
Market Manual 4: Market Operations

Part 4.3: Operation of the Real-Time Markets

Issue 65.3
June 7, 2024

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

This procedure provides guidance to *market participants* on the *real-time scheduling process* in the *real-time energy* and *operating reserve* markets.

Document Change History

Issue	Reason for Issue	Date
For history prior to 2011, refer to version 40.0		
For history prior to December 2014, refer to versions 50.0 and prior		
For changes prior to 2017, refer to version 58.0 and prior		
49.0	Issue released for Baseline 37.0	March 1, 2017
50.0	Issue released for Baseline 37.1	June 7, 2017
51.0	Issue released in advance of Baseline 38.0	August 1, 2017
52.0	Issue released for Baseline 38.0	September 13, 2017
53.0	Issue released for Baseline 38.1	December 6, 2017
54.0	Issue released in advance of Baseline 40.1	November 14, 2018
55.0	Issue released in advance of Baseline 41.1	April 30, 2019
56.0	Issue released in advance of Baseline 42.1	October 15, 2019
57.0	Issue released in advance of Baseline 43.1. These changes are applicable to the <i>capacity auction</i> for the <i>commitment period</i> beginning May 1, 2021.	May 4, 2020
58.0	Issue released in advance of Baseline 44.0	June 29, 2020
59.0	Updated to meet accessibility requirements pursuant to the <i>Accessibility for Ontarians with Disabilities Act</i> .	December 2, 2020
60.0	Issue released in advance of Baseline 45.0. Updated to include electricity storage participation.	February 26, 2021
61.0	Issue released for Baseline 45.1	June 2, 2021
62.0	Issue released for Baseline 46.0	September 15, 2021
63.0	Issue released for Baseline 47.1	June 1, 2022
64.0	Issue released for Baseline 48.0	September 14, 2022
65.0	Issue released in advance of Baseline 48.1	September 19, 2022
65.1	Updated for stakeholder engagement to reflect Market Renewal Program	July 14, 2023
65.2	Updated after considering external stakeholder review	March 13, 2024
65.3	Updated for MRP – Final Alignment	June 7, 2024

Related Documents

Document ID	Document Title
MDP_PRO_0027	Market Manual 4.1: Submitting Dispatch Data in the Physical Markets
TBD	Market Manual 4.2: Operation of the Day-Ahead Market

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Table of Changes

Reference	Description of Change

Market Transition

- A.1.1 This *market manual* is part of the *renewed market rules*, which pertain to:
- A.1.1.1 the period prior to a *market transition* insofar as the provisions are relevant and applicable to the rights and obligations of the *IESO* and *market participants* relating to preparation for participation in the *IESO administered markets* following commencement of *market transition*; and
 - A.1.1.2 the period following commencement of *market transition* in respect of all the rights and obligations of the *IESO* and *market participants*.
- A.1.2 All references herein to chapters or provisions of the *market rules* or *market manuals* will be interpreted as, and deemed to be references to chapters and provisions of the *renewed market rules*.
- A.1.3 Upon commencement of the *market transition*, the *legacy market rules* will be immediately revoked and only the *renewed market rules* will remain in force.
- A.1.4 For certainty, the revocation of the *legacy market rules* upon commencement of *market transition* does not:
- A.1.4.1 affect the previous operation of any *market rule* or *market manual* in effect before the *market transition*;
 - A.1.4.2 affect any right, privilege, obligation or liability that came into existence under the *market rules* or *market manuals* in effect prior to the *market transition*;
 - A.1.4.3 affect any breach, non-compliance, offense or violation committed under or relating to the *market rules* or *market manuals* in effect prior to the *market transition*, or any sanction or penalty incurred in connection with such breach, non-compliance, offense or violation
 - A.1.4.4 affect an investigation, proceeding or remedy in respect of,
 - (a) a right, privilege, obligation or liability described in subsection A.1.4.2, or
 - (b) a sanction or penalty described in subsection A.1.4.3.
- A.1.5. An investigation, proceeding or remedy described in subsection A.1.4.3 may be commenced, continued or enforced, and any sanction or penalty may be imposed, as if the *legacy market rules* had not been revoked.

Market Manuals

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

Market Manual Conventions

This *market manual* uses the following conventions:

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

– End of Section –

1 Introduction

1.1 Purpose

This *market manual* contains the information associated with the operation of the *real-time market*. It is intended to provide a summary of the steps and interfaces between *market participants* and the *IESO* during the operation of the *real-time market*.

The information in this *market manual* serves as a roadmap for *market participants* and the *IESO*, and reflect the requirements set out in the *market rules* and applicable *IESO* policies and standards.

1.2 Scope

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

- MR Ch.4 s.7.3
- MR Ch.5 s.1.2: General Principles
- MR Ch.5 s.2.3: Emergency Operating State
- MR Ch.5 s.3.2: Obligations of the IESO
- MR Ch.5 s.4.5: Operating Reserve
- MR Ch.5 s.5.3: The Use of Tie-Lines and Associated Facilities
- MR Ch.5 s.6: Outage Coordination
- MR Ch.5 s.10.2: Demand Control Initiated by a Market Participant
- MR Ch.7 s.1.3: Co-ordination with Control Areas Outside the IESO Control Area
- MR Ch.7 s.1.5: Planned Outages for Maintenance and Upgrades of IESO-Administered Markets Software, Hardware and Communication Systems
- MR Ch.7 s.1.6.1.3
- MR Ch.7 s.2.2.6.10
- MR Ch.7 s.2.2A: Registration of Commissioning Generation Facilities
- MR Ch.7 s.2.2D: Registration of Commissioning Electricity Storage Facilities
- MR Ch.7 s.2.3: Aggregated Generation Units, Electricity Storage Units or Sets of Load Equipment as Resources

- MR Ch.7 s.3.3.7: Revisions During the Real-Time Market Restricted Window for Daily Dispatch Data Parameters
- MR Ch.7 s.3.3.8: Obligation to Revise Dispatch Data
- MR Ch.7 s.3.5: Energy Offers and Energy Bids
- MR Ch.7 s.3.9: Intermittent Generation Resources
- MR Ch.7 s.3A.1: Information Used by the IESO to Determine Schedules and Prices
- MR Ch.7 s.5: The Pre-Dispatch Process
- MR Ch.7 s.6: The Real-Time Market
- MR Ch.7 s.7.1: Purpose and Timing of Dispatch Instructions
- MR Ch.7 s.7.2: Information Used to Determine Dispatch Instructions
- MR Ch.7 s.7.3.1.1
- MR Ch.7 s.7.4: IESO Dispatch of Operating Reserve
- MR Ch.7 s.7.5: Compliance with Dispatch Instructions
- MR Ch.7 s.7.6: Dispatch Scheduling Errors
- MR Ch.7 s.7.7: Additional IESO Powers in Emergency and High-Risk Conditions
- MR Ch.7 s.8.2.2
- MR Ch.7 s.8.4A.2
- MR Ch.7 s.10: Instructions for Generator Offer Guarantee Eligible Resources
- MR Ch.7 s.11.2.6: Revisions to Synchronization
- MR Ch.7 s.12.1: IESO System Status Reports and Advisory Notices
- MR Ch.7 s.19.4: Energy Market Participation for Hourly Demand Response Resources
- MR Ch.7 s.19.9: Energy Market Participation for System-Backed Capacity Import Resources
- MR Ch.7 s.19.9B: Energy Market Participation for Generator-Backed Capacity Import Resources
- MR Ch.7 s.20.3.1
- MR Ch.7 s.22: Market Power Mitigation
- MR Ch.7 App.7.2 s.1.2.8

- MR Ch.7 App.7.3 s.1.2.10
- MR Ch.7 App.7.3 s.1.4.9
- MR Ch.7 App.7.5A s.10: Constrained Area Conditions Test
- MR Ch.7 App.7.5A s.11: Conduct Test
- MR Ch.7 App.7.5A s.12: Reference Level Scheduling
- MR Ch.7 App.7.5A s.13: Reference Level Pricing
- MR Ch.7 App.7.5A s.14: Price Impact Test
- MR Ch.7 App.7.8: Economic Operating Point
- MR Ch.9 s.3.3.5
- MR Ch.9 s.3.5.8: Real-Time Make-Whole Payment for Boundary Entity Resources
- MR Ch.9 s.3.6: Real-Time Intertie Offer Guarantee
- MR Ch.9 s.3.7: Real-Time Intertie Failure Charges
- MR Ch.9 s.3.10: Hourly Uplifts
- MR Ch.9 s.4.11: Fuel Cost Compensation Credit
- MR Ch.9 s.4.13: Capacity Obligations

1.3 Workstation and Dispatch Workstation

Market participants are required to operate a *participant workstation* and a *dispatch workstation* for the purposes of participating in the *real time market*. The *participant workstation* is connected to the participant network. *Registered market participants* submit *bids* and *offers* to the *IESO* via the *participant workstation* or equivalent Application Programming Interface (API).

Dispatch instructions for *resources* are issued to *market participants* via their *dispatch workstation* except for *interchange schedules* which are published via the Market Participant Interface, a component of the *participant workstation*. Start-Up notices for operational commitments, as well as commitment extensions and decommitments, are issued to *market participants* via their *dispatch workstation*.

For more information on the system and software requirements for the *participant workstation* and the *dispatch workstation*, refer to MM 6.

1.4 Contact Information

Changes to this *market manual* are managed via the [IESO Change Management process](#). Stakeholders are encouraged to participate in the evolution of this *market manual* via this process.

To contact the *IESO*, you can email *IESO* Customer Relations at customer.relations@IESO.ca or use telephone or mail. Telephone numbers and the mailing address can be found on the [IESO website](#). *IESO* Customer Relations staff will respond as soon as possible.

– End of Section –

2 The Pre-Dispatch Process

(MR Ch.7 s.5)

2.1 Pre-Dispatch Look-Ahead Period

(MR Ch.7 s.5.1)

Runs every hour – The *pre-dispatch calculation engine* runs every hour, initializing at the top of the hour using the most recent inputs. Refer to [section 2.3.3](#) for more details on initialization.

First pre-dispatch run – The first run of the *pre-dispatch calculation engine* creates *pre-dispatch schedules* and prices for HE 22 of the current *dispatch day* to HE 24 of the next *dispatch day*, resulting in a look-ahead period of 27 hours (i.e. 21:00 EST current day – 24:00 EST next day).

Subsequent pre-dispatch runs – The next run of the *pre-dispatch calculation engine* will start at 21:00 EST with a look-ahead period from HE 23 of the current *dispatch day* to HE 24 of the next *dispatch day*. The look-ahead period reduces by one hour for each subsequent pre-dispatch run until it again increases to 27 hours at 20:00 EST the next day.

Figure 2-1 illustrates the look-ahead period applicable to *pre-dispatch calculation engine* runs occurring in each hour.

