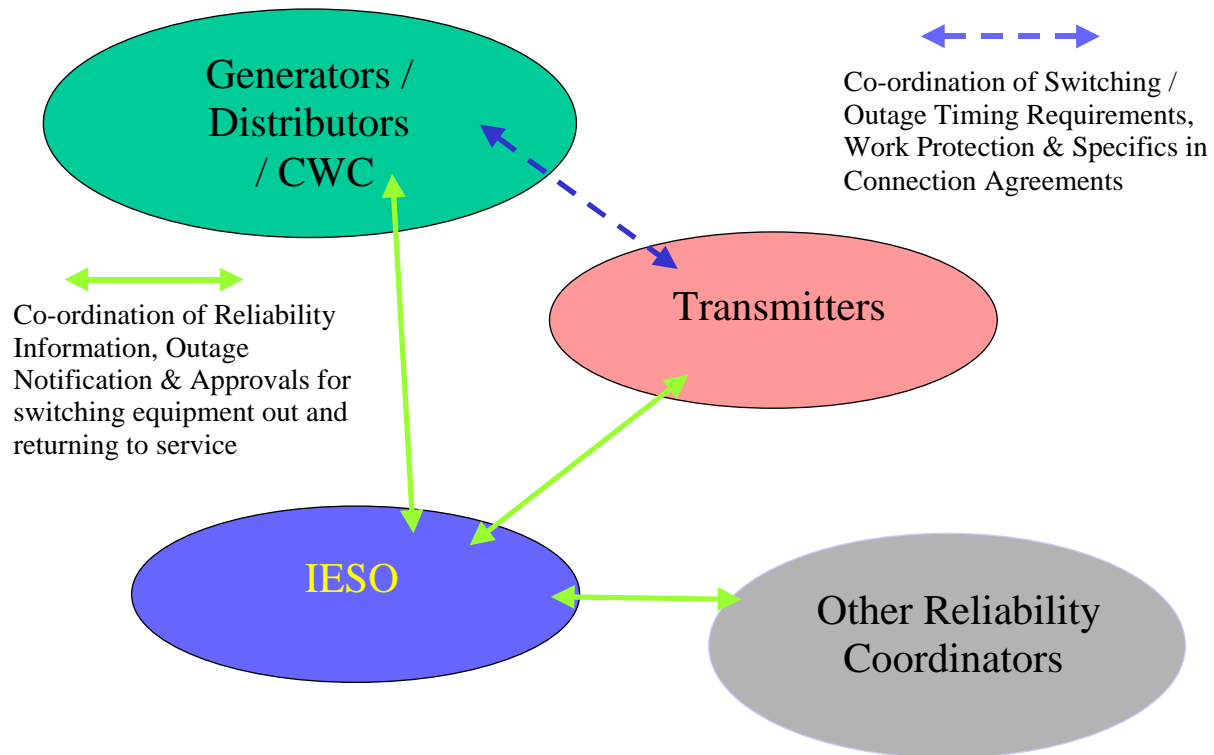
If a *distributor* or *connected wholesale customer* has more than a single *connection point* to the *IESO-controlled grid*, for example a DESN transformer installation, the status of the breakers that can effect a parallel between the multiple *connection points* must be reported to *IESO*, as well as any planned operation of them.

3.3.5 Other Market Participants

Other *Market Participants* will promptly inform the *IESO* of any matters that affect the reliable operation of the *IESO-controlled grid* outside of the scope of commercially related communications outlined in the *market rules*.

3.3.6 Normal Operating State Diagram

Communications for **Normal** Conditions



3.4 Abnormal Conditions

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

3.4.1 Independent Electricity System Operator

If the *IESO-controlled grid* is in a degraded state of *reliability*, the *IESO* will issue Reliability Directives to direct the actions that are required by each *market participant* to return the *IESO-controlled grid* to an acceptable level of *security*.

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, matters of a confidential nature relating to another party are being discussed, if another party objects to that party hearing information of a confidential nature, or if, in the opinion of *IESO*, the party's presence is impeding the process.

Figure 3-1, and the accompanying Table 3-2, illustrate the activities and communication that occur following a contingency and during the process of re-preparation.

The *IESO* will notify affected *market participants* of power system alerts or other situations that could affect the operation of the *IESO-controlled grid* (Chapter 5, Section 2.4.3 of the *market rules*). Examples of power system alerts are: declaration of a *high-risk operating state*, capacity or *energy* shortfalls, periods of reduced system *reliability* and/or increased customer unreliability, weather and environmental advisories, etc.

In instances where the system conditions indicate that Emergency Operating State Control Actions (EOSCA) may be required to mitigate operating reserve deficiency and/or energy deficiency, the principal medium for *reliability* related alerts from the *IESO* to *market participants* will be the System Status Report. The market participant will be informed of the anticipated system conditions and possible implementation of EOSCA. This is carried out through the MOS-MIM interface via the market participant network and the *IESO* website, supplemented by the use of a pre-recorded broadcast telephone message.

The System Status Report will be used by the *IESO* to inform *market participants* of any changes in the status of alerts, or of any relevant contingencies in other jurisdictions.

Upon returning to a *normal operating state*, the *IESO* shall release to all *market participants* via the System Status Report, an estimate of aggregate load curtailed as soon as practicable. (Chapter 5, Section 10.3.7 of the *market rules*.)

The *IESO* will inform affected *market participants* of declared restrictions and removals from service of equipment and auxiliaries in other jurisdictions, where it has previously been informed of such restrictions and removals.

3.4.2 Transmitters

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*. However, 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 that are necessary to do so. A typical process is illustrated in Section 3.7 (Chapter 5, Section 3.4.1.4 of the *market rules*).

Transmitters shall report the following contingencies:

- automatic operations of all circuit breakers that form part of the *IESO-controlled grid*;
- operation of power system auxiliaries such as *special protection systems* and underfrequency protection;
- degradation of auxiliary equipment³, control equipment, or staffing that reduces security of the *IESO-controlled grid*;
- degradation of switchyard auxiliaries, such as air compressors, 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.; and
- loss of reactive power capability or resources of 15 MVAR or greater for areas electrically South of Essa in Barrie, or 10MVAR or greater for areas electrically North of Essa in Barrie.

Transmitters will inform the *IESO* of restrictions on equipment in the *IESO-controlled grid* (Chapter 5, Section 3.4.1.4 of the *market rules*).

Transmitters will inform *IESO* 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 and police). Any change in such conditions shall likewise be communicated.

Such communication by the *transmitter* shall be made by telephone to the *IESO* shift operating staff.

3.4.3 Generators

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* (Chapter 5, Sections 3.6.1.3 and 3.6.1.4 of the *market rules*):

- unscheduled step changes in a *generation unit's* output of greater than 50MW or 10MVAR;
- deratings in a *generation unit's* output of greater than 50MW or 10MVAR;
- automatic removal from service of generation, or *generation facilities* of 20 MW nominal capacity or greater;

³ Auxiliary equipment includes:

- All protection systems (including line, transformer, overvoltage, overcurrent, and high resistance open phase)
- All communications *facilities* associated with protections
- All dynamic control systems: AVRs, power system stabilisers, other excitation system components
- All *special protection systems*
- All underfrequency load shedding relays
- All automatic reclosure schemes
- All automatic tap changer controls on 500kV/230kV and 230kV/115kV autotransformers
- All voltage reduction *facilities* that are used for *demand* control
- Ferroresonance protection schemes
- All voice communications *facilities* that are required by the *Market Rules*
- *Automatic generation control facilities*
- SCADA *facilities*

- degradation of auxiliary equipment³ that reduces *IESO-controlled grid reliability*;
- operation of power system auxiliaries such as *special protection systems*;
- unavailability of any *generation units* that are included in *operating reserve*; and
- frequency outside the range of 59.8Hz to 60.2Hz.

Such communication by the *generator* shall be made by telephone to the *IESO* shift operating staff.

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*, that *market participant* shall be advised as soon as conditions permit.

Generators shall advise the *IESO* of any extraneous factors that may affect the operation of the *IESO-controlled grid*. Examples include but not are 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 (i.e. fire and police). Any change in such conditions shall likewise be communicated.

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

Generators who have operating control of portions of the *IESO-controlled grid* shall abide by any communications requirements specified for *transmitters*.

3.4.4 Distributors

Following a contingency, immediate communication shall be initiated 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* shift operating staff (Chapter 5, Sections 3.7.1.2 and 3.7.1.3 of the *market rules*). The *facility* location operator shall report promptly and directly to the *IESO* after the following contingencies:

- any automatic loss or forced manual interruption of load greater than 100MW, or 50MW electrically north of Essa TS in Barrie;
- automatic removal from service of reactive capability of 15MVAR or greater for areas electrically South of Essa in Barrie, or 10MVAR or greater for areas electrically North of Essa in Barrie;
- operation of power system auxiliaries³ such as *special protection systems* and underfrequency protection;
- degradation of power system auxiliaries³ that reduces security of the *IESO-controlled grid*; and
- loss of any distribution line(s) that affects the output of an *embedded generation facility* of 20MW or greater in nominal capacity.

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:
 1. solely due to a low tension problem and there is no indication of a problem on the *transmission system*; and
 2. the loss of customer load is not greater than 100MW, or 50MW 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.

Distributors will advise the *IESO* of any operating restrictions or removal from service of equipment that could affect the *reliability* of the *IESO-controlled grid*.

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 and police). Any change in such conditions shall likewise be communicated.

Distributors that control portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters*.

3.4.5 Embedded Market Participants

Embedded market participants shall notify the *IESO* of any loss of load greater than 100MW, or 50MW electrically north of Essa TS in Barrie, or generation in excess of 20MW. Such communication by the *embedded market participant* shall be made by telephone to the *IESO* shift operating staff.

Embedded market participants that control portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *distributors*.

3.4.6 Connected Wholesale Customers

Following a contingency, immediate communication shall be initiated 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* shift operating staff (Chapter 5, Section 3.5.1.2 of the *market rules*). The *facility* location operator shall report promptly and directly to the *IESO* after the following contingencies:

- any automatic loss or forced manual interruption of load greater than 100MW, or 50MW electrically north of Essa TS in Barrie;
- automatic removal from service of reactive capability of 15MVAR or greater that are dispatchable by the *IESO* for areas electrically south of Essa in Barrie, or 10MVAR or greater that are dispatchable by the *IESO* for areas electrically north of Essa in Barrie;
- operation of power system auxiliaries³ such as *special protection systems* and underfrequency protection;
- degradation of power system auxiliaries³ that reduces security of the *IESO-controlled grid*; and

- loss of any internal distribution line(s) that affects the output of an *embedded generation facility* of 20MW or greater in nominal capacity or *dispatchable load*.

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:
 1. solely due to a low tension problem and there is no indication of a problem on the *transmission system*; and
 2. the loss of load is not greater than 100MW, or 50MW 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.

Connected *wholesale customers* will advise the *IESO* of any operating restrictions or removal from service of equipment that could affect the *reliability* of the *IESO-controlled grid*.

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 and police). Any change in such conditions shall likewise be communicated to the *IESO*.

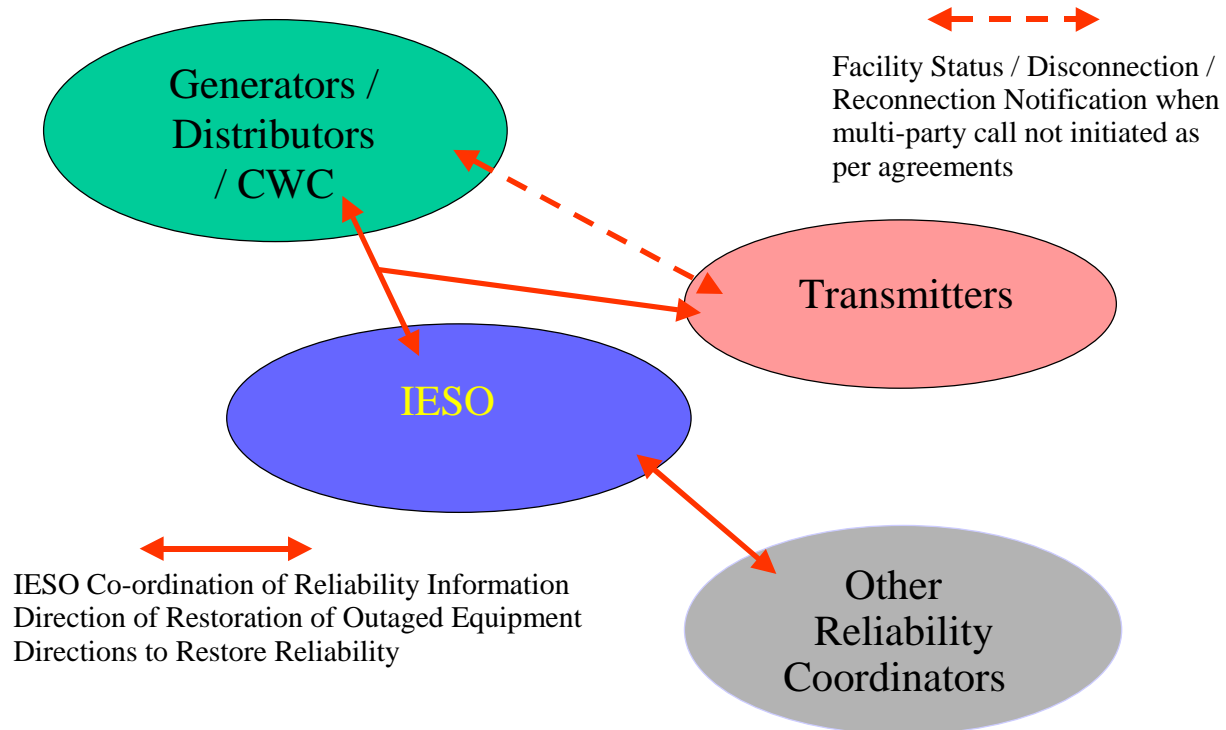
Connected *wholesale customers* that control portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters*.

3.4.7 Other Market Participants

Other *market participants* will promptly advise the *IESO* of any commercially induced load curtailments (e.g. water heaters) that they initiate beyond the scope of such advisement that are contained within the *market rules*. Confirmations of the load curtailment and amounts, cessation of load curtailment requests and load restoration times will also be communicated.

3.4.8 Abnormal Conditions Diagram

Communications for **Abnormal** Conditions



3.5 Response to NERC Threat Alert Levels

In order to quickly and effectively communicate emerging threats to electricity infrastructure owners and operators, *NERC* has implemented a Threat Alert Level system and guidelines for physical and cyber response. These threats are communicated on a 24x7 basis to *NERC* Reliability Coordinators and participants in *NERC*'s Electricity Sector – Information Sharing and Analysis Centre (ES-ISAC). *NERC* Threat Alert Levels are issued on the basis of information provided by:

- Electricity sector infrastructure owners or operators through the *NERC* hotline or Reliability Coordinator Information System
- Local law enforcement
- Canada's Office of Critical Infrastructure Protection and Emergency Preparedness (OC�PEP)
- The U.S. Office of Homeland Security

Consistent with the five level threat alert system of the U.S. Office of Homeland Security, *NERC*'s ES-ISAC delineates the five threat levels into both Cyber and Physical threats and provides guidelines that suggest appropriate levels of response for each threat level (consult the *NERC* ES-ISAC Web site at www.esisac.com). The current threat level in effect is displayed prominently in the *NERC* ES-ISAC Web site. For ease of application, Figure 3-1 identifies the five threat levels combined, which are applicable to both Cyber and Physical threats. It should be noted that in the event of a discrepancy between Figure 3-1 and the *NERC* ES-ISAC information, the latter shall be the official source.

The *IESO* will respond to *NERC* threat alert levels as appropriate (i.e. a change in declared threat level or related specifics), and depending on the specifics of the threat and its relevance to Ontario's electricity market and system operation, will communicate this information to *market participants*. Should a *market participant* be made aware of any threat that could impact upon or elicit a *NERC* threat level change, the *IESO* shall be promptly informed. Subsequently the *IESO* will communicate with the appropriate *NERC* authorities at the ES-ISAC or other operating authorities or *market participants* as provided for in Chapter 3, Section 5.3 of the Market Rules.

Figure 3-1: NERC ES-ISAC Threat Alert Level System

Threat Level	Description
GREEN (Low)	Applies when no known threat exists of terrorist, cyber or hacker activity or only a general concern exists about criminal activity, such as vandalism, which warrants only routine security procedures. Any <i>security</i> measures applied should be maintainable indefinitely and without adverse impact to site/business and <i>security</i> activities or expenses. This level is equivalent to normal daily conditions.
BLUE (Guarded)	Applies when a general threat exists of criminal, terrorist, cyber or hacker activity with no specific threat directed against the electric industry. Additional <i>security</i> measures are recommended, and they should be maintainable for an indefinite period of time with minimum impact on normal facility operations and <i>security</i> activities or expenses.

Threat Level	Description
YELLOW (Elevated)	Applies when a general threat exists of terrorist, criminal activity or disruptive activity directed against the electric industry. Implementation of additional <i>security</i> measures is expected. Such measures are anticipated to last for an indefinite period of time.
ORANGE (High)	Applies when a credible threat exists of terrorist, criminal activity or disruptive activity directed against the electric industry. Additional <i>security</i> measures have been implemented. Such measures are anticipated to last for a defined period of time. Business entities need to be aware that corporate resources will be required above and beyond those required for normal business or expenses.
RED (Severe)	Applies when an incident occurs or credible intelligence information is received by the electric industry indicating a criminal or terrorist act, or disruptive attack against the electric industry is imminent or has occurred. This condition may apply as a result of an incident in North America outside the electric industry. Maximum <i>security</i> measures are necessary. Implementation of such measures could be expected to cause hardship on personnel and seriously impact site/business and <i>security</i> activities.

3.6 Emergencies

There are primarily three types of *IESO-controlled grid emergencies* that may result in the IESO declaring an *emergency operating state*. These emergency types may apply to either local or global issues.

Table 3-1: Types of Emergencies

Type	Description
<i>Energy</i>	When the IESO 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.
Unstudied Operating State	The IESO-controlled grid is considered to be in an Unstudied Operating State when either of following occur: <ul style="list-style-type: none"> • An equipment failure for which limits are not derived (e.g., a stuck breaker), OR • A limit exceedance (e.g., voltage, circuit loading) that cannot be resolved through normal/routine Control Actions.