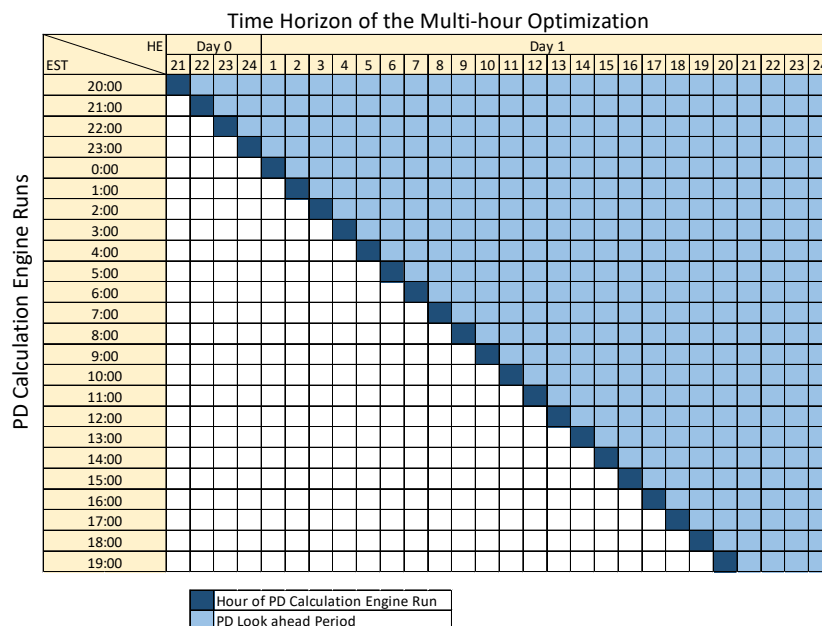


Figure 2.1: Pre-Dispatch Look-Ahead Periods

2.2 Pre-Dispatch Process

(MR Ch.7 s.5.1)

Summary of pre-dispatch process – The timeline for the *pre-dispatch process* is outlined below.

1. The *pre-dispatch process* runs every hour. As described in the previous section, the first run of the *pre-dispatch calculation engine* that includes all hours of the next *dispatch-day* will occur at 20:00 EST on the current day.
2. *Pre-dispatch schedules for boundary entity resources* for the first two *dispatch hours* of the look-ahead period will be issued at approximately 15 minutes past the current hour.
3. *Extended pre-dispatch operational commitments* will be issued¹ at approximately 15 minutes past the current hour (**MR Ch.7 s.5.8.2.2**).
4. At approximately 30 minutes past the current hour the *IESO* will issue:
 - *pre-dispatch schedules for resources other than boundary entity resources*;
 - *schedules for boundary entity resources* beyond the first two hours of the look-ahead period;
 - if applicable, *start-up notices for day-ahead operational commitments and pre-dispatch operational commitments*, and
 - if applicable notices of decommitment.

2.3 Pre-Dispatch Data Inputs

(MR Ch.7 ss.3A.1, 5.2.1 and 5.5)

This section provides information with respect to certain inputs used in the *pre-dispatch process*.

Registered market participant data input (MR Ch.7 s.5.5.1) – The *pre-dispatch calculation engine* uses the following information supplied by *market participants*:

- *registered market participant dispatch data* used by the *day-ahead market calculation engine*, other than *dispatch data for price responsive loads, self-scheduling storage resources* intending to withdraw, or *virtual zonal*

¹ In addition to being informed of extensions to commitments at 15 minutes past the current hour via the Predispatch Intertie Transaction Schedule and GOG Eligible Extensions Reports, *market participants* will receive an electronic extension notice at 30 minutes past the hour.

- resources*, unless changed by the *registered market participant*, to the extent authorized by the *market rules*;
- *outages*;
 - *segregated mode of operation* information;
 - planned *demand control* activities such as *transmitter* or *distributor* voltage reductions, load disconnection, and related activities provided in **MR Ch.5 s.10.2**; and
 - thermal ratings for the relevant portions of the *transmission system*.

2.3.1 Day-Ahead Market Inputs

Inputs from the day-ahead market – Certain outputs from the *day-ahead market* are also carried over as inputs into the *pre-dispatch calculation engine*:

- *day-ahead operational commitments* and the associated *start-up offers*; and
- *day-ahead market* scheduled quantities for *boundary entity resources*.

2.3.2 IESO Data Inputs

The *IESO* is responsible for providing certain data inputs for the *pre-dispatch calculation engine* to use when scheduling *resources*. These data inputs include, but are not limited to those described in this section.

2.3.2.1 Constraint Violation Penalty Curves

(MR Ch.7 s.1.6.1.3)

Constraint violation penalty curves are penalty functions used to prioritize the violation of constraints in the *pre-dispatch calculation engine* and *real-time calculation engine*. Refer to Appendix A for further details.

2.3.2.2 Market Power Mitigation Information

The data in connection with the market power mitigation process is established in accordance with **MR Ch.7 s.22.14**. Ex-ante market power mitigation is evaluated independently from mitigation in the *day-ahead market* using the most current *dispatch data* and *reference levels*.

2.3.2.3 IESO Reliability Requirements

Reliability requirements refer to *reliability*-related system limitations provided by the *IESO* including any system-wide and area-specific *operating reserve* requirements, *security limits*, maximum import and export limits, net interchange scheduling limit (NISL) and *regulation* requirements. The *IESO* updates this information to reflect anticipated conditions for every *dispatch hour*.

2.3.2.4 Resource Reliability Constraints

(MR Ch.5 ss.1.2 and 3.2)

Manual constraints – The *IESO* may manually intervene and constrain *resources* to be scheduled to inject or withdraw *energy* at, above or below a specific value to maintain *reliability*. To ensure the *resource* is scheduled by the *pre-dispatch calculation engine*, the *IESO* will create a scheduling constraint on the *resource* as an input to the *pre-dispatch calculation engine* following notice to the affected *market participant*.

Timing of constraint – *Resource* constraints for *reliability* may be applied at any time.

2.3.2.5 Demand Forecasts

(MR Ch.7 s.3A.1.7)

Demand forecast areas – The *IESO* produces average and peak hourly *demand* forecasts for the province as a sum of four separate *demand* forecasts for each of the following *demand* forecast areas:

- **Northeast:** comprised of the Northeast electrical zone;
- **Northwest:** comprised of the Northwest electrical zone;
- **Southeast:** comprised of the East, Essa, Ottawa and Toronto electrical zones; and
- **Southwest:** comprised of the Bruce, Niagara, Southwest and West electrical zones.

The *demand* forecasts are generated based on historical *demand* levels as well as expectations of future *demand*.

IESO determination of demand forecasts – Average and peak hourly non-*dispatchable demand* forecasts, which the *IESO* determines using the average and peak *demand* forecasts, load distribution factors and *bid* quantities submitted on physical *hourly demand response resources*, represent the forecast *demand* quantities for all *non-dispatchable loads* and forecast losses in the *demand* forecast areas.

Average demand forecast – The *pre-dispatch calculation engine* uses average non-*dispatchable demand* forecasts in all hours of the day, unless an hour is deemed to be a ramp hour which is any hour where the peak demand exceeds the average *demand* by 300 MW or more.

Peak demand forecast – The *pre-dispatch calculation engine* uses peak non-*dispatchable demand* forecast for all ramp hours of the day.

Adequacy concern or surplus baseload generation – The *IESO* may use the average forecast *demand* or peak forecast *demand* if the *IESO* determines that

doing so is advisable to maintain *adequacy* or in response to surplus baseload generation, regardless of whether the hour is a ramp hour.

2.3.2.6 Centralized Variable Generation Forecast

(MR Ch.4 s.7.3.5 and MR Ch.7 s.3A.1.6)

The *IESO* determines the centralized *variable generation* forecast which consists of the expected output of registered *variable generation resources*. The *IESO* may adjust the centralized *variable generation* forecast to better align with observed *variable generation* output trends.

2.3.2.7 IESO-Controlled Grid Information

IESO-controlled grid information includes, but is not limited to:

- power system model which represents power flow relationships between locations on the *IESO-controlled grid* and between the *IESO control area* and neighbouring *control areas*;
- the distribution of imports, exports, and any unscheduled flows (loop flows) between the *integrated power system* and neighbouring *control areas* or neighbouring *transmission systems*;
- the status of power system equipment;
- *forced outages* and approved *planned outages* in accordance with **MR Ch.5 s.6**;
- load distribution factors;
- a list of contingencies to be simulated;
- a list of monitored equipment; and
- the transmission system information provided by each *transmitter* pursuant to **MR Ch.7 s.3.9**.

2.3.2.8 Operating Reserve Requirements

(MR Ch.5 s.4.5.3)

Flexible operating reserve – The *IESO* determines the amount of *operating reserve* that is required by the system for any given hour. In addition to the minimum amount of *operating reserve* required to be maintained under the applicable *reliability standards* (**MR Ch.5 s.4.5.2**), the *IESO* may require additional *thirty-minute operating reserve* for flexibility pursuant to **MR Ch.5 s.4.5.3**.

2.3.2.9 Intertie Scheduling Treatment Exceptions

(MR Ch.7 s.5.2.2)

Reliability (MR Ch.7 s.5.2.2.1) – The *reliability* exception applies for any hours the *IESO* determines to be necessary to alleviate *reliability* concerns;

Failure of the day-ahead market (MR Ch.7 s.5.2.2.2) – The exception in respect of the failure of the *day-ahead market* applies for any hours of the *pre-dispatch schedule*;

Capacity-backed exports and imports (MR Ch.7 s.5.2.2.3) – The exception in respect of *energy* scheduled to carry out (a) an *energy* import that is supported by a *system-backed capacity import resource*, or (b) *called capacity export*, applies for the specific hours of the import or capacity export; and

Over-generation condition (MR Ch.7 s.5.2.2.4) – The exception in respect of over-generation applies for any hours the *IESO* determines to be necessary to alleviate the over-generation condition.

Advisory Notices – The *IESO* will *publish* an advisory notice in accordance with **MR Ch.7 s.12.1.3A** informing *market participants* of the restrictions that have been lifted.

2.3.2.10 Daily Energy Production

(MR Ch.7 ss.3.5.25 and 3.5.26)

Overview – The *IESO* tracks the cumulative *energy* production for the *dispatch day* for *dispatchable electricity storage resources* and *dispatchable generation resources* other than a nuclear *generation resources*. The *pre-dispatch process* takes into account the cumulative *energy* production to ensure the applicable *resource schedules* that are produced for the remainder of the day respect the *maximum daily energy limit* and *minimum daily energy limit* parameters.

2.3.2.11 Initial Hours of Operation and Initial Hours Down

The *IESO* calculates the number of hours that a *GOG-eligible resource* has been generating at or above its *minimum loading point*, or below *minimum loading point*. These values are used to evaluate the operating status and *thermal state* of these *resources*.

2.3.2.12 Maximum Number of Starts per Day

(MR Ch.7 ss.3.5.2.5 and 3.5.28).

The *IESO* tracks the cumulative number of starts of *dispatchable* hydroelectric and non-nuclear *GOG-eligible resources* for the *dispatch day*. The *pre-dispatch process* takes into account these cumulative number of starts in order to ensure the

applicable *resources* schedules that are produced for the remainder of the day respect the *maximum number of starts per day* parameter.

2.3.3 Initializing Conditions

(MR Ch.7 s.5.4.1)

Role of initializing conditions in pre-dispatch process – The *pre-dispatch calculation engine* establishes initializing conditions of the *IESO-administered markets* and *IESO-controlled grid* for the study period. This section describes those conditions to allow *registered market participants* to manage *dispatch data* accordingly and to understand the results of the *pre-dispatch calculation engine*.

2.3.3.1 Daily Dispatch Data Across Two Dispatch Days

Daily dispatch data for the current day – In most cases, the daily *dispatch data* submitted for a *dispatch day* will be used to determine *pre-dispatch schedules* for that *dispatch day*. In cases where the pre-dispatch look-ahead period spans two *dispatch days* (i.e. for the 20:00 to 22:00 EST *pre-dispatch calculation engine* runs) the *IESO* may use daily *dispatch data* submitted for a different *dispatch day*, as set out in this section.

Daily dispatch data for the next day – The *pre-dispatch calculation engine* uses the following *daily dispatch data* submitted for the next *dispatch day* across the entire look-ahead period:

- *time lag*;
- *MWh ratio*;
- *downstream linked forebay*;
- *minimum generation block down time* (MGBDT);
- *lead time*;
- *ramp up energy to minimum loading point* and *ramp hours to minimum loading point*;
- *daily energy ramp rate*;
- *minimum loading point* (MLP), subject to the exception below; and
- *minimum generation block run time* (MGBRT), subject to the exception below.

Exception – The *IESO* will use the MLP and MGBRT for the current *dispatch day* rather than the next *dispatch day*, where the *GOG-eligible resource* received a *day-ahead operational commitment*, *pre-dispatch operational commitment*, or *reliability commitment* prior to the first *pre-dispatch calculation engine* run at 20:00 EST. In this case, the MLP and MGBRT for the current *dispatch day* will continue to apply

until the commitment is complete even if the commitment extends into the next *dispatch day*. Once the commitment is complete the MLP and MGBRT for the next *dispatch day* will apply.

Single cycle mode – When the pre-dispatch look-ahead period spans two *dispatch days* (i.e. during the 20:00 to 22:00 EST *pre-dispatch calculation engine* runs), the *pre-dispatch calculation engine* will use the *single cycle mode* submitted for the next *dispatch day* for the entire look-ahead period. However, if the *pseudo-unit* is online at 20:00 EST, or is scheduled to be synchronized before the end of the current *dispatch day*, then the following two exceptions apply:

Table 2-1: Exceptions to Use of Single Cycle Mode

Constraint status	Treatment of single cycle mode
The <i>pseudo-unit</i> is NOT subject to a minimum constraint to keep the <i>resource</i> in-service through midnight	<ul style="list-style-type: none"> The <i>pre-dispatch calculation engine</i> will use the <i>single cycle mode</i> submitted for the current <i>dispatch day</i> until the end of the current <i>dispatch day</i> and use the <i>single cycle mode</i> submitted for the next <i>dispatch day</i> for the next <i>dispatch day</i>. The <i>pre-dispatch calculation engine</i> will schedule the <i>pseudo-unit</i> to 0 MW in HE01 of the next <i>dispatch day</i> to respect the <i>registered market participant</i> submitted change in the operating mode.
The <i>pseudo-unit</i> is subject to a minimum constraint to keep the <i>resource</i> in-service through midnight	<ul style="list-style-type: none"> The <i>pre-dispatch calculation engine</i> will use the <i>single cycle mode</i> submitted for the current <i>dispatch day</i> until the end of the minimum constraint and use the <i>single cycle mode</i> submitted for the next <i>dispatch day</i> after the minimum constraint has been met. The <i>pre-dispatch calculation engine</i> will schedule the <i>pseudo-unit</i> to 0 MW in the first hour after the minimum constraint has been met in order to respect the <i>registered market participant</i> submitted change in the operating mode.

2.3.3.2 Advancing Day-Ahead Operational Commitments

Overview – The *pre-dispatch calculation engine* will evaluate *start-up offers* differently when considering whether to issue an *advanced pre-dispatch operational commitment* for a *day-ahead operational commitment*, if the *advanced pre-dispatch operational commitment* begins during the advancement period. For clarity, the initializing assumptions discussed in this section do not apply to issuing *advanced pre-dispatch operational commitments* for existing *pre-dispatch operational commitments*.

Advancement period – The advancement period begins one hour after the hour that precedes the *day-ahead operational commitment* by the sum of the *resource's* MGBRT and MGBDT (hot). The advancement period ends at the beginning of the existing *day-ahead operational commitment*. For clarity, the IESO determines the advancement period as follows.

$$AP = DAMOC_{st} - (MGBRT + MGBDT_h) + 1$$

Where:

AP	=	The beginning of the advancement period in respect of advanced <i>pre-dispatch operational commitment</i>
$DAMOC_{st}$	=	The hour that represents beginning of an existing <i>day-ahead operational commitment</i>
$MGBRT$	=	The <i>minimum generation block run-times</i> submitted for the <i>dispatch day</i>
$MGBDT_h$	=	The <i>minimum generation down time</i> for the hot <i>thermal state</i> submitted for the <i>dispatch day</i>

Advanced pre-dispatch operational commitment beginning within the advancement period – For *advanced pre-dispatch operational commitments*, in respect of *day-ahead operational commitments*, that begin during the advancement period, the *pre-dispatch calculation engine* evaluates the higher value of the existing *day-ahead operational commitment start-up offer* and the pre-dispatch *start-up offer*. This ensures that only increases in *start-up offers* are evaluated.

Advanced pre-dispatch operational commitment beginning before the advancement period – For *advanced pre-dispatch operational commitments*, in respect of *day-ahead operational commitments*, that begin before the advancement period, the *pre-dispatch calculation engine* evaluates the pre-dispatch *start-up offer*.

2.3.3.3 Past Hourly Production for Hydroelectric Resources with Linked Forebay

Operating reserve activations excluded – To determine the *energy pre-dispatch schedule* of a *resource* on a downstream *linked forebay* that is consistent with the submitted *time lag* and *MWh ratio*, the *pre-dispatch calculation engine* uses the actual *energy* output of the *resource* on the upstream *linked forebay*, as indicated by operational telemetry data, exclusive of any *energy* injected as part of an *operating reserve* activation.

2.3.3.4 Operational Commitments over Midnight

The *pre-dispatch calculation engine* will initialize the status of a *GOG-eligible resource* to complete the MGBRT for a *day-ahead operational commitment* or *pre-dispatch operational commitment* at the end of the current *dispatch day* if the *day-ahead operational commitment* or *pre-dispatch operational commitment*, as applicable, has not been completed by the *day-ahead calculation engine* run. Refer to **MR Ch.7 s.10.3.4**.

2.4 Pre-Dispatch Optimization Process

(MR Ch.7 s.5.6)

Market power mitigation – The *pre-dispatch calculation engine* will perform tests related to the ex-ante market power mitigation process, as described in **MR Ch.7 App.7.5A ss.10-14**.

2.5 Results from the Pre-Dispatch Process

(MR Ch.7 ss.5.1, 5.2, 5.7 and 5.8)

This section describes some of the outputs of the *pre-dispatch process*. These outputs are further described in subsequent sections.

2.5.1 Pre-Dispatch Schedules

2.5.1.1 Hourly Resource Schedules

Eligible resources (MR Ch.7 s.5.8.2.3) – The *pre-dispatch process* produces hourly *pre-dispatch schedules* only for *resources* for which the *registered market participant* has submitted *dispatch data* for the relevant *dispatch day*.

Minimum daily energy limit constraints – When the sum of a *dispatchable hydroelectric generation resource's* daily *energy* production and future *pre-dispatch schedules* equals the *resource's minimum daily energy limit*, the *pre-dispatch process* produces a minimum constraint, for the *real-time dispatch process*, equal to the *resource's* schedule for the next *dispatch hour*.

2.5.1.2 Scheduling Discrepancies due to Inaccurate Initial Conditions

(MR Ch.7 s.3.3.7.4)

Overview – *Pre-dispatch schedules* will respect the following daily *dispatch data* parameters based on the actual and anticipated numbers of starts and actual and forecast *energy* production at pre-dispatch calculation engine initialization:

- *maximum number of starts per day* (MNSPD)
- *maximum daily energy limit* (MAX DEL)

- *minimum daily energy limit* (MIN DEL)

Pre-dispatch reports – *Market participants* can consult the following reports to view the values of starts and *energy* production used by the *pre-dispatch calculation engine* to respect the MNSPD, MAX DEL and MIN DEL:

- Number of Starts Tracking Report; and
- Daily Energy Limit Tracking Report.

Refer to [section 6.1](#) for more information on these reports.

Telemetry or tracking errors – Telemetry or other errors might cause the values of the number of starts or actual *energy* production used by the *pre-dispatch calculation engine* to be inaccurate. In such circumstances, if *market participants* observe scheduling discrepancies attributable to inaccurate values of actual starts or *energy* production, *registered market participants* are expected to revise the relevant daily *dispatch* parameters, to compensate for the discrepancy, and notify the *IESO*. If revising the relevant daily *dispatch data* parameters is not feasible then *market participants* may request that the *IESO* revise the parameters used to set initial conditions.

2.5.1.3 Hydroelectric Generation Resources with Linked Forebays

(MR Ch.7 s.3.3.7.4)

Net Output – For hydroelectric *generation resources* with *linked forebays*, the output of the upstream *resource*, less any output from an *operating reserve* activation, impacts the *pre-dispatch schedule* of the downstream *resource*.

Pre-dispatch report – *Market participants* can consult the Generator Output and Capability Report to view the reported output of the upstream *resource*.

Reported output of upstream resource – Telemetry or other errors might cause the value of *energy* production at the upstream *linked forebay* used by the *pre-dispatch calculation engine* to be inaccurate, despite the submission of accurate *dispatch data*. In such circumstances, if a *market participant* notices a discrepancy in the upstream *linked forebay's* reported output, the *market participant* must contact the *IESO* to correct the reported output as revising *dispatch data* in these circumstances will not ensure that the downstream *resource* is scheduled correctly.

Cascade management – The *linked forebay*, *time lag* and *MWh ratio* daily dispatch parameters allow the *day-ahead market calculation engine* and *pre-dispatch calculation engine* to reflect production at an upstream *resource* in schedules for the linked downstream *resource*. Circumstances may arise when the *linked forebay*, *time lag* and *MWh ratio* originally submitted no longer accurately reflect the impact, if any, of upstream *resource* production on the expected downstream *resource* production. For example, the upstream or downstream

resource may experience unit outage(s), and decide to pass water via spill rather than production, rendering the previously submitted value of *MWh ratio* invalid. When these circumstances arise the *registered market participant* is expected to adjust the *linked forebay*, *MWh ratio* and *time lag*, as needed, to accurately reflect the relationship between upstream *resource* production and downstream *resource* expected production so that these can be properly shown in future pre-dispatch schedules.

2.5.1.4 Scheduling Discrepancies due to Thermal States

(MR Ch.7 ss.3.3.7.4)

Determining thermal state – The *pre-dispatch calculation engine* determines the *thermal state* of *GOG-eligible resources* based on the number of hours the *resource* has operated below its MLP and based on the *resource's* MGBDT for each *thermal state*.

Pre-dispatch reports – *Market participants* can consult the Pre-Dispatch GOG-Eligible Unit Inferred State Report to ascertain the *thermal states* used to determine *pre-dispatch schedules*.

Revise thermal state – If a *market participant* observes scheduling or inferred *thermal state* discrepancies attributed to *thermal state* values, despite the submission of accurate *dispatch data*, the *registered market participant* is expected to revise its MGBDT values accordingly. If revising the MGBDT values is not feasible, the *market participant* may contact the *IESO* and request to overwrite the computation of hours down used to set the *thermal state*.