3.6.1 Emergency Operating State

The IESO generally declares an *emergency operating state* in an *IESO-controlled grid* emergency that requires the implementation of one or more of the following control actions:

- Purchasing *emergency energy*
- Implementing 3% or 5% voltage reductions
- Operating to Emergency Condition Limits (ECLs)
- Shedding *non-dispatchable load*
- Disregarding normal regulatory or legal requirements

When an *emergency operating state* has been declared:

- The IESO shall inform *market participants, balancing area operators* and *reliability coordinators* in directly adjacent *balancing areas*, as required. Notification will be through the System Status Report and other industry-related sites. The telephone or other available means may also be used.
- Through the use of reliability directives, the IESO shall direct relevant facility location operators to take actions and return the *IESO-controlled grid* to *normal operating state*.
- An operating entity shall inform the IESO as soon as possible whenever they take independent actions.

The IESO shall also inform *market participants, balancing area operators*, and *reliability coordinators* in directly adjacent *balancing authority areas* when the *IESO-controlled grid* has returned to a *normal operating state* and the *emergency operating state* has concluded (Chapter 5, Section 2.3.3 of the *market rules*).

3.7 Procedural Work Flow

The following diagram represents the flow of work and information relating to re-preparation following a contingency.

The steps illustrated in the diagram are described in detail in Section 3.7.

Table 3-2: Legend for Work Flow Diagrams

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

Figure 3-2 illustrates the activities and communication that occur following a contingency and during the process of re-preparation.

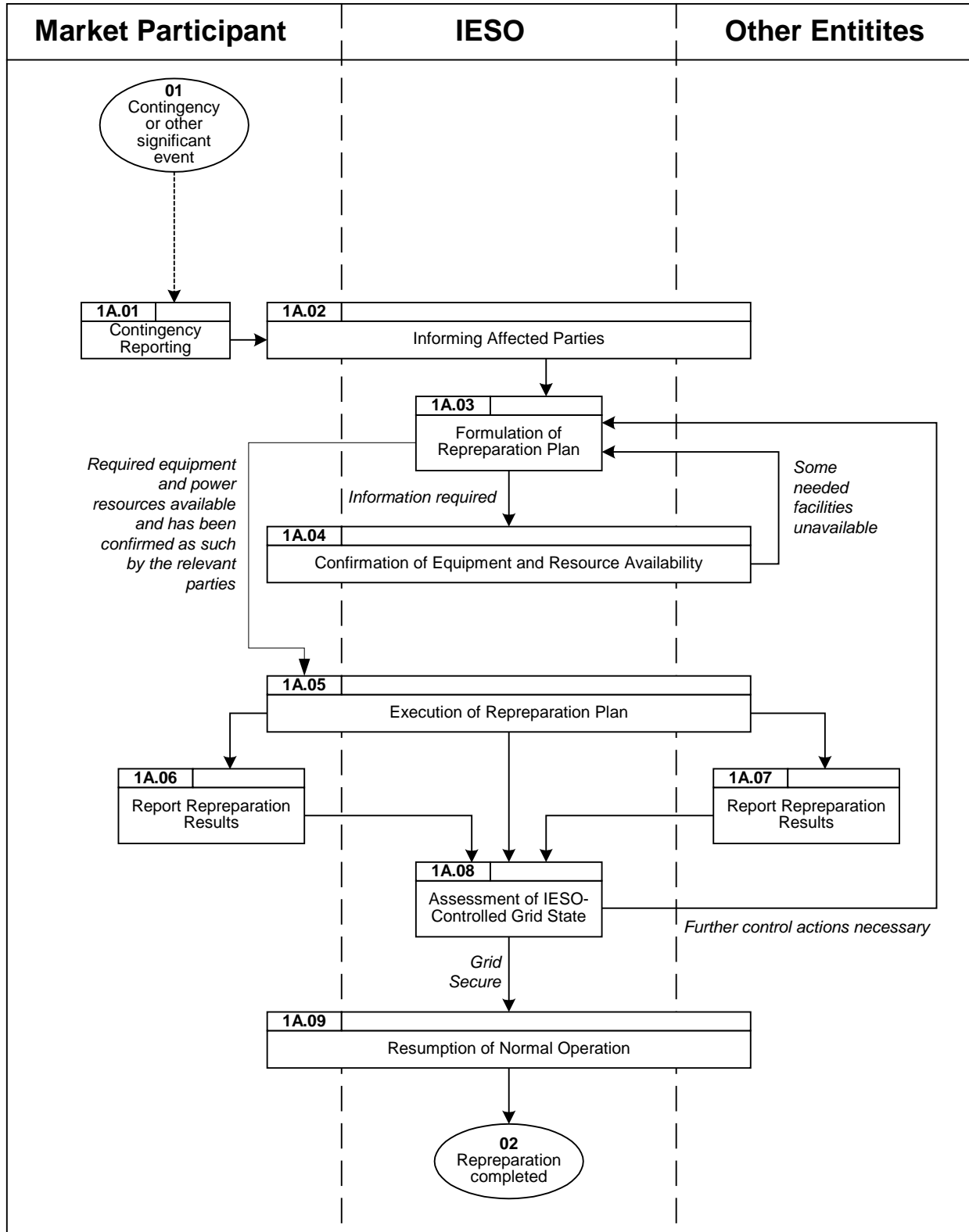


Figure 3-2: Work Flow for Re-preparation Following a Contingency

3.8 Procedural Steps

This section contains detail on the tasks (steps) that comprise the figure 'Re-preparation Following a Contingency'. The steps in the following table are illustrated in Section 3.6.

Each table contains seven columns, as follows:

Ref.

The numerical reference to the task.

Task Name

The task name as identified in Section 3.6.

Task detail

Detail about the task.

When

A list of all the events that can trigger commencement of the task.

Resulting information

A list of the information flows that may or must result from the task.

Method

The format and method for each information flow are specified.

Completion events

A list of all the circumstances in which the task should be deemed finished.

Table 3-3: Procedural Steps to Re-preparation Following a Contingency

Ref.	Task Name	Task Detail	When	Resulting Information	Method	Completion Events
1A.01	Contingency Reporting.	Operator calls <i>IESO</i> and reports details of the contingency and any other relevant information to <i>IESO</i> . Other authority centres may listen to the conversation provided it does not cause a delay in contacting <i>IESO</i> .	As soon as possible, but no more than 5 minutes after the initiating <i>contingency event</i> .	Reporting location Sequence of events Status and condition of equipment Cause of event (if known)	Telephone	<i>IESO</i> confirms that all required information has been received.
1A.02	Informing Affected Parties.	<i>IESO</i> contacts other <i>market participants</i> and other entities that are affected by the contingency and reports it to them.	After receiving contingency event report from operator.	Time, location and description of <i>contingency event</i> .	Telephone	<i>IESO</i> terminates conversation.
1A.03	Formulation of Re-preparation Plan.	Identify <i>security</i> limit violations and equipment overloads. Determine most effective means of re-preparing the <i>IESO-controlled grid</i> , including the restoration of any equipment that may be required to achieve re-preparation.	Within 10 minutes of the initiating event.	List and sequence of control actions, and corresponding operators. List of generation shifts required.	Application of established policies, procedures and guidelines, and personal knowledge, training and experience.	Plan approved by <i>IESO</i> shift authority.
1A.04	Confirmation of Equipment and Resource Availability.	<i>IESO</i> confirms with authority centres that required equipment and power resources are available, including status of outaged equipment.	After re-preparation plan is formulated.	Any equipment that is unavailable for service, including status of outaged equipment Quantity, location and activation times of active and reactive power sources that are available	Telephone	Answers received from all necessary parties.

Table 3-3: Procedural Steps to Re-preparation Following a Contingency

Ref.	Task Name	Task Detail	When	Resulting Information	Method	Completion Events
1A.05	Execution of Re-preparation Plan.	Operators execute control action instructions from <i>IESO</i> and report results as actions are completed. <i>Generation units</i> ramp toward outputs specified by either automatic or manual <i>dispatch instructions</i> from <i>IESO</i> .	As soon as possible, but no later than 5 minutes after instructions are received from <i>IESO</i> .	Verbal reports from operators Changes in local and telemetered metering and status indications	Telephone. Application of standard operating procedures and training.	Status indicators and verbal reports show that <i>IESO</i> instructions have been implemented.
1A.06	Report Re-preparation Results.	<i>Market Participant</i> operators report to <i>IESO</i> that actions are completed and the local results that were observed.	Immediately after completing control actions.	Consistency between local and <i>IESO</i> metering and status indicators. Observed equipment problems.	Telephone.	<i>IESO</i> terminates conversation.
1A.07	Report Re-preparation Results.	Other entities report to <i>IESO</i> that actions are completed and the local results that were observed.	Immediately after completing control actions.	Consistency between local and <i>IESO</i> metering and status indicators.	Telephone.	<i>IESO</i> terminates conversation.
1A.08	Assessment of <i>IESO</i> -controlled Grid State.	Check for any remaining security limit violations or equipment overloads. Check <i>AGC</i> capacity and <i>operating reserve</i> .	After operators have completed requested control actions and any generation shifts are finished.	State of <i>IESO</i> -controlled grid.	Observe metering and status indications relative to security limits and equipment limitations.	Conclusion that <i>IESO</i> -controlled grid is reliable, or that further action is necessary.
1A.09	Resumption of Normal Operation.	Return control of <i>generation dispatch</i> to the <i>dispatch algorithm</i> if manual overrides were implemented. Inform <i>market participants</i> and other entities of state of <i>IESO</i> -controlled grid.	After the <i>dispatch algorithm</i> has resolved any security limit violations.	Status of <i>dispatch algorithm</i> .	Telephone. System status report.	No alarms from <i>dispatch algorithm</i> . No equipment capability exceeded. System Status report updated.