Revise thermal state (pseudo-units) – The *thermal state* of a *pseudo-unit* is determined based on the number of hours that the associated combustion turbine has operated below its MLP. In cases where the steam turbine associated with a *pseudo-unit* is in service the *market participant* may consider that the thermal state of the combustion turbine does not accurately reflect the actual thermal state of the *pseudo-unit*. In this case the *registered market participant* may revise the combustion turbine's MGBDT values accordingly to reflect the actual thermal state that it wishes to use for assessment of the pseudo-unit. If revising the MGBDT values is not feasible, the *market participant* may contact the *IESO* and request to overwrite the computation of hours down used to set the pseudo-unit *thermal state*.

2.5.1.5 Scheduling Discrepancies due to Turnaround Time

Pre-dispatch commitments not respecting MGBDT – When the *pre-dispatch calculation engine* look-ahead period only contains the current *dispatch day* it will not consider any commitments produced for the next *dispatch day*. This could result in the creation of a *pre-dispatch operational commitment* or *extended pre-*

dispatch operational commitment that does not allow for sufficient time for a *resource* to satisfy its MGBDT(hot) prior to the next day commitment. In the event that this occurs the *market participant* must contact the *IESO*.

Unviable real-time schedules – *Market participants* should monitor their *dispatch* advisories and inform the *IESO* if the *resource* will not be able to comply with a future *day-ahead operational commitment* or *pre-dispatch operational commitment* due to limitations caused by the *resource's* MGBDT. If *registered market participants* do not expect to comply with a *start-up notice* or commitment notice for other reasons, refer to **MR Ch.7 ss.10.1.4, 10.1.5 and 10.3.3**.

IESO assessment – When the *IESO* is aware of an unviable *real-time schedule* due to a *resource's* MGBDT, the *IESO* will conduct a *reliability* assessment as follows:

- If the *resource* is critical for maintaining *reliability* during the hours in which it would be unavailable, the *IESO* will keep it in service until its next commitment by applying a *reliability* constraint with a code of “**PDRCMT**”; or
- If the *resource* is not critical for maintaining *reliability* during the hours in which it would be unavailable, the *IESO* will *dispatch* the *resource* off to respect its MGBDT and allow it to meet its future commitment.

2.5.1.6 GOG-Eligible Resource Scheduling after Isolated State

(MR Ch.7 s.3.3.7.4)

Overview – When a *GOG-eligible* resource is on *outage* or is rendered grid incapable by a transmission *outage*, the *resource* is unavailable to be scheduled.

Scheduling to reach MLP – In the hours following a *resource's* *outage* or grid incapability, the *pre-dispatch calculation engine* will consider the *resource* to be incapable of reaching its MLP, and will not schedule the resource to MLP or above, until the *ramp hours to minimum loading point* for the cold *thermal state* have elapsed. This applies except in cases where the *resource* is subject to a minimum constraint greater than or equal to the MLP for these hours. If the *resource* is subject to a minimum constraint that it is unable to satisfy following an outage or grid incapability the *registered market participant* must notify the *IESO* pursuant to **MR Ch.7 s.10.1.5**.

Reducing ramp hours to MLP to reach MLP sooner - If the *GOG eligible resource* is capable of reaching its MLP before *ramp hours to minimum loading point* for the cold *thermal state* have elapsed, the *registered market participant* is expected to reduce the *resource's* *ramp hours to minimum loading point* for the cold *thermal state*, to allow the *resource* to be scheduled to its MLP sooner.

Unable to reach MLP after cold ramp hours – It is possible that due to lead time requirements a resource may not be able to reach MLP even after the cold

ramp hours to MLP have elapsed. In this case the *registered market participant* has several options to prevent the *resource* being scheduled to MLP until it is able to reach MLP these include:

- Increasing cold *ramp hours to MLP* to delay the first hour in which the *resource* may be scheduled to MLP. Note that the ability to increase these hours may be limited due to the maximum number of *ramp hours to MLP* being limited to 12 hours and also the *ramp hours to MLP* being subject to applicable market power mitigation requirements under **MR Ch.7 s.22**; or
- Submitting an outage or derate request that prevents the *pre-dispatch calculation engine* for scheduling the *resource* to its MLP during these hours; or
- Contacting the IESO.

2.5.1.7 Interchange Schedules

(MR Ch.7 ss.5.8.2.1 and 6.1.3)

The *pre-dispatch process* produces hourly *pre-dispatch schedules* for *boundary entity resource*, including *interchange schedules* in the hour-ahead run of the *pre-dispatch calculation engine*.

2.5.1.8 Hourly Demand Response Resource Schedules and Notices

(MR Ch.7 ss.5.8.2.3 and s.19.4)

The *pre-dispatch process* produces hourly schedules, standby notices and activation notices for *hourly demand response resources* based on the *pre-dispatch schedules*.

2.5.1.9 Increase in Fuel Availability

(MR Ch.7 ss.3.3.7.4)

The MAX DEL parameter represents the maximum quantity of *energy* that may be scheduled for a *resource* within a *dispatch day* and is used by the *day-ahead market calculation engine* and the *pre-dispatch calculation engine* to limit the scheduled output of the associated *resource*. It is possible that fuel availability may increase e.g. additional rainfall or fuel deliveries, or an increase of the *state of charge* of an *electricity storage resource*. When a *registered market participant* becomes aware of such a change they are expected to increase the MAX DEL associated with the *resource* accordingly.

2.5.2 Pre-Dispatch Operational Commitments and Constraints

(MR Ch.7 ss.5.2.3, 5.8.2.2, 5.8.2.4, 5.8.2.5)

Establishing stand-alone pre-dispatch operational commitments (MR Ch. 7 s.5.8.2.4) – When a *GOG-eligible resource* receives a *pre-dispatch schedule* to at least its *minimum loading point*, for hours without an overlapping or contiguous *day-ahead operational commitment*, *pre-dispatch operational commitment* or *reliability commitment*, the *IESO* implements the constraints for a *stand-alone pre-dispatch operational commitment* in accordance with **MR Ch.7 s.5.2.3** and issues a *start-up notice* in accordance with **MR Ch.7 s.10.1.1**.

Duration of stand-alone pre-dispatch operational commitments (MR Ch.7 s.5.8.2.4) – *Stand-alone pre-dispatch operational commitments* apply for the duration of a *GOG-eligible resource's* MGBRT. In cases where a *resource* is scheduled in HE24 but has not been scheduled for the duration of its MGBRT, the *pre-dispatch operational commitment* applies for the duration of the hours where it was scheduled to at least its *minimum loading point*. Refer to **MR Ch.7 s.10.3.4**.

Establishing advanced pre-dispatch operational commitments (MR Ch.7 s.5.8.2.5) – When a *GOG-eligible resource* receives a *pre-dispatch schedule* to at least its *minimum loading point*, for hours contiguous to the start of a *day-ahead operational commitment*, *pre-dispatch operational commitment* or *reliability commitment*, the *IESO* implements the constraints for an *advanced pre-dispatch operational commitment* in accordance with **MR Ch.7 s.5.2.3** and issues a *start-up notice* in accordance with **MR Ch.7 s.10.1.1**.

Duration of advanced pre-dispatch operational commitment (MR Ch.7 s.5.8.2.5) – *Advanced pre-dispatch operational commitments* do not exceed the *resource's* MGBRT.

Establishing extended pre-dispatch operational commitments (MR Ch.7 s.5.8.2.2) – When a *GOG-eligible resource* receives a *pre-dispatch schedule* to at least its *minimum loading point*, for the hour directly following a *day-ahead operational commitment*, *pre-dispatch operational commitment* or *reliability de-operational commitment* and notifies the *market participant*.

Duration of extended pre-dispatch operational commitments (MR Ch.7 s.5.8.2.2) – *Extended pre-dispatch operational commitments* issued apply for one hour at a time, to the next *dispatch hour*.

Decommitment (MR Ch.7 s.10.2.1) – When a *GOG-eligible resource* does not receive a *pre-dispatch schedule* to at least its *minimum loading point*, for the hour directly following a *day-ahead operational commitment*, *pre-dispatch operational commitment* or *reliability commitment*, the *IESO* issues a notice of decommitment.

2.5.3 Passing Pre-Dispatch Operational Commitments to Real-time

When the *IESO* establishes *pre-dispatch operational commitments*, *GOG-eligible resources* will have constraints applied for the *real-time dispatch process*. The *IESO*

applies minimum constraints for *GOG-eligible resources* to their *minimum loading point* for the duration as described in [section 2.5.2](#).

2.5.3.1 GOG-Eligible Resource Constraints for Combined Cycle Plants

Combustion turbine (CT) – A *generation resource* associated with a CT for a *combined cycle plant* that is not aggregated pursuant to **MR Ch.7 s.2.3** has a constraint applied based on its *minimum loading point* with a constraint code of “PD-CMT”.

Steam turbine (ST) – A *generation resource* associated with a ST for a *combined cycle plant* that is not aggregated pursuant to **MR Ch.7 s.2.3** has a constraint applied based on the number of CTs within the *combined cycle plant* that are committed in a given hour. The constraints are described below.

For STs not using the *pseudo-unit* model:

- The 1-on-1 ST MLP with a constraint code of “PD-CMT”, and the n-on-1 ST MLP with a constraint code of “COMCYC” whenever n number of associated CTs ($n > 1$) are committed in a given hour and the ST also has a commitment for that hour. If the ST does not have a commitment for that hour then no ST commitment is created since when not using the PSU model the CT and ST must be committed independently.

For STs using the *pseudo-unit* model:

- The n-on-1 ST MLP with a constraint code of “PD-CMT”, where n represents the number of CTs that are committed through an associated *pseudo-unit* operating in combined cycle mode in a given hour.

For more details, related to constraint codes, refer to Appendix B.

2.5.4 Pre-Dispatch Market Prices

(MR Ch.7 ss.5.7.1.1-5.7.1.4)

Price calculations – While real-time prices are interval based, the *pre-dispatch calculation engine* produces hourly prices. [Section 6.1](#) includes additional information related to pre-dispatch prices including their components.

– End of Section –

3 The Real-Time Scheduling Process

(MR Ch.7 s.6)

3.1 Real-Time Market Timeline and Look-Ahead Period

(MR Ch.7 s.6.1)

Frequency and look-ahead period – The *real-time calculation engine* runs every five minutes, performing a multi-interval optimization over the next 11 *dispatch intervals* to determine *real-time schedules*.

First dispatch interval – The *real-time calculation engine* results for the first *dispatch interval* of the *real-time dispatch process* look-ahead period are used to determine the *dispatch instructions* for all *resources* that receive them.

Dispatch intervals 2-11 – The *real-time calculation engine* results for *dispatch intervals* 2 through 11 are used to produce *dispatch advisories*. This process is illustrated in Figure 3-1.

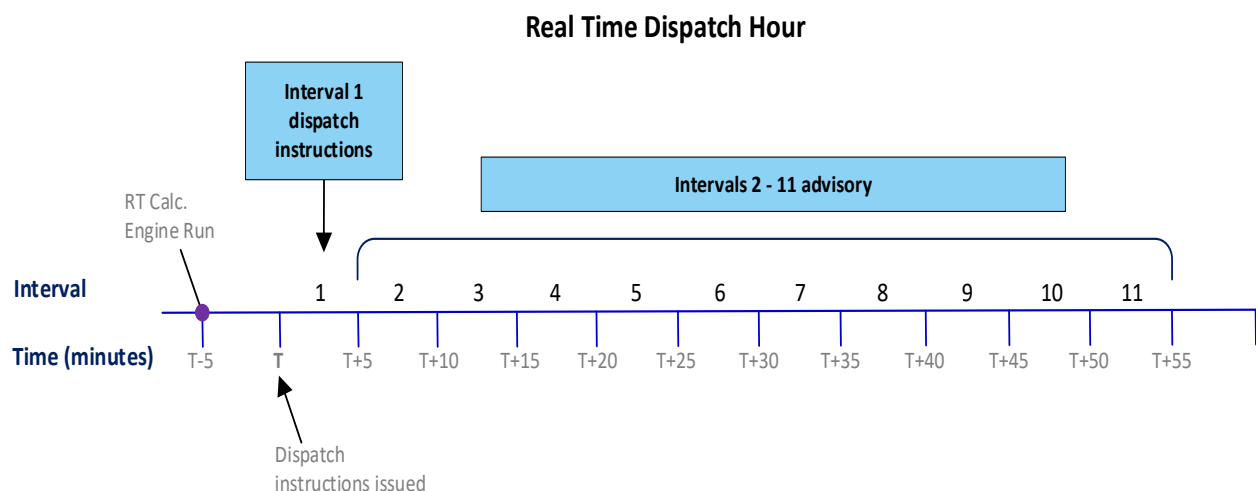


Figure 3-1: Example of Real-time Calculation Engine Process

3.2 Dispatch Advisories

(MR Ch.7 s.7.1.6)

Content of dispatch advisory – *Dispatch* advisories include the following information in respect of *dispatchable resources* for the next 10 *dispatch intervals*:

- The anticipated *dispatch instructions* for *energy*; and
- The anticipated *real-time schedule* for each class of *operating reserve*.

Missed dispatch advisories – In the event the *IESO* does not issue a *dispatch* advisory before the applicable *dispatch interval*, the *IESO* will not retrospectively issue the *dispatch* advisory.

Pseudo-units – For *combined cycle plants* registered as a *pseudo-unit*, the *IESO* issues dispatch advisories in respect of the *resources* for the corresponding combustion turbine *generation units* and steam turbine *generation unit*, respectively.

3.3 Real-Time Data Inputs

(MR Ch.7 ss.3A.1, 6.2.1 and 6.4)

Sections [3.3.1](#) through [3.3.3](#) provide information with respect to certain inputs used by the real-time scheduling process.

3.3.1 Real-Time Market Participant Data

Market participant data carried over from pre-dispatch – Many inputs from the *pre-dispatch process* carry over into the real-time scheduling process unless updated by *registered market participants*, to the extent authorized by the *market rules*.

Market participant data not carried over from pre-dispatch – Some *registered market participant* data inputs are not carried over into the real-time scheduling process, in which case the real-time scheduling process does not respect these data inputs from the *pre-dispatch process*.

These *dispatch data* parameters include:

- *maximum daily energy limit (MAX DEL);*
- *minimum generation block down time (MGBDT);*
- *linked forebays, time lags, and MWh ratios;*
- *minimum hourly output; and*
- *maximum number of starts per day.*

3.3.2 Real-time Integration with the Pre-Dispatch Process

Outputs from the pre-dispatch process used in the real-time scheduling process – Outputs from the *pre-dispatch process* that are carried over as inputs into the real-time scheduling process include:

- *interchange schedules;*
- *day-ahead operational commitments;*
- *pre-dispatch operational commitments;*

- *hourly demand response resource* activations;
- *minimum daily energy limit* constraints;
- mitigated *dispatch data*; and
- *hourly must run* constraints.

3.3.3 Real-Time IESO Data Inputs

The *IESO* is responsible for providing data inputs for the real-time scheduling process. These inputs include, but are not limited to those described in this section.

3.3.3.1 Constraint Violation Penalty Curves

Refer to [section 2.3.2.1](#)

3.3.3.2 Market Power Mitigation Information

The *real-time dispatch process* does not apply market power mitigation functions. However, it will use any *dispatch data* produced by ex-ante market power mitigation during the *pre-dispatch process*.

Market power mitigation functions are defined in [section 2.3.2.2](#).

3.3.3.3 IESO Reliability Requirements

If there are changes to *reliability* requirements or if *outages* change, the *IESO* updates this information in its tools. The updated information is used by the real-time scheduling process. Refer to [section 2.3.2.3](#).

3.3.3.4 Resource Reliability Constraints

(MR Ch.5 ss.1.2 and 3.2)

Manual constraints – Where the *IESO* enters constraints into the *real-time calculation engine* in order to maintain *reliability*, it will follow a process equivalent to that described in [section 2.3.2.4](#).

3.3.3.5 Demand Forecasts

(MR Ch.7 s.3A.1.7)

The *real-time scheduling process* uses a *demand* forecast for each *dispatch interval*. Refer to [section 2.3.2.5](#).

3.3.3.6 Centralized Variable Generation Forecast

(MR Ch.4 s.3A.1.6 and Ch.4 s.7.3.5)

Refer to [section 2.3.2.6](#) for a discussion on the *IESO's* centralized *variable generation* forecast, which is used by the *real-time scheduling* process.

3.3.3.7 IESO-controlled Grid Information

Refer to [section 2.3.2.7](#) for a discussion on the *IESO-controlled grid* information, which is used as an input to the *real-time scheduling* process.

3.3.3.8 Operating Reserve Requirements

(MR Ch.5 s.4.5.3)

Refer to [section 2.3.2.8](#) for a discussion on the *IESO's operating reserve* requirements, which is used as an input to the *real-time scheduling* process.

3.4 Real-Time Optimization Process

(MR Ch.7 s.6.5)

The *real-time calculation engine* performs a single pass. The results of this pass determine the *real-time schedule* which forms the basis of *dispatch instructions*, and prices for the next *dispatch interval*. The results also determine advisory schedules.

3.5 Results from Real-Time Scheduling Process

3.5.1 Scheduling Outputs

The *real-time scheduling process* produces the following three scheduling outputs:

- *real-time schedules*;
- *dispatch* advisories; and
- *dispatch instructions*.

3.5.2 Real-Time Market Prices for each Dispatch Interval

(MR Ch.7 ss.6.6.1.1-6.6.1.4)

The *real-time calculation engine* produces prices for each *dispatch interval*. Table 6-3 includes additional information related to *real-time market prices* including their components.

3.5.3 Real-Time Market Economic Operating Point

(MR Ch.7 App.7.8)

Economic Operating Points - The *IESO* calculates the real-time lost cost economic operating points and real-time lost opportunity cost economic operating points for resources. Refer to **MR Ch.7 App.7.8** for more information.

– End of Section –

4 Determining Dispatch Instructions

4.1 Dispatchable Generation Resources, Dispatchable Loads and Dispatchable Storage Resources

(MR Ch.7 ss.7.1.1A and 7.2.1A)

Departing from dispatch instructions (MR Ch.7 s.7.2.1A.2) – *Real-Time schedules* that are “clearly and materially in error” may include, but are not limited to, *real-time schedules* that do not accurately reflect a *resource’s minimum run-time* or lockout status due to tool limitations.

Pseudo-units – For the purposes of determining *dispatch instructions* pursuant to **MR Ch.7 s.7.1.1A**, the *real-time calculation engine* will determine a *real-time schedule* for both the *pseudo-unit* and the *resources* associated with the corresponding steam turbine *generation unit* and combustion turbine *generation units*. The *IESO* will only issue *dispatch instructions* on the *resources* associated with the corresponding steam turbine *generation unit* and combustion turbine *generation unit*.

4.2 Boundary Entity Resources

(MR Ch.7 s.6.1.3)

Checkout process – When the *IESO* modifies *interchange schedules* pursuant to **MR Ch.7 s.6.1.3**, the *IESO* may change e-Tags and *interchange schedules* if the *IESO* and the external *control area operator* determine that such changes are appropriate to facilitate the flow of *physical service* to or from the neighbouring *control area*. The *IESO* makes these changes using the following procedure:

1. The *IESO* validates e-Tags and confirms the *interchange schedules* with the appropriate *control areas*, prior to five minutes before the start of the *dispatch hour*. The *IESO* removes *interchange bids* or *offers* from the schedule where e-Tags are missing, late, invalid, and incorrect and/or *control area* confirmation fails, unless such *interchange bids* or *offers* are required for *reliability* reasons. Refer to **MM 4.1**, section 5.1.6.
2. The *IESO* confirms the *interchange schedules’* MW quantities with the appropriate *control areas* and quantities may be modified prior to the start of the ramp up process, as necessary, to ensure viable *interchange schedules*. In the event of a disagreement between the *IESO* and the external *control area operator* in respect of the quantity of an *interchange schedule*, the lesser quantity shall prevail. Failure of the *IESO* and the external *control*

area operator to agree to the lesser quantity will result in the *interchange scheduling* being reduced to 0 MW.

3. If the *IESO* has reduced the quantity of an *interchange schedule*, the *IESO* notifies the *market participant* accordingly.

4.3 Interchange Scheduling Protocols

(MR Ch.7 ss.1.3.1, 6.1.3, 7.5.8A and 7.5.8B)

4.3.1 IESO/NYISO Protocol: NY90

Overview – The *IESO* and the NYISO have agreed to follow a specific *interchange scheduling* protocol for the exchange of *interchange scheduling* information. This *interchange scheduling* protocol establishes a timeline that defines when certain *interchange scheduling* checkout activities occur, both within and between the two organizations. Figure 4-1 illustrates this timeline.

Transaction codes – The *IESO* will assign New York *interchange schedules* with either the "NY90", "MrNh", "TLRe" or "OTH" code within the *IESO* systems to reflect schedule check-out activities within the NYISO (see *IESO*-NYISO scheduling protocol below). This approach will result in more accurate and reliable *pre-dispatch schedules*.

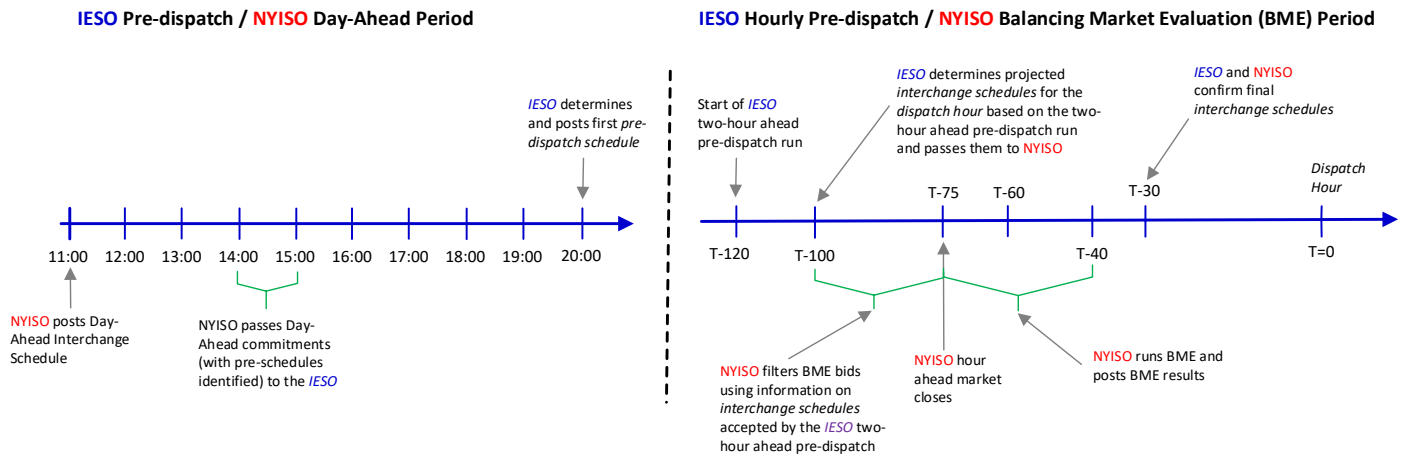


Figure 4-1: IESO - NYISO Scheduling Protocol

11:00 hours (EST) to 12:00 hours	The NYISO posts the day-ahead market schedule
13:30 EPT to 15:30 EPT	The <i>IESO</i> posts the <i>day-ahead market</i> results
14:00 hours to 15:00 hours	NYISO calls and performs a cursory check on eligible <i>energy traders</i> .
20:00 EST	The <i>IESO</i> posts initial <i>pre-dispatch schedule</i> for the next 27 hours.