- End of Section -

4. Security and Reliability

Reference: "Market Rules", Chapters 4 and 5

4.1 Security Limits

4.1.1 Overview

Security limits are technical, rather than economic, constraints on the operation of a power system that are intended to ensure that the *IESO-controlled grid* meets defined *reliability standards*. The *reliability standards* are set by *NERC*⁴, *NPCC*⁵, and the “Part 7.4: IESO-Controlled Grid Operating Policies”, and are available on the web pages of the respective organizations. *Security limits* in areas of the *IESO-controlled grid* that affect other *control areas* that are in regional councils other than *NPCC*, such as MAPP and ECAR, respect the *reliability standards* of these areas as well as those of *NPCC*⁶.

The *IESO* will establish *security limits* that seek to maximize the power transfer capability of the *IESO-controlled grid* within the *security* criteria imposed by *NERC*, *NPCC* and *IESO* policies. These *security limits* will respect the equipment capabilities that are specified by *market participants* and the voltage ranges that are required by *transmitters* and *distributors* to deliver acceptable voltage to their customers.

Changes to *security limits* are triggered by such things as:

- addition or removal of a transmission line or other transmission equipment;
- addition or removal of generation;
- change in load level or distribution;
- change in operating state (*normal*, *emergency*, *high risk*);
- change in weather;
- *emergencies* in neighbouring *control areas*;
- change in capability of existing equipment; and
- arming or disarming *special protection systems*.

Since *security limits* are affected by equipment *outages*, it is important that *outage* requests for planned work include all equipment that is required out of service to do that particular job. If additional *outage* requirements are identified after approval of the *outage*, there is a risk that the work will have to be cancelled because it conflicts with other approved *outages*, or because there is insufficient time to calculate *security limits* for the different configuration. (See “Part 7.3: Outage Management” for more information on this process.)

Security limits are frequently specified in the form of maximum power flows and associated minimum voltages at important interfaces on the power system. For example, the sum of the power

⁴ *NERC Reliability Standards* - TOP-004, TOP-007 and IRO-001

⁵ *NPCC Document A-2*

⁶ In respect of transactions across the tie-lines between the *IESO-controlled grid* and Michigan, the more restrictive of the *NPCC* and *ECAR* criteria will be used.

flows on all of the transmission lines into a particular 230kV transformer station should not exceed 400MW at a minimum voltage of 238kV. Different limits may apply in each of the *normal*, *emergency*, and *high-risk operating states*.

Security limits are formulated as linearized constraints, to facilitate market operation, with significant *outages* as parameters. The defining equations are posted on the *IESO* Web site. If *outages* or other changes to the base network configuration cause changes to *security limits*, the revised *security limits* will be publicized as well.

Appendix B illustrates a hypothetical example of a *security limit*.

4.1.2 Publication

Security limits will be posted on the *IESO* Web site. The constraining phenomenon (stability, voltage decline, thermal) will be listed for each limit.

The 14-day and 28-day *Security* and *Adequacy* Assessments will provide *security limits* for the specific network configurations that are planned in those time periods. The accuracy of the *security limits* will improve as the time until the forecasted day gets shorter.

Longer-term forecasts and routine reviews will also provide information about *security limits*. Some of these sources are:

- 18-month forecast;
- 10-year forecast;
- studies that are done to incorporate new *facilities* (See "Market Manual 2: Market Administration, Part 2.10: Connection Assessment and Approval" for more information on this process.); and
- NERC reviews.

4.2 Settings on Equipment

4.2.1 Transformer Taps

The *IESO* and *market participants* shall give due consideration to equipment and power system limitations when specifying fixed taps or when operating under load tap changers (Chapter 5, Sections 9.2.1 and 9.3.1 of the *market rules*).

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

The *IESO* will determine the fixed tap settings of autotransformers rated above 50kV. The *IESO* will direct the operation of under load tap changers on these 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.

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.

4.2.2 Generation Unit Excitation Systems

Values for the adjustable parameters of automatic voltage regulators, excitation limiters, and power system stabilizers will be specified by the *IESO* for all *generation units* that affect the *IESO-controlled grid* (Chapter 4, Appendix 4.2 of the *market rules*).

Generators and *embedded generators* shall implement settings within the time specified by the *IESO* and will confirm the performance of the equipment, by standard measurements⁷, immediately following any change in settings.

Any settings that are implemented must not be changed without the prior approval of the *IESO*.

Performance retesting will be conducted every five years, as required by *NERC*, or at shorter intervals if specified by the *IESO* (Chapter 4, Section 5.2 of the *market rules*).

4.2.3 Generation Unit Governors

Governor settings on *generation units* that affect the *IESO-controlled grid* shall be specified by the *IESO*, in consultation with the owner of the equipment.

Generators or *embedded generators* shall implement the settings within the time specified by the *IESO*, and shall verify the performance, by standard measurements⁸, immediately following any settings change. Performance retesting will be conducted every five years, as required by *NERC*, or at shorter intervals if specified by *IESO*.

4.2.4 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*.

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.

4.2.5 Special Protection Systems

The *IESO* shall specify settings for *special protection systems (SPS)*, in consultation with affected *market participants*.

SPS will be used in accordance with “Part 7.4: IESO-Controlled Grid Operating Policies”⁹.

4.2.6 Automatic Reclosure

Reference “Market Rules, Chapter 4, Appendix 4.4”

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*.

⁷ *NERC* Planning Standards, II System Modelling Data Requirements, B. Generation Equipment, Standard S1

⁸ *NERC* Planning Standards, II System Modelling Data Requirements, B. Generation Equipment, Standard S1

⁹ “Part 7.4, IESO-Controlled Grid Operating Policies”

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.

4.3 Operating States

4.3.1 Normal

Reference "Market Rules", Chapter 5, Section 2.2.

It is expected that the *IESO-controlled grid* will be in a *normal operating state* most of the time. A *normal operating state* is characterized by the following: the *outage* program is progressing as planned, there is no adverse weather threatening, equipment is operating within its normal ratings, normal limits¹⁰ are being respected, etc.

4.3.2 Emergency

Reference: "Market Rules" Chapter 5, Section 2.3.

An *emergency operating state* exists when declared by the *IESO*. Typically this occurs when *non-dispatchable load* would have to be shed to respect *normal operating state security limits*, or when an *emergency operating state* exists in a neighbouring *control area* and respecting *normal operating state security limits* would restrict *IESO's* ability to assist that *control area*. *Emergency limits*¹¹, which are the minimum acceptable level of *security*, will be respected in this state.

4.3.3 High Risk

A *high-risk operating state* may be declared by *IESO* in the presence of any of the following conditions:

- adverse weather such as lightning, freezing precipitation, or widespread or heavy fog within 50km of a *facility* forming part of the *IESO-controlled grid*;
- extreme weather such as tornadoes or wind gusts equal to or exceeding 130km/h within 50km of a *facility* forming 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 automatic control systems 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 beyond normal criteria contingencies. In this case, the *IESO*, if requested, will explain the reasons after the incident has passed.

If high risk limits are available, they will be respected.

¹⁰ "Part 7.4, IESO-Controlled Grid Operating Policies"

¹¹ "Part 7.4, IESO-Controlled Grid Operating Policies"

High risk conditions frequently imply a reasonable probability that a second contingency will occur before there has been time to re-prepare after the first one. In these cases, the *IESO* may take prudent actions such as recalling or canceling relevant *outages* to enhance the *security* of the *IESO-controlled grid*, in accordance with Section 4 of “Part 7.4: IESO-Controlled Grid Operating Policies”.

4.4 Maintaining Security

The *IESO* must use and support *interconnected systems* as necessary to maintain *security* of the *IESO-controlled grid* in accordance with agreements with other *security coordinators*, *control area operators* or *interconnected transmitters* (Chapter 5, Section 5.1.2.7 of the *market rules*).

The *IESO* shift operators, assisted by the Energy Management System (EMS), continuously monitor important variables such as power flows and voltages at different locations on the *IESO-controlled grid*, and continually update action plans to deal with contingencies to which the *IESO-controlled grid* is exposed. These plans typically involve some or all of generation shifts, load transfers, under load tapchanger movement, arming *special protection systems*, recalling *outages*, cutting *dispatchable loads*, etc.

In urgent situations, *non-dispatchable load* shedding may be ordered.

During a market suspension, the *IESO* will also use market mechanisms to the extent that is feasible to solve *security limit* violations. However, because of the short times permitted to return the *IESO-controlled grid* to a secure state, actions such as generation shifts may be ordered with regard only to their effectiveness in solving the limit violation.

NERC reliability standards stipulate that a *security limit* violation must not exist for more than 30 minutes. The *IESO* is required to abide rigidly by this standard. Further, *IESO* policy requires that *security limit* violations be resolved within 15 minutes in a *high-risk operating state*. This means that, particularly in *high-risk operating states*, the time permitted to restore the *IESO-controlled grid* to a secure state following a contingency is very short relative to all of the activities that must take place (Chapter 5, Section 2.4 of the *market rules*).

At the outset of any event, the prudent approach is to assume that all actions that are needed to restore *security* must be completed within 15 minutes. Three general activities must be accomplished in that time:

1. Report the event (relevant facility location operators).
2. Prepare an action plan (*IESO*).
3. Execute control actions (relevant facility location operators).