Hourly Pre-dispatch Period (*IESO*) / RTC (*NYISO*)

T-100 minutes	The <i>IESO</i> determines projected <i>interchange schedules</i> for the <i>dispatch hour</i> based on the two-hour ahead pre-dispatch run, applies the NY90 code to projected <i>interchange schedules</i> and communicates the information to the <i>NYISO</i> .
T-100 minutes to T-75 minutes	The <i>NYISO</i> filters the hour ahead Real-Time Commitment (RTC) <i>interchange schedule bids</i> that affect the <i>IESO</i> / <i>NYISO</i> <i>interties</i> to include only those <i>interchange schedules</i> with <i>offers</i> / <i>bids</i> accepted by the <i>IESO</i> 's two-hour ahead run of the <i>pre-dispatch calculation engine</i> .
T-75 minutes to T-40 minutes	The <i>NYISO</i> runs the RTC, automatically reducing e-Tags accordingly based on the RTC results then notifies the <i>IESO</i> of those <i>interchange schedules</i> that have failed (in whole or part) ² to navigate the <i>NYISO</i> market and posts the <i>NYISO</i> hour-ahead schedule.
T-30 minutes	The <i>IESO</i> confirms final <i>interchange schedules</i> with the <i>NYISO</i> , making final reductions to <i>interchange schedules</i> accordingly and notifies the <i>market participant</i> of the changes by automated e-mail. The <i>NYISO</i> posts RTC results.
T-100 minutes to T-75 minutes	If necessary to maintain <i>reliability</i> , the <i>IESO</i> may, in order of economic merit, <ul style="list-style-type: none"> (a) include transactions from the <i>NYISO</i> two-hour ahead RTC evaluation that were not scheduled in the <i>IESO</i> two-hour ahead <i>pre-dispatch calculation engine</i> run, in the short list for evaluation in the final RTC evaluation; or (b) adjust <i>interchange schedules</i> irrespective of the <i>IESO</i>-<i>NYISO</i> scheduling protocol.

Revising dispatch data – Revisions and/or additions to *dispatch data* two hours prior to the *dispatch hour* are restricted. The *IESO* may accept revisions and/or additions for internal *reliability* reasons. Additionally, at the request of the *NYISO*, the *IESO* may allow revisions and/or additions during this timeframe if the changes facilitate a solution to *NYISO reliability* concerns.³ *IESO* / *NYISO interchange*

² The *NYISO* identifies to the *IESO* those *interchange schedules* not scheduled and partially scheduled by RTC. Those *interchange schedules* scheduled in part by RTC will be scheduled accordingly. Those *interchange schedules* not scheduled will be removed by the *IESO* prior to the *dispatch hour*.

³ This does not apply to *called capacity exports*.

schedule implementation is consistent with the *NERC* transaction ramping default of 10-minutes with the ramp straddling the top of the *dispatch hour*.

4.3.1.1 Curtailed and Failed Interchange Schedules

Reinstating curtailed transactions – An *interchange schedule* that has been curtailed during the *dispatch hour* for *reliability* reasons may be reinstated within that *dispatch hour* if the *reliability* condition causing the curtailment is resolved, and the curtailed *interchange schedule* is scheduled in the next *dispatch hour*.

Maximum quantity – At T-100 minutes, the projected *interchange schedule* for the *dispatch hour*, based on the two-hour ahead run of the *pre-dispatch calculation engine*, are used to set the maximum quantity available for the *dispatch hour* and are "capped" at that using the code NY90. This "short list" is forwarded to NYISO for RTC evaluation.

Short list – Where required for *reliability* reasons, the *IESO* may include in the short list for evaluation in the final NYISO RTC evaluation the next most economical *interchange schedule* from the NYISO two-hour ahead RTC evaluation that failed the *IESO* two-hour ahead run of the *pre-dispatch calculation engine*. The **NY90** code is not used for such *interchange schedule* produced by the *pre-dispatch process* when the addition to the short list includes a complete *offer* (either the full quantity of the new *interchange schedule* or an existing *interchange schedule* MW is increased to the full quantity *offered*). The NY90 code is used if the addition to the short list results in a selection of a partial *interchange schedule offer*.

Failed transactions – At T-30 minutes, *interchange schedule* that failed the NYISO RTC (all or in part) will be failed by the *IESO* using the code **OTH**, unless failed as a result of external transmission limitation, in which case the **TLRe** code will be applied.

4.3.2 IESO/MISO Protocol: MISO Protocol

Overview – In an effort to facilitate the release of MISO transmission and accommodate MISO ramp restrictions the *IESO* has a unique scheduling protocol for all MISO transactions. At T-90, all e-Tags for transactions on the Michigan, Manitoba or Minnesota interfaces will be reduced to their two-hour-ahead *pre-dispatch schedule*. Subsequently, all transactions whose schedule increases from two hours out to one hour out will be reloaded to reflect their hour-ahead *interchange schedule*.

4.3.3 IESO/Hydro-Quebec: Bilateral Capacity Agreements

Overview – The *IESO* and Hydro-Quebec are parties to a capacity agreement independent of a *capacity auction*. *Energys* scheduled to satisfy the terms of the agreement will be on the PQ. OUTAOUAIS *boundary entity*. Delivery of firm *energy* under the agreement is measured as the net schedule on PQ. OUTAOUAIS

regardless of the *market participant* responsible for the scheduled transaction (i.e. a Hydro Quebec *energy* transaction does not have to be scheduled for the sending entity to be meeting its *energy* obligation, if other transactions deliver an equivalent amount of *energy*).

Governed by market rules – Submission of *dispatch data* for transactions associated with the agreement shall adhere to applicable timelines and requirements set out in the *market rules* and *market manuals*. The *IESO* determines *real-time schedules*, *locational marginal prices*, and *dispatch instructions* for these transactions in accordance with the applicable *market rules* and this *market manual*.

Quebec capacity call – To call on Quebec capacity, the *IESO* will issue a *reliability* declaration⁴ to Hydro Quebec TransÉnergie (HQT) and issue an advisory notice in accordance with **MR Ch.7 s.12.1.3A**. Following this, HQ Energy Marketing (HQEM) will submit an associated import *offer* (HQEM import). This HQEM import will be scheduled by the *pre-dispatch calculation engine* using normal market mechanisms.

Emergency operating state – Consistent with **MM 7.1 App.B.1**, the *IESO* may adjust import transactions on a reasonable effort economic basis in advance of or during an *emergency operating state*. This may include import transactions on PQ. OUTAOUAIS associated with the capacity agreements, with no preferential treatment given to the HQEM import. Manual constraints will be applied using either the **TLRi** or **ADQh** code for *IESO adequacy* (refer to Table 4-1: Make Whole Payment Eligibility and Failure Charges).

4.4 Pre-Emptive Curtailments

IESO actions where curtailment is expected – If the *IESO* reasonably expects transactions will require curtailment in the *real-time dispatch process*, the *IESO* will exercise reasonable efforts to curtail the transactions during the *pre-dispatch process*. The *IESO* will curtail such transactions in circumstances including those described in this section.

Internal reliability – If the *IESO* determines that certain transactions or a certain volume of transactions might not be successfully scheduled or might require curtailment in the *real-time market* due to an internal issue, the *IESO* may remove the affected transactions from the *IESO* scheduling processes for future hours. Under such circumstances, the *IESO* will assign a **TLRi** reasons code.

External reliability or market participant failure – If the *IESO* determines that transactions might not be successfully scheduled due to external *reliability* issues,

⁴ Refer to **MM 7.1 App.B.1**: Actions in Advance of and During the IESO Controlled Grid Emergency Operating State.

or due to a persistent *market participant* failure, the *IESO* may remove or reduce the anticipated affected transactions from the *IESO* scheduling processes for future hours and code appropriately in accordance with Table 4-2: Assigning Reason Codes to Interchange Schedule Adjustments.

Transmission Loading Relief – If an external *reliability* coordinator has initiated the *NERC* Transmission Loading Relief (TLR) procedure and:

- it has resulted, or is anticipated to result, in transaction failures; and
- the *IESO* determines that the cause of the TLR will continue;

the *IESO* may pre-emptively remove transactions or reduce scheduled quantities. Under such circumstances, the *IESO* will assign a **TLRe** reason code

On a reasonable effort basis, the *IESO* will attempt to remove or reduce the transactions as per the Interchange Distribution Calculator (IDC) process (first by transmission priority bucket, then on a reasonable effort economic basis within the transmission bucket). To prevent an increased schedule to the remaining transactions, the *IESO* may constrain these transactions to their pre-dispatch value with a **TLRe** code.

Market participants can visit the *NERC* website at www.nerc.com to confirm whether TLR procedures have been implemented.

Advisory notice – If the *IESO* expects pre-emptive curtailments to persist for multiple hours, the *IESO* will *publish* an advisory notice to that effect in accordance with **MR Ch.7 s.12.1.3A**. The *IESO* will *publish* another advisory notice when the pre-emptive curtailments have ended.

4.5 Transaction Coding

(MR Ch.7 ss.6.1.3, 7.5.8A and 7.5.8B)

4.5.1 Modifying Interchange Schedules

The *IESO* modifies *interchange schedules* in accordance with the considerations described in this section.

Principle 1 – The *IESO* modifies *interchange schedules* for a given *dispatch hour* if:

- in the *IESO's* opinion, as a result of changing conditions, the *real-time schedules* will not have sufficient *resources* available to maintain the *reliable* operation of the *IESO-controlled grid*; or
- consistent with *interconnection agreements* and industry standards, the *IESO* is requested to do so by an external *control area operator* or reliability coordinator; or

- the *market participant* has not met all applicable requirements to schedule a transaction on a *boundary entity resource*.

Principle 2 – To the extent that it is practicable for the *IESO* to do so, the *IESO* modifies *interchange schedules* in a manner that most closely reproduces the anticipated outcome of the *pre-dispatch process* considering the *reliability* concern.

Principle 3 – To the extent that it is practicable for the *IESO* to do so, the *IESO* limits manual intervention to an amount equal to the difference between the change in conditions and the real-time capability of available internal *resources* to address that change.

Principle 4 – To the extent that it is practicable for the *IESO* to do so, the *IESO* uses the economic merit order⁵ of import or export transactions as the basis for determining which scheduled transactions to manually adjust.

4.5.1.1 Reason Code Application for Interchange Schedule Adjustments and Curtailments

Overview – When the *IESO* modifies an *interchange schedule* in accordance with **MR Ch.7 s.6.1.3**, it assigns a reason code to the *interchange schedule* modification. The reason code consists of both the reason for the modification as well as the modification type as described below. Reason codes are used to determine the appropriate *settlement* treatment.

Reason element of reason codes – The reason portion of the reason codes are listed below:

- **Auto** – economic schedule (i.e., no curtailment or reduction)
- **NY90** – New York 90-minute protocol **MrNh** – MISO Ramp/Transmission Service or NYISO Hour Ahead Market (HAM) protocol
- **TLRe** – Transmission loading relief external
- **TLRi** – Transmission loading relief internal
- **ADQh** – *Adequacy*
- **ORA** – *Operating Reserve Activation*
- **OTH** – Other

Modification types – The modification identifier element of a reason code, which specifies how the *IESO* modified the *interchange schedule*, may consist of the following types of modifications:

- reduced *interchange schedules* are coded as **MAX**;

⁵ Economic merit will be evaluated by comparing the *bid/offer* price of a transaction against the *locational marginal price* associated with the *intertie zone* applicable to the transaction.

- fixed *interchange schedules* are coded as **FIX**; and
- increased *interchange schedules* are coded as **MIN**.

Bona fide and legitimate reason – Each reason code indicates whether an *energy trader's* failure to comply with an *interchange schedule* is due to a bona fide and legitimate reason for the purposes of **MR Ch.7 ss.7.5.8A** and **7.5.8B**, as described in Table 4-1

Settlement treatment – The reason codes applicable to a *market participant's interchange schedule* identify whether the adjustment to the *interchange schedule* will be eligible for the following *settlement* treatments:

- real-time make whole payments; (**MR Ch.9 s.3.5.8**);
- *intertie* failure charges (**MR Ch.9 s.3.7**);
- *intertie offer* guarantees (**MR Ch.9 s.3.6**); or
- *day-ahead market* balancing credit (**MR Ch.9 s.3.3.5**).

Table 4-1 summarizes the impact reason codes have on *settlement* treatment for certain *settlement* amounts listed above. For clarity, the table indicates one of multiple requirements for eligibility to receive a payment or pay a charge, and the requirement for such payment or charge will be determined by the applicable provisions of **MR Ch.9** for further details.

Table 4-1: Make Whole Payment Eligibility and Failure Charges

Scheduling Scenario	Reason Code ⁶	DAM and RT Intertie Failure Charge Exempt	DAM Balancing Credit	RT Intertie Offer Guarantee	RT Import Make-Whole for Operating Reserve	RT Export Make-Whole for PD Pricing ⁷ Discrepancy	RT Export Make-Whole for Manual Dispatch Out-of-Merit
Economic Schedule	AUTO	N/A	No	Yes	Yes	Yes	No
Reduced	NY90 - MAX	N/A	No	Yes	Yes	Yes ⁸	No
	MrNh - MAX	Yes	No	Yes	Yes	Yes	No
	OTH - MAX	No	No	Yes	Yes	Yes ⁹	No
	TLRe - MAX	Yes	No	Yes	Yes	Yes ¹⁵	No
	TLRi - MAX	Yes	Yes ¹⁰	Yes	Yes	Yes	No
	ADQh - MAX	Yes	Yes	Yes	Yes	Yes	No
Increased	ADQh - MIN	Yes	No	Yes	Yes	No	Yes
	ORA - MIN	Yes	No	Yes	Yes	No	Yes
	TLRi - MIN	Yes	No	Yes	Yes	No	Yes

⁶ The reason codes that will be *published* for important and export transactions will be limited to six characters and will include the adjustment reason and the modification type. **MAX**, **MIN** and **FIX** will be shortened to **MX**, **MN**, and **FX**. For example, **TLRe - MAX** will be published as **TLREMx**.

⁷ The real-time export make whole payment is not available if an export is scheduled with the intervention of a *control area operator* adjustment to fix or increase the export *interchange schedule*.

⁸ Make whole payments will apply as appropriate as per the normal scheduling process, provided the "capped" T-100 minutes *interchange schedule(s)* clears the NYISO RTC @ T-75 minutes.

⁹ No make whole payments will apply for transactions that failed the T-30 minutes NYISO RTC (all or in part).

¹⁰ Eligibility is subject to a verification step that confirms that the transaction was scheduled for an amount equal to the *IESO* manual adjustment.

Scheduling Scenario	Reason Code ⁶	DAM and RT		RT Intertie Offer Guarantee	RT Import Make-Whole for Operating Reserve	RT Export Make-Whole for PD Pricing ⁷ Discrepancy	RT Export Make-Whole for Manual Dispatch Out-of-Merit
		DAM Intertie Failure Charge Exempt	DAM Balancing Credit				
Fixed	ADQh - FIX	Yes	Yes	Yes	Yes	No	Yes
	TLRi - FIX	Yes	Yes	Yes	Yes	No	Yes

Table 4-2 provides the circumstances under which the *IESO* will assign a given reason code for modifying an *interchange schedule*.

Table 4-2: Assigning Reason Codes to Interchange Schedule Adjustments

Adjustment Reasons	Further Description	Code Assigned
e-Tagging errors	e-Tagging errors	OTH
External jurisdiction economic selection failure (whole or partial)	External jurisdiction economic selection failure (whole or partial)	OTH
PJM ramping capacity (where ramp reservations required)	<i>Market participant</i> failure to acquire ramping capability	OTH
ISO <i>market participant</i> scheduling errors	Scheduling errors in external ISOs or RTOs that are within the <i>market participant's</i> control (e.g. acquiring transmission, market scheduling)	OTH
Linked <i>wheeling through transaction</i> within participant control	Curtailed of linked wheels within participant control	OTH
e-Tag held by IDC	e-Tag held by IDC following the first hour of the TLR process	OTH
Transaction on a commercially unavailable <i>intertie</i>	<i>Market participant</i> submits a <i>bid</i> or <i>offer</i> on a <i>boundary entity resource</i> associated with a commercially unavailable <i>intertie</i> if the <i>IESO</i> has indicated that the <i>intertie</i> is commercially unavailable ¹¹	OTH
External ISO Curtailments	External ISO/RTO Curtailments for TLR (including pre-emptive <i>curtailments</i>)	TLRe
External ISO Curtailments	Other <i>security curtailments</i>	TLRe
External ISO Curtailments	External ISO/RTO <i>adequacy cuts</i>	TLRe
NYISO Ramping Capacity	For NYISO Net Interchange Scheduling Limit (NISL) binding	TLRe
Linked <i>wheeling through transaction</i> outside participant control	Curtailed of <i>linked wheeling through transaction</i> outside participant control	TLRe
<i>Intertie</i> limit violation when caused by an external curtailment or failure	<i>IESO</i> or external curtailment to respect an <i>intertie</i> limit violation when the violation is	TLRe

¹¹ For any subsequent *bids* or *offers* received against that *intertie*, the transaction will be curtailed to 0 MW and the *market participant* will be subject to a failure charge.

Adjustment Reasons	Further Description	Code Assigned
	caused for a reason where the failure code is tagged as OTH , TLRe or MrNh	
Capacity export reduced for a transmission limitation	Capacity export reduced for a transmission limitation	TLRe
Capacity export reduced due to <i>resource</i> status	Backing <i>resource</i> is derated to an amount less than the scheduled quantity and the <i>IESO</i> is in an <i>energy</i> or <i>operating reserve</i> shortfall	TLRe
<i>IESO</i> curtailments (manual)	<i>IESO</i> curtailments for TLR	TLRi
<i>IESO</i> curtailments (manual)	Other <i>security</i> curtailments	TLRi
<i>Intertie</i> limit reduction (total or partial)	<i>IESO</i> selects and decreases transaction quantity after the hour-ahead <i>pre-dispatch calculation engine</i>	TLRi
<i>IESO</i> ramping capacity (Manual management of Ramp)	For <i>IESO</i> managing transactions to prevent violation of NISL	TLRi
<i>IESO</i> curtailments	<i>IESO adequacy</i> actions Shortfall beyond next hour (for shifting <i>energy</i> limited <i>resources</i> for future hour shortfall)	TLRi
<i>IESO</i> curtailments	<i>IESO adequacy</i> actions Internal <i>security</i> concerns leading to an <i>adequacy</i> concern.	TLRi
<i>IESO security</i> curtailment <i>operating reserve</i> activation	Activation of <i>operating reserve</i> provided by import (increase import schedule)	ORA
<i>IESO security</i> curtailment <i>operating reserve</i> activation	Activation of <i>operating reserve</i> provided by export (reduce export schedule)	ADQh
<i>IESO security</i> curtailment <i>operating reserve</i> activation	Reduction in <i>operating reserve</i> import schedule for the activation of <i>operating reserve</i>	ADQh
MISO - Minnesota - Inability to acquire transmission service	Real-Time transaction failures from MISO	MrNh
MISO - Michigan - Inability to acquire transmission service	Real-Time transaction failures from MISO	MrNh
MISO - Manitoba - Inability to acquire transmission service	Real-Time transaction failures from MISO	MrNh

Adjustment Reasons	Further Description	Code Assigned
MISO ramping capacity	<i>Market participant</i> inability to acquire ramping capability in real-time ¹²	MrNh
NYISO curtailments	Cuts by NYISO under HAM protocol due to TLR (NYISO real-time transactions, not NYISO day-ahead transactions but could be <i>IESO</i> Day-Ahead Imports)	MrNh
<i>IESO</i> curtailments	<i>IESO adequacy</i> (surplus or deficiency) actions not caused by internal <i>security</i> . (<i>dispatching</i> on or off of imports or exports after the hour-ahead <i>pre-dispatch calculation engine</i> run leading up to the <i>dispatch hour</i>)	ADQh
NYISO - <i>IESO</i> Scheduling Protocol	90-minute checkout	NY90
<i>IESO</i> curtailments (Auto - Automatic treatment by the <i>pre-dispatch calculation engine</i>)	Other <i>security</i> curtailments Scheduling result of the <i>security</i> constrained economic <i>dispatch</i> process whether in full or in part	AUTO or NY90
<i>Intertie</i> limit reduction	After <i>day-ahead market</i> expiration and before hour-ahead run of the <i>pre-dispatch calculation engine</i> leading up to the <i>dispatch hour</i> Import schedules may be reduced by an <i>Intertie</i> Limit Reduction which may impact <i>day-ahead market schedules</i> for importing <i>energy</i>	AUTO or NY90
<i>IESO</i> ramping capacity (<i>pre-dispatch calculation engine</i> managing ramp)	For <i>pre-dispatch calculation engine</i> managing transactions to prevent violation of NISL	AUTO or NY90

4.5.2 Methodology for Assigning Failure Codes

4.5.2.1 External Curtailment Causing an Intertie Limit Violation

Curtailment or transaction failure due to external curtailment or energy trader conduct – If an external *control area operator* curtails a transaction or a

¹² This is communicated via the e-Tag and not a phone call to the *IESO* Control Room.

transaction fails due to an *energy trader's* conduct, the *IESO* curtails the transactions schedule and codes the transaction with **TLRe**, **MrNh** or **OTH**. If the curtailment causes the *intertie* limit to be violated, the *IESO* will take immediate action to relieve the violation. On all *interties*, with the exception of Quebec, the *IESO* cannot increase and therefore must curtail other transactions.