All reporting and execution of control actions are to be completed promptly. Accordingly, *market participants* are expected to execute control actions within 5 minutes unless told otherwise by the *IESO*. Obviously, if the reporting and action plan preparation can be done faster, there is more time to accomplish the control actions. On the other hand, any discussion of the plan reduces the time that is available for the control actions. Consequently, the relevant facility location operators shall execute directions from the *IESO*, as specified, and as soon as possible, with due regard to equipment, human and environmental safety. (Reference: *Market Rules*, Chapter 5, Section 5.10.1). 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*.

4.4.1 Generators

If a controlled reduction of generation for *reliability* concerns is acceptable, it is required that the *generating unit's* output change be completed promptly. In the case of nuclear and fossil-fired plants, it is recognized that this may not always be achievable within 5 minutes, and the *IESO* will endeavour to specify the maximum time that is permitted to complete the reduction so that tripping the generating unit can be avoided if possible. The *Generator* will implement the increase or reduction in a manner that supports the safe and secure operation of the *generation facility* (Chapter 5, Section 3.6.1.6 of the *market rules*).

If an immediate *response* is required, or if a requested controlled reduction cannot be completed by the specified time, the *IESO* will request that the *generation units* be immediately removed from service. The facility location operator will proceed to remove the specified *generation unit(s)* from service immediately in a safe and secure manner.

4.4.2 Transmitters

Load transfers, *special protection system* arming and single transmission element removal from service are expected to be done promptly (Chapter 5, Section 3.4.1.5 of the *market rules*).

Transmitters shall inform the *IESO* of any such control actions, such as load transfers, that cannot be completed within 5 minutes. In those instances, the *IESO* may direct that the control action be executed in advance of any contingency.

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

4.4.3 Distributors

Load transfers, and single transmission element removals from service are to be completed promptly.

Distributors shall inform the *IESO* of any such control actions, such as load transfers, that cannot be completed within 5 minutes. In those instances, the *IESO* may direct that the control action be executed in advance of any contingency (Chapter 5, Section 3.7.1.5 of the *market rules*).

4.5 Demand Management

4.5.1 Voltage Reduction

Distributors may institute voltage reductions to reduce *demand* within their service areas in accordance with Chapter 5, Section 10.2 of the "Market Rules". Notification to the *IESO* shall be via the *outage* management process in accordance with procedures in "Part 7.3: Outage Management".

If there is an actual or expected generation deficiency that cannot be resolved by market mechanisms and an *emergency operating state* exists on the *IESO-controlled grid* or on a neighbouring system, the *IESO* may direct selected *market participants* to reduce voltage by up to 5% to reduce *demand*. 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 (Chapter 5, Section 10.3. of the *market rules*).

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*.

Notification that voltage reductions are anticipated or are occurring will be made by the *IESO* to *market participants* via the System Status Report.

After a voltage reduction, *market participants* shall provide the required post-voltage reduction data 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*.

4.5.2 Load Shedding to Reduce Demand

By Market Participants

Transmitters and *distributors* may *disconnect* load to reduce *demand* within their service areas in accordance with Chapter 5, Section 10.2 of the "Market Rules". Notification to the *IESO* shall be via the *outage* management process in accordance with procedures in "Part 7.3: Outage Management".

If a *Transmitter* or *distributor* has disconnected load pursuant to Section 10.2.4 of Chapter 5, that load shall not be reconnected until directions have been received from the *IESO* permitting it. Such *transmitter* or *distributor* shall commence restoration of load immediately following receipt of such directions.

If there is an immediate risk to human safety or the environment, the *transmitter* or *distributor* may attempt to restore the load first, and then promptly inform the *IESO*.

By the IESO

If there is a generation deficiency that cannot be resolved by other means, the *IESO* may direct selected *market participants* to begin rotational load shedding to reduce *demand*. The *IESO* will instruct the entity that has direct operational control of the *facilities* to execute the load shedding. This entity will be identified by *market participants* during the registration process and be updated as required (Ch. 5, S. 10.3 of the *market rules*).

Notification that rotational load shedding is anticipated or is occurring will be made by the *IESO* to *market participants* via the System Status Report.

4.5.3 Customer Appeals

Local Problems

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 (Chapter 5, Section 10.2 of the *market rules*).

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

Grid Deficiency

If the market *response* is expected to leave all, or significant portions of, the *IESO-controlled grid* deficient of generation, the *IESO* may initiate public appeals to encourage customers to reduce electricity consumption voluntarily (Chapter 5, Section 10.3 of the *market rules*).

The *IESO* shall handle the public communication required to initiate such an appeal, and subsequently, recall the appeal when the need has disappeared.

4.6 Load Shedding

It may be necessary to interrupt *non-dispatchable load* to resolve generation deficiencies, equipment limitations, or *security limit* violations. Load shedding will be undertaken in accordance with the procedures in “Part 7.4: IESO-Controlled Grid Operating Policies”. In some instances, this will be accomplished automatically by underfrequency protection or *special protection systems*; in others, manual intervention will be required.

There are three types of manual load shedding:

1. Rotational Load Shedding – portions of load in an electrical area that are sequentially interrupted and restored, commonly on a 30 minute rotation (Chapter 5, Section 10.3 of the *market rules*).
2. *Emergency Load Shedding* – relatively large blocks of load, typically specified in increments of 100MW to 200MW, to respect *security limits* or equipment ratings.
3. Manual Load Shedding (that is done independent of direction by the *IESO*) for Low Frequency– as much of the load in an electrical area as is required to arrest declining system frequency.

4.6.1 Automatic Under Frequency Load Shedding (UFLS)

Global automatic underfrequency load shedding is intended to prevent the loss of generating units via their underfrequency protection if the system frequency begins to decline because of insufficient generation. "Market Rules" Chapter 5 Section 10.4.6 states that at least 30% of load be connected to automatic underfrequency load shedding relaying for this purpose (Chapter 5, Section 10.4.6 of the *market rules*).

In order to ensure at least 30% of load shedding is done, the *IESO* requires that 35% of the total peak load of *connected wholesale customers* and *distributors* be connected to automatic underfrequency load shedding relays. The additional 5% above required takes into account UFLS feeder and relay outages as well as *generation units* that trip for low frequencies above the curve specified in Market Rule Chapter 4 Grid Connection Requirements Appendix 4.2, Category 1. The load shedding must be done in stages as specified in Market Manual 7: System Operations, Part 7.4: IESO-Controlled Grid Operating Policies Section 4.5.

Local automatic underfrequency load shedding may be used to balance generation and load in areas that are prone to islanding. In this case, the load that is required to be connected to underfrequency relaying will be specific to each area and may exceed 30%. The global requirement is met by ensuring that the total load connected to underfrequency load shedding relays in all the areas is at least 35% of the total load.

The Section 4.5 of “Part 7.4: IESO-Controlled Grid Operating Policies” defines underfrequency load shedding areas, and specifies the amount of load that is to be connected to underfrequency relaying in each area.

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

4.6.2 Load Shedding Via Special Protection Systems

Load that is connected to *special protection systems (SPS)* will be chosen in accordance with policies in “Part 7.4: *IESO-Controlled Grid Operating Policies*”.

Requests for exclusion from load shedding via SPS as a result of *planned outages* will be handled through the *outage* management process, in “Part 7.3: *Outage Management*”.

Equipment failure (such as SCADA that would prevent the restoration of load following an *SPS* operation) may lead to an unplanned request for an exclusion from load shedding. Such requests are to be made by the relevant *market participants* to the *IESO* shift operating staff.

4.6.3 Manual Load Shedding Schedules

Connected distributors and connected wholesale customers shall identify to their controlling authority their *priority loads*.

Connected Distributors

The *IESO* will identify electrical areas in which rotational load shedding may be required. Each *Connected Distributor* shall maintain up-to-date rotational 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. *Connected distributors* shall ensure equitable treatment of different loads within the schedules and will manage sensitive loads such as hospitals, water treatment plants, etc. within the schedules (Chapter 5, Section 10.4.7 of the *market rules*).

The *IESO* will identify electrical areas for which *emergency* load shedding schedules are to be maintained. Exclusion from manual load shedding schedule should be kept to a minimum to facilitate rapid load shedding (Chapter 5, Section 10.3.6 of the *market rules*).

Because of the varying load profiles, each *connected distributor's* operating staff is responsible for determining where 100MW, 200MW, etc., cuts can be made at any given time during the shift.

Emergency and rotational load shedding should be such that load shedding in the vicinity of a natural or man-made disaster does not hamper *emergency* measures. Load shedding should not take place in a area where prevailing transmission conditions prevents this actions from alleviate the system *security* concerns.

Emergency and rotational load-shedding schedules should avoid, to the extent practical, load being shed by *special protection systems*. *Connected distributors* shall prepare, in advance, underfrequency load-shedding schedules that identify a block of load equivalent to 25% of the load that is under the direction of each controlling authority. These blocks of load should be separate from any that is connected to automatic underfrequency protection.

When a *transmitter* exercises operating control on behalf of a *connected distributor*, that *transmitter* will follow the procedures outlined above for *connected distributors*.

Connected Wholesale Customers

Each *connected wholesale customer* is encouraged to prepare a manual load shedding schedule that divides its load into at least two blocks and priorities 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.

Connected wholesale customers who have a peak load of 100MVA or more shall prepare, in advance, underfrequency load-shedding schedules that identify a block of load equivalent to 25% of the load that is under the direction of each controlling authority. These blocks of load should be separate from any that is connected to automatic underfrequency protection.

4.6.4 Executing Manual Load Shedding

The *IESO* shall direct any *emergency* load shedding that is required resolving a *security limit* violation, to correct voltages on the *IESO-controlled grid*, or any rotational load shedding that is needed to balance generation with *demand*.

The communication will be directly from the *IESO* to the entity that has operational control of the relevant breaker. Depending upon the situation, operating control of feeder breakers may be exercised by connected *distributors*, *connected wholesale customer* or *transmitters*. Connected *distributors* and *connected wholesale customer* shall ensure that load shedding schedules are provided to the appropriate entities.

For Voltage Problems

In the absence of specific directions from the *IESO*, *transmitters* and *distributors* may shed load independently when the low side voltage at a stepdown transformer station is beyond tolerable levels and does not appear to be recovering.

Each area shall have a defined normal voltage level. The guidelines for independent load shedding are:

- voltage has been 10% to 15% above or below the normal level for more than three minutes; or
- any time that voltage deviates by more than 15% from its normal value.

For Frequency Problems

If automatic underfrequency load shedding fails to maintain frequency at an acceptable value, manual control action may be required. The magnitude of the frequency deviation determines whether the action is directed by the *IESO* or done independently by *transmitters* (Chapter 5, Section 10.4.3 of the *market rules*).

Transmitters shall have annunciation of underfrequency set at 59.8Hz.

For frequencies 59.0Hz and above, the *IESO* shall direct the actions.

For frequencies between 59.0Hz and 58.5Hz, *transmitters* shall shed 25% of their controlled load. For frequencies below 58.5Hz, *transmitters* shall shed load until the frequency returns to 59.0Hz. If an island is known to have formed within the *IESO-controlled grid*, frequency in that island should be returned to as close to 60Hz as practical. *Market participants* shall ensure that frequency metering is available to the entity that has operating control of their feeder breakers (Chapter 4, Appendices 4.1.5 and 4.1.6 of the *market rules*).

No load that has been shed to correct low frequency shall be restored without the approval of the *IESO* (Chapter 5, Section 10.4.8 of the *market rules*).

4.7 Generators With Abnormal Frequency

4.7.1 All Generators

For frequencies in the range of 59.8 Hz to 60.2Hz, *generators* shall not act without instructions from the *IESO* except for the purpose of protecting the safety of its equipment, its employees, the public or the environment. If a generator 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, whilst observing operating restrictions. If the unit operator must take immediate and independent action, the *IESO* should be contacted as soon as possible after (Chapter 5, Section 10.5. of the *market rules*).

During periods of abnormal frequency unit voltage should be maintained within normal ranges with the automatic voltage regulator kept in service where possible.

If the frequency is above 60.2Hz for more than 2 minutes and the *IESO* cannot be contacted, a *generator* shall gradually reduce the output of affected *generation units* until the frequency reaches 60.0Hz.

4.7.2 Hydroelectric Generators

When frequency is in the range of 57.5 Hz to 59.8 Hz and stable, available *generators* shall be started independently and synchronized to the *IESO* controlled grid. Any units on condense shall be changed to generate mode. The *IESO* shall provide instructions on loading units. If frequency is not stable, secure station service with available non synchronized generation.

When frequency is below 57.5 Hz, where there is no evidence of frequency recovery, *generators* shall separate their units from the system in a manner that allows the *generators* to supply their station service load. Units should remain at synchronous speed, and await instructions from the *IESO*. Any units within known islands, or experiencing frequency fluctuations, should endeavor to use a damped mode of governor operation.

4.7.3 Non Hydroelectric Generators

When frequency is in the range of 57.5Hz to 59.8Hz, available *generators* shall make themselves ready for start up (do not start any equipment). Units are not to be synchronized without direction from the *IESO*. When frequency is below 57.5Hz, generating units with steam turbines, where under-frequency protection has operated, shall stabilize and ready units for synchronization and loading as per the *IESO*'s instructions.

4.8 Testing or Simulation of Emergency Procedures

Testing or simulation of *emergency* procedures is done to keep involved staff familiar with the procedures, and to identify any deficiencies in the procedures so that they can be corrected.

4.8.1 Voltage Reduction Test

For the purpose of this section, transmitters and connected distributors with directly connected load facilities of 20 MVA and greater who have control of their own voltage reduction facilities (i.e. under-load tap changing step-down transformers) are known as *Voltage Reduction Test Participants*.

Purpose

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 *Voltage Reduction 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.

Scheduling and Responsibilities

Preferred dates for tests are the third Tuesday or Thursday of January or July. The *IESO* (Market Forecasts and Integration) will set the date for the test and will schedule it through the *outage* management process. As necessary, voltage reduction test meetings will be held with voltage reduction test participants before and after each scheduled test.

Province-wide tests are normally scheduled 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 (Chapter 5, Section 11.7.5 of the *market rules*).

Each *Voltage Reduction Test Participant* will maintain a plan to initiate customer notification, handling of customer concerns during reductions procedures, and follow up and correction of customer problems after reduction termination.

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

Notification

Voltage Reduction Test Participants will be given notice by the *IESO* 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 notification from the *IESO* shall specify the times, duration, and percent voltage reduction of each exercise. The test may include a 3% reduction, a 5% reduction, or both.

The *IESO* will post notification of the voltage reduction tests on the *IESO* Web site. Additional notification will also be included in the Security and Adequacy Assessment and System Status Reports. These notices will be posted one week in advance of the test.

Each *Voltage Reduction 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 posted on the *IESO* Web site and in the Security and Adequacy Assessment and System Status Reports.

To facilitate the aforementioned notification requirements, the *IESO* and *Voltage Reduction Test Participants* communication departments may consider a joint communication notification where possible.

Reporting

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

- *Voltage Reduction 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.

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*.

Within one week of the exercise, data from the *Voltage Reduction Test Participants* shall be forwarded to the Manager of Market Forecasts and Integration at the *IESO* along with a plan that details corrective actions to be implemented to minimize the need to exclude load in subsequent tests.

The *IESO* relies on our 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;
- amount of load (MW) restored (by transformer or transformer pair) at the conclusion of the test;

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 should keep the data for 1 month after the exercise has been completed.

Requests for Exclusion from Voltage Reduction Test

All requests for exclusion from voltage reduction tests will be made by the *Voltage Reduction Test Participant* to the *IESO* using the *outage* management process. All requests should be received no later than 10:00 a.m. EST three *business days* prior to the scheduled day for the voltage reduction test. The *IESO* will approve or reject exclusion requests based on the decision criteria below and advise the *Voltage Reduction 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 *Voltage Reduction Test Participant* in determining whether to approve requests for exclusion from the voltage reduction test. The same criteria should be applied to requests made while the test is in progress:

- Safety of the employees or the public;
- Undue injury to the environment;
- Damage to equipment; and
- Loss of production.

During a voltage reduction test, customers connected to or embedded in a *Voltage Reduction Test Participant* are expected to notify their *Voltage Reduction Test Participant* and request an exclusion to mitigate the risks described above. The *Voltage Reduction 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 an exclusion request directly, the *IESO* will promptly direct the affected *Voltage Reduction Test Participant* to take the appropriate mitigating action.

As outlined in this instruction, each *Voltage Reduction Test Participant* is responsible for customer notification and handling of customer concerns, both during and after the exercise.

4.8.2 Simulation of Rotational Load Shedding

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

Rotational load shedding is usually simulated during two periods each year. Six 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.

The *IESO* shift operating 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 rotational 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 *SPS* load rejection load is to be excluded.
3. Instruct the operators at the time of the exercise, to simulate rotational load shedding. After the simulation has commenced, advise the operator that rotation of simulated load interrupted may commence.
4. Order simulated load restoration.

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.

Analysis and Reporting

Within 2 weeks of the simulation, *transmitters, distributors and connected wholesale customers* will deliver a report to the Manager of Market Facilitation at the *IESO* that includes:

- the actual amount (MW) of load under control at the time of the simulation;
- the amount of load (MW) that was simulated shed in each stage of the rotation;
- the identification and resolution of any problems that occurred during the simulation; and
- conclusions and recommendations.

The *IESO* will review and compare the results of the simulations relative to the expected performance and the impact on *IESO-controlled grid* operation. The *IESO* will report on the effectiveness of the simulation and any problems identified.

4.8.3 Intentionally Left Blank

4.8.4 SeptSystem Restoration

Testing the various aspects of system restoration are covered in the *Ontario Power System Restoration Plan*.

4.9 IESO Actions in Advance of Extreme Conditions

The *IESO* has NERC Transmission Operations (TOP) and Emergency Preparedness and Operations (EOP) standard obligations to develop and implement plans to prepare for reliable operations, including response for unplanned events. Under extreme conditions, this may require the *IESO* to commit additional resources. Some extreme conditions may require the *IESO* to take actions outside of normal market timelines. We will continue to use normal market mechanisms to the greatest extent possible. Table 4-1 provides examples of conditions that may require the *IESO* to take such steps, as well as examples of the potential actions¹.

The *IESO* will issue an Extreme Conditions Alert in a Security and Adequacy Assessment (SAA) or System Status Report (SSR) in advance or during extreme conditions as appropriate. The alert will notify the market of:

- The conditions or expected conditions in the forecast, AND
- The action(s) the *IESO* is taking.

Table 4-1: IESO Actions in Advance of Extreme Conditions

If ...	Then...
The IESO experiences, or expect conditions such as: <ul style="list-style-type: none">• Extreme temperatures (hot or cold)• Hurricane• Ice Storm• Forest Fires	The IESO may: <ul style="list-style-type: none">• Commit additional generators,• Reject or revoke planned outages, OR• Other actions appropriate for the circumstances.

– End of Section –

5. Compliance & Surveillance

The compliance process that applies to this procedure is detailed in “Market Manual 2: Market Administration, Part 2.6: Treatment of Compliance Issues”.

The market surveillance process that applies to this procedure is detailed in “Market Manual 2: Market Administration, Part 2.7: Treatment of Market Surveillance Issues”.

– End of Section –

Appendix A: Voltage Reduction

Voltage Reduction Test / Event Reading Sheet								
Market Participant:								
Date (YYYY/MM/DD):								
Exclusions Prior to the voltage reduction (actual or test):								
Customer Name	Station Name	3% Test Load (MW)			5% Test Load (MW)			Reason for Exclusion
TOTAL				0.00			0.00	
Exclusions During the voltage reduction (actual or test):								
Customer Name	Station Name	3% Test			5% Test			Reason for Exclusion
		From (hh:mm)	To (hh:mm)	Load (MW)	From (hh:mm)	To (hh:mm)	Load (MW)	
TOTAL				0.00			0.00	
Comments (complaints, observations):								

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

NOTES:

– End of Section –

Appendix B: Structure of Security Limit

Different areas of the *IESO-controlled grid* may be overgenerated or undergenerated, depending upon the time. In this example, an undergenerated area is considered.

An undergenerated area of the *IESO-controlled grid* is typically constrained by post-contingency voltage declines within the area. Figure B-1 illustrates such an area and the *security limit* that might apply to it. Assume that the *security* criteria for this area require that only single element losses have to be considered, and that post-contingency voltage declines of up to 10% are acceptable.

The solid line in Figure B-1 is the locus of all of the combinations of transfers into the area that produce no more than a 10% voltage decline at any bus in the area when all 4 lines are in service before the contingency. There will be three lines left to supply the area after the contingency. The dashed line is the limit when Line 4 is out prior to the contingency. In this case, the area will be left with only two lines supplying it after the contingency.

The following equations define the *security limit* with all 4 transmission lines in service:

$$(P1 + P2) \leq 250 \quad \text{the current-carrying capacity of Lines 1 and 2}$$

$$(P3 + P4) \leq 700 \quad \text{the current-carrying capacity of Lines 3 and 4}$$

$$(P1 + P2) \leq 400 - 0.8(P3 + P4) \quad \text{the voltage decline limit}$$

With Line 4 out of service, the constraints are:

$$(P1 + P2) \leq 250 \quad \text{the current-carrying capacity of Lines 1 and 2}$$

$$(P3 + P4) \leq 350 \quad \text{the current-carrying capacity of Lines 3 and 4}$$

$$(P1 + P2) \leq 292 - 0.8(P3 + P4) \quad \text{the voltage decline limit}$$

Similar constraints would exist for one of Lines 1, 2, or 3 out of service.

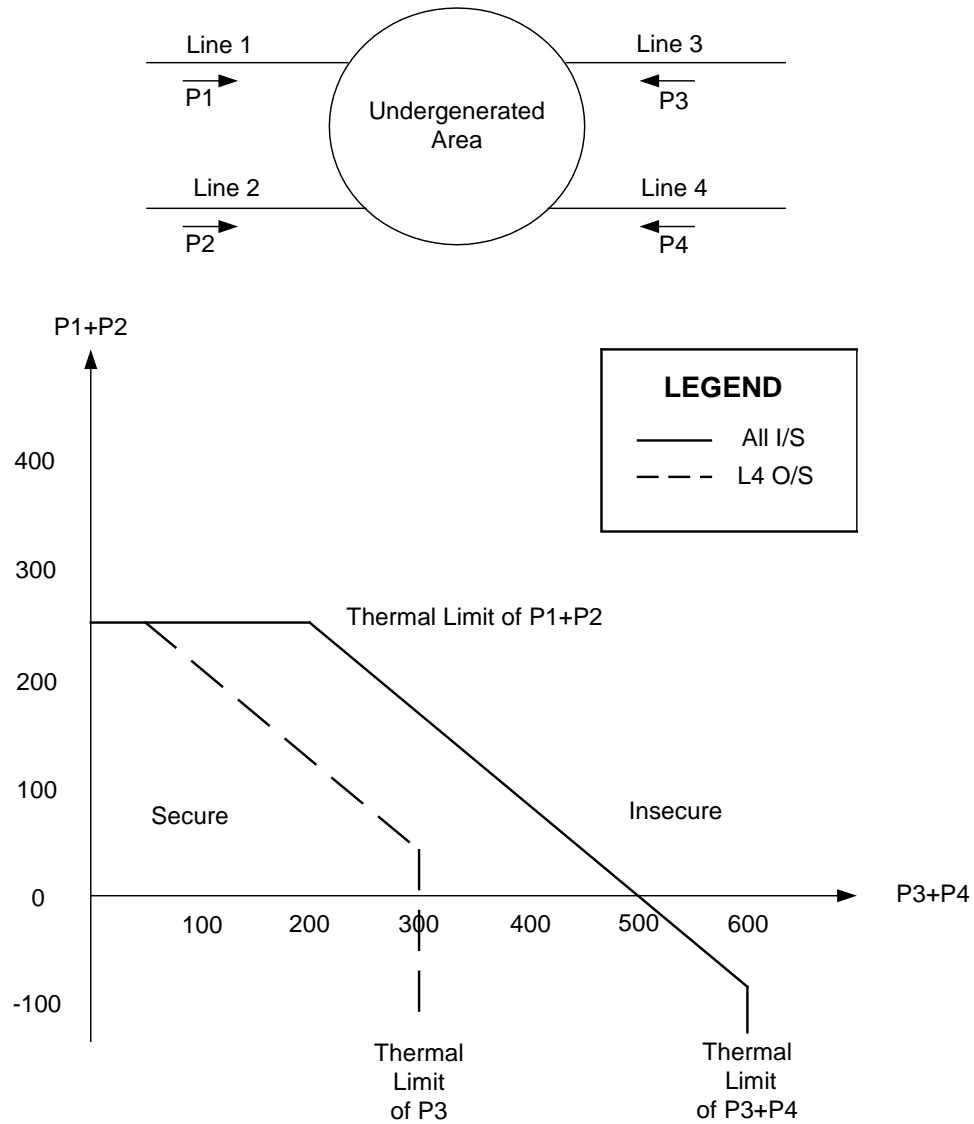


Figure B-1: Security Limit for an Undergenerated Area

– End of Section –

Appendix C: Definition of the IESO-controlled grid

Following are the relevant sections from *IESO-Transmitter Agreements* that define the *IESO-controlled grid*.

C.1 Hydro One

Note: The text in the following section has been taken from the *Operating Agreement* between the *IESO* and Hydro One.

IESO-controlled grid means the *transmission systems* with respect to which, pursuant to *operating agreements*, the *IESO* has authority to the direct operations. For the purpose of this Agreement *IESO-controlled grid* means those transmission *facilities* owned and operated by Hydro One and identified in Article III.

Transmission *facilities* means the lines, structures, equipment, auxiliary equipment and *facilities* owned and operated by Hydro One that are used for the purpose of transmitting electricity. For the purposes of this Agreement these *facilities* are all lines, structures, equipment, auxiliary equipment and *facilities* operated at greater than 50 kV and *facilities* operated at less than 50 kV at the step-down transformer stations down to the load side of the feeder breaker.

Section 3.1 Transmitter Transmission Facilities

On the effective date of this Agreement all transmission *facilities* owned and operated by Hydro One in Ontario shall be included in the *IESO-controlled grid*. The boundary of the *IESO-controlled grid* shall normally be at the load side of the low voltage feeder breakers at step-down transformer stations having a low voltage winding operated at voltages of 50 kV or less.

Section 3.2 Transmission Facilities Excluded

If after the effective date of this Agreement, the *IESO* determines that any existing transmission *facilities* should not be included in the *IESO-controlled grid*, or if Hydro One successfully challenges the *IESO's* designation of any such existing transmission *facilities* as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XVI, such *facilities* shall be excluded from the *IESO-controlled grid*. Any existing transmission *facilities* excluded from the *IESO-controlled grid* shall be included in Schedule A.

Section 3.3 New Transmission Facilities

Any transmission *facilities* that may be constructed in the future in Ontario shall be included in the *IESO-controlled grid*, unless the *IESO* determines that such transmission *facilities* should not be included in the *IESO-controlled grid* or Hydro One successfully challenges the *IESO's* designation of any such transmission *facilities* as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XVI. Any new transmission *facilities* excluded from the *IESO-controlled grid* shall be added to Schedule A.

Section 3.4 New Facilities at or Below 50 kV

Facilities operated at voltages 50 kV or less and are not defined as transmission *facilities*, that are constructed and placed into operation after the effective date, shall not be part of the *IESO-controlled grid* unless the *IESO* concludes that such *facilities* should be included in the *IESO-controlled grid*, and Hydro One does not successfully challenge the *IESO's* designation of any such *facilities* as being

part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XVI. Schedule A shall include those *facilities* operated at voltages 50 kV or less and are not defined as transmission *facilities*, that form part of the *IESO-controlled grid*.

C.2 Five Nations Energy Inc.

Note: The text in the following section has been taken from the *Operating Agreement* between the *IESO* and Five Nations Energy Inc. (Five Nations).

IESO-controlled grid means the *transmission systems* with respect to which, pursuant to *operating agreements*, the *IESO* has authority to the direct operations. For the purpose of this Agreement *IESO-controlled grid* means those transmission *facilities* owned and operated by Five Nations and identified in Article III.

Transmission *facilities* means the lines, structures, equipment, auxiliary equipment and *facilities* owned and operated by Five Nations that are used for the purpose of transmitting electricity. For the purposes of this Agreement these *facilities* are all lines, structures, equipment, auxiliary equipment and *facilities* operated at greater than 50 kV and *facilities* operated at less than 50 kV at the step-down transformer stations down to the load side of the feeder breaker.

Section 3.1 Five Nations Transmission Facilities

On the *effective date* of this Agreement all *transmission facilities* owned and operated by Five Nations in Ontario shall be included in the *IESO-controlled grid*. The boundary of the *IESO-controlled grid* shall normally be at the load side of the low voltage feeder breakers at step-down transformer stations having a low voltage winding operated at 50 kilovolts or less.

Section 3.2 Transmission Facilities Excluded

If after the *effective date* of this Agreement, the *IESO* determines that any existing *transmission facilities* should not be included in the *IESO-controlled grid*, or if Five Nations successfully challenges the *IESO's* designation of any such existing *transmission facilities* as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XV, such facilities shall be excluded from the *IESO-controlled grid*. Any existing *transmission facilities* excluded from the *IESO-controlled grid* shall be included in Schedule A.

Section 3.3 New Transmission Facilities

Any *transmission facilities* that may be constructed in the future in Ontario shall be included in the *IESO-controlled grid*, unless the *IESO* determines that such *transmission facilities* should not be included in the *IESO-controlled grid* or Five Nations successfully challenges the *IESO's* designation of any such *transmission facilities* as part of the *IESO-controlled*. Any new *transmission facilities* excluded from the *IESO-controlled grid* shall be added to Schedule A.

Section 3.4 New Five Nations Facilities

Any Five Nations facilities not defined as *transmission facilities*, that may be constructed in the future in Ontario, shall not be included in the *IESO-controlled grid*, unless the *IESO* determines that such facilities should be included in the *IESO-controlled grid* and Five Nations does not successfully challenge the *IESO's* designation of such facilities as part of the *IESO-controlled*. Any facilities not defined as *transmission facilities*, that form part of the *IESO-controlled grid* shall be listed in Schedule B.

C.3 Great Lakes Power Limited

Note: The text in the following section has been taken from the *Operating Agreement* between the IESO and The Transmission Division of Great Lakes Power Limited (GLP).

IESO-controlled grid means the *transmission systems* with respect to which, pursuant to *operating agreements*, the IESO has authority to the direct operations. For the purpose of this Agreement *IESO-controlled grid* means those *transmission facilities* owned and operated by GLP and identified in Article III.

Transmission facilities means the lines, structures, equipment, auxiliary equipment and *facilities* owned and operated by GLP that are used for the purpose of transmitting electricity. For the purposes of this Agreement these *facilities* are all lines, structures, equipment, auxiliary equipment and *facilities* operated at greater than 50 kV and *facilities* operated at less than 50 kV at the step-down transformer stations down to the load side of the feeder breaker.

Section 3.1 GLP Transmission Facilities

On the *effective date* of this Agreement all *transmission facilities* owned and operated by GLP in Ontario shall be included in the *IESO-controlled grid*. The boundary of the *IESO-controlled grid* shall normally be at the load side of the low voltage feeder breakers at step-down transformer stations having a low voltage winding operated at 50 kilovolts or less. Any GLP facilities which, by agreement of the Parties, are not defined as *transmission facilities* and are to be included as part of the *IESO-controlled grid* are listed in Schedule B.

Section 3.2 Transmission Facilities Excluded

If after the *effective date* of this Agreement, the IESO and GLP are not able to agree on the exclusion of any existing *transmission facilities* from the *IESO-controlled grid* and the IESO subsequently determines that any such existing *transmission facilities* should not be included in the *IESO-controlled grid*, or if GLP successfully challenges the IESO's designation of any such existing *transmission facilities* as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XV, such facilities shall be excluded from the *IESO-controlled grid*. Any existing *transmission facilities* excluded from the *IESO-controlled grid* shall be included in Schedule A.

Section 3.3 New Transmission Facilities

Any *transmission facilities* that may be acquired in the future in Ontario shall by agreement of the Parties be included in the *IESO-controlled grid*, unless failing such agreement the IESO determines that such *transmission facilities* should not be included in the *IESO-controlled grid* or GLP successfully challenges the IESO's designation of any such *transmission facilities* as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XV. Any new *transmission facilities* excluded from the *IESO-controlled grid* shall be added to Schedule A.

Section 3.4 New GLP Facilities

Any GLP facilities not defined as *transmission facilities*, that may be acquired in the future in Ontario, shall by agreement of the Parties not be included in the *IESO-controlled grid*, unless failing such agreement the IESO determines that such facilities should be included in the *IESO-controlled grid* and GLP does not successfully challenge the IESO's designation of such facilities as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XV. Any facilities not defined as *transmission facilities*, that form part of the *IESO-controlled grid* shall be listed in Schedule B.

C.4 Canadian Niagara Power Inc.

The text in the following section has been taken from the *Operating Agreement* between the *IESO* and The Transmission Division of Great Lakes Power Limited (GLP). *IESO-controlled grid* means the *transmission systems* with respect to which, pursuant to agreements, the *IESO* has authority to *direct the operations*. For the purpose of this Agreement *IESO-controlled grid* means those *transmission facilities* owned and operated by CNP and identified in Article III.

Transmission facilities means the lines, structures, equipment, auxiliary equipment and facilities owned and operated by CNP that are used for the purpose of transmitting electricity. For the purposes of this Agreement these facilities are all lines, structures, equipment, auxiliary equipment and facilities operated at greater than 50 kV and facilities operated at less than 50 kV at the step-down transformer stations down to the load side of the feeder breaker.

Section 3.1 CNP Transmission Facilities

On the *effective date* of this Agreement all *transmission facilities* owned and operated by CNP in Ontario shall be included in the *IESO-controlled grid*. The boundary of the *IESO-controlled grid* shall normally be at the load side of the low voltage feeder breakers at step-down transformer stations having a low voltage winding operated at 50 kilovolts or less. Any CNP facilities which, by agreement of the Parties, are not defined as *transmission facilities* and are to be included as part of the *IESO-controlled grid* are listed in Schedule B.

Section 3.2 Transmission Facilities Excluded

If after the *effective date* of this Agreement, the *IESO* determines that any existing *transmission facilities* should not be included in the *IESO-controlled grid*, or if CNP successfully challenges the *IESO's* designation of any such existing *transmission facilities* as part of the *IESO-controlled grid* pursuant to the dispute resolution process in Article XV, such facilities shall be excluded from the *IESO-controlled grid*. Any existing *transmission facilities* excluded from the *IESO-controlled grid* shall be included in Schedule A.

Section 3.3 New Transmission Facilities

Any *transmission facilities* that may be constructed in the future in Ontario shall be included in the *IESO-controlled grid*, unless the *IESO* determines that such *transmission facilities* should not be included in the *IESO-controlled grid* or CNP successfully challenges the *IESO's* designation of any such *transmission facilities* as part of the *IESO-controlled grid*. Any new *transmission facilities* excluded from the *IESO-controlled grid* shall be added to Schedule A.

Section 3.4 New CNP Facilities

Any CNP facilities not defined as *transmission facilities*, that may be constructed in the future in Ontario, shall not be included in the *IESO-controlled grid*, unless the *IESO* determines that such facilities should be included in the *IESO-controlled grid* and CNP does not successfully challenge the *IESO's* designation of such facilities as part of the *IESO-controlled grid*. Any facilities not defined as *transmission facilities*, that form part of the *IESO-controlled grid* shall be listed in Schedule B.

– End of Section –

Glossary of Terms

The glossary of terms for System Operations is *published* as a separate document, "Market Manual 7: Part 7.6: Glossary of Standard Operating Terms" within the *System Operations Manual*. The glossary can be found on the *IESO* public Web site at the same location as this manual.

– End of Section –

References

Document ID	Document Title
MDP_RUL_0002	Market Rules for the Ontario Electricity Market
IMO_PLAN_0002	Ontario Electricity Emergency Plan
MDP_PRO_0022	Market Manual 2: Market Administration, Part 2.6: Treatment of Compliance Issues
MDP_PRO_0023	Market Manual 2: Market Administration, Part 2.7: Treatment of Market Surveillance Issues
MDP_PRO_0048	Market Manual 2: Market Administration, Part 2.10: Connection Assessment and Approval
MDP_MAN_0004	Market Operations 4.0: Market Operations Overview
IMP_MAN_0012	Market Manual 7: System Operations, Part 7.0: System Operations Overview
IMP_PRO_0035	Market Manual 7: System Operations, Part 7.3: Outage Management
IMO_POL_0002	Market Manual 7: System Operations, Part 7.4: IESO-Controlled Grid Operating Policies
IMP_GOT_0002	Market Manual 7: System Operations, Part 7.6: Glossary of Standard Operating Terms

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