Consequential curtailment – Where the *IESO* curtails a transaction to remedy a violation of an *intertie* limit caused by an external curtailment or due to an *energy trader's* conduct, this consequential curtailment will be assigned a code of **TLRe**, based on Principle 2 described in [section 4.5.1](#).

4.6 Capacity Export Scheduling and Curtailment

Interpretation – Unless the context requires otherwise, capitalized terms in this section are defined in **MM 13 App.A**.

..4.6.1 Capacity Export Delivery

(Ch.7 s.20.3.1)

Called capacity exports with adequate supply – Where Ontario has *adequate* supply during the period for the *called capacity export*, the *IESO* will flow a *called capacity export* only if the requirements provided by **MR Ch.7 s.20.3.1** are satisfied and the bid for the *called capacity export* is scheduled economically.¹³ If the Capacity Resource is not scheduled economically, refer to [section 4.6.2](#).

Called capacity export during adequacy shortfall – Where Ontario has an *adequacy* shortfall during the period for the *called capacity export*, the *IESO* will flow a *called capacity export* only if the requirements provided by **MR Ch.7 s.20.3.1** are satisfied, the bid for the *called capacity export* is scheduled economically, and the Capacity Resource is injecting *energy* in real-time to at least the amount of the *called capacity export*.¹⁴

Curtailed called capacity exports where global adequacy shortfall exists – If the *called capacity export* is scheduled pro-rata due to other economic exports on the *intertie*, and the *IESO* is subsequently required to curtail exports for global *adequacy*, the *IESO* will ensure the delivery of the full called amount to the external *control area*, provided that the Capacity Resource(s) is injecting *energy* in real-time to at least the full amount of the *called capacity export*. In this circumstance, the Capacity Resource's *interchange schedule* will be based on pro-rata economic curtailment of all *intertie* transactions, including *called capacity exports*, up to the called amount.

¹³ Capacity exports are subject to normal economic scheduling. Therefore, a capacity export can be scheduled to a value less than its *bid* quantity in the event that an *intertie* is congested and there are other economic *offers* (e.g., pro-rata scheduling).

¹⁴ There can be multiple Capacity Resource responding to a *called capacity export*.

4.6.2 Curtailment Provisions

(MR Ch.7 s 20.4.3)

Reasons for curtailment – In accordance with applicable *capacity export agreements*, the *IESO* may curtail a *called capacity export*:

- to correct or prevent a violation of voltage, stability, or thermal transmission limits/criteria;
- to prevent a threat to the safety of any person, damage to equipment or the environment, or the violation of any *applicable law*;
- if the Capacity Resource is reduced in the *pre-dispatch schedule* or *real-time schedule* for reasons which may include:
 - constraints for voltage, stability, or thermal transmission limitations
 - constraints for ensuring safety of any person
 - constraints preventing the damage of equipment or the environment
 - constraints for preventing the violation of any *applicable law*
- if the external *control area* or *IESO-administered markets* have been suspended, or there is a market tool failure which precludes *intertie* scheduling and/or inter-ISO coordination; or
- if the Capacity Resource is contracted to the *IESO* to provide *black start capability* and is required for *IESO-controlled grid* restoration.

Curtailment for failing to synchronize and inject – As discussed in [section 4.6.1](#), where *called capacity exports* are implemented in accordance with **MR Ch.7 s.20.3.1**, the Capacity Resource must be synchronized with the *real-time schedule* to at least the quantity of the *called capacity export*. If the Capacity Resource does not satisfy this requirement (e.g. including where the Capacity Resource submits an *outage*), the *IESO* will curtail the transaction to the amount of the *pre-dispatch schedule* or the lower of the *real-time schedule* or real-time injection amount.

No curtailment – A *called capacity export* will not be curtailed by the *IESO* out of economic merit:

- as a result of, or to avoid, a global capacity shortfall resulting in voltage reductions and/or load shedding; or
- to compensate for losses other than that of the Capacity Resource.

4.7 Capacity Import Scheduling

(MR Ch.7 ss.19.9 and 19.9B)

Scheduling Protocols – Imports offered on *system-backed capacity import resources* and *generator-backed capacity import resources* will be scheduled according to the intertie scheduling protocols set out in [section 4.3](#).

4.7.1 Capacity Import Call for Generator-Backed Capacity Import Resources

(MR Ch.7 s.19.9B)

Pre-conditions for issuing a capacity call for generator-backed capacity import resources – If the *IESO* is forecasting or experiencing an *adequacy* shortfall, it may initiate a *capacity import call* to a *generator-backed capacity import resource*.

Content of capacity import call – The *capacity import call* issued to *generator-backed capacity import resources* will communicate the hour(s) and MW quantity, up to the *capacity obligation* amount, for which the import will need to be scheduled.

Offer and bid requirements – To increase the likelihood that the import transaction is successfully scheduled, the *capacity market participant* should price its export *bid* in its host *energy* market at the maximum *bid* price, and its import *offer* in the *IESO energy market* is offered at negative *MMCP*.

Resource availability – To reduce the likelihood of curtailment, the *generator-backed capacity import resource* must be available to supply *energy* to back the import during the called hour(s) pursuant to the host *control area's* requirements (e.g. be able to inject the scheduled import MW quantity within 30-minute notice for NYISO resources). *Generator-backed capacity import resources* should be available to deliver their offered imports, but are not required to be available until such time, if any, as the *IESO* issues a *capacity import call*, in which case the *generator-backed capacity import resource* must be available to satisfy its capacity obligation (**MR Ch.7 s.19.9B**).

Non-performance charge – If the import is not successfully scheduled according to *capacity import call* issued by the *IESO* or if it is curtailed partially or in full in the *real-time dispatch process* after being scheduled in a *pre-dispatch calculation engine* run, non-performance charges may apply, as specified in **MR Ch.9 s.4.13**. The transaction will not be considered a failure for the purposes of **MR Ch.9 s.4.13**, and therefore, the *capacity market participant* will not be subject to such non-performance charges, where the *IESO* assigns a curtailment reason code of **TLRi**, **TLRe**, or **ADQh**.¹⁵

– End of Section –

¹⁵ These curtailment reason codes are described in section 4.5: Transaction Coding.

5 Issuing Dispatch Instructions and Operational Notices

5.1 Dispatchable Generation Resources, Dispatchable Loads or Dispatchable Storage Resources

Target energy output (MR Ch.7 s.7.3.1.1) – The *dispatch instruction* indicates the target *energy* output to be achieved (in MW) by the *resource* at the end of the *dispatch interval* consistent with the ramp rate as specified below:

- for a *dispatchable load* or *electricity storage resource* that proposes to withdraw, the ramp rate provided by the *registered market participant* as *dispatch data*; and
- for a *generation resource* or *electricity storage resource* that proposes to inject, the most limiting of:
 - the offered ramp rate applicable to the *energy* output specified in the *resource's* most recent *dispatch instruction*; and
 - the effective maximum ramp rate, as set out below.

Target energy output for pseudo-units (MR Ch.7 s.7.3.1.1) – For *pseudo units*, the target *energy* output is derived from the *pseudo-unit's* ramp rate and *energy* output of the associated combustion turbine and steam turbine *generation units*.

Effective maximum ramp rate – The effective maximum ramp rate consists of the lesser of:

- the *resource's* registered maximum ramp rate; and
- the largest ramp rate contained in the *offer* for the *resource*, multiplied by the ramp rate multiplier established by the *IESO*. The ramp rate multiplier is currently set to a value of 1.2.

Materiality threshold (MR Ch.7 s.7.1.1A) – For the purpose of **MR Ch.7 s.7.1.1A**, the *IESO* will only issue *dispatch instructions* for a given *dispatch interval* when the change in the quantity to be scheduled is greater than or equal to the lesser of (a) 2% of the maximum *offer/bid* capability of the *resource*, and (b) 10 MW. However, the *IESO* will also issue *dispatch instructions* in each of the following circumstances, irrespective of whether the *dispatch instruction change* falls within the above materiality thresholds:

- to ensure the *resource* is *dispatched* to its high operating limit or low operating limit;

- for provision of *energy* reduction change when the previous *dispatch instructions* are higher than the *resource's* current maximum *offer*, or
- for *dispatch interval* 1 and 7 of each *dispatch hour*.

Variable generation resources (MR Ch.7 s.7.1.2A.1) – *Dispatch instructions* for *variable generation resources* are accompanied with an “obligation indicator” which indicates either **MANDATORY** or **RELEASE**. A **RELEASE** flag indicates that the *dispatch instruction* is accompanied with a *release notification*. A *release notification* issued under **MR Ch.7 s.7.1.2A.1** allows the *energy* supplied from the *resource* to be produced by ambient conditions rather than a specified *dispatch quantity*. The *IESO* issues *dispatch instructions* for *energy* to each *variable generation resource* only for *dispatch intervals* with mandatory obligation indicators in effect or for the first *dispatch interval* when the mandatory obligation indicator for *variable generator* no longer applies.

Contingency events impacting electronic dispatch – Where a *contingency event* is occurring or has occurred, the *IESO* may temporarily cease issuing *dispatch instructions*. If the *IESO* does not issue *dispatch instructions* to a *resource*, the *resource* must continue to follow its most recent *dispatch instructions* in accordance with **MR Ch.7 s.7.5.1**. If the *IESO* issues *dispatch instructions* by alternative means other than through *dispatch workstations*, including by telephone, *registered market participants* are expected to communicate to the *IESO* using those alternative means, including to accept or reject *dispatch instructions*.

Table 5-1: Procedure for Dispatching Dispatchable Resources

Step	Completed by...	Action
1	<i>IESO</i>	The <i>IESO</i> schedules <i>resources</i> to supply <i>energy</i> and <i>operating reserve</i> to meet <i>electricity system</i> requirements.
2	<i>IESO</i>	The <i>IESO</i> issues <i>dispatch instructions</i> in accordance with MR Ch.7 s.7.1.1A or, for <i>variable generation resources</i> , a <i>release notification</i> in accordance with MR Ch.7 s.7.1.2A1 .
3	<i>Registered market participant</i>	The <i>registered market participant</i> receives the <i>dispatch instruction</i> from the <i>IESO</i> and, within 60 seconds of receipt, acknowledges the <i>dispatch instruction</i> by confirming to the <i>IESO</i> that the <i>registered resource</i> will accept or reject the <i>dispatch instruction</i> in accordance with MR Ch.7 s.7.1.2A .
4	<i>IESO</i>	The <i>IESO</i> confirms whether the <i>registered market participant</i> has accepted or rejected the <i>dispatch instruction</i> . If the <i>registered market participant</i> does not duly acknowledge the <i>dispatch instruction</i> within 60 seconds, the <i>registered market participant</i>

Step	Completed by...	Action
		<p>may, within an additional 30 seconds, call and request the <i>IESO</i> to manually accept or reject the dispatch instruction on its behalf.</p> <p>If the <i>registered market participant</i> rejects the <i>dispatch instruction</i>, it should call the <i>IESO</i> to explain the reason for the rejection. Rejecting a <i>dispatch instruction</i> for reasons other than those permitted under MR Ch.7 s.7.5.3 may result in non-compliance with the <i>market rules</i>. The <i>IESO</i> may also contact the <i>market participant</i> by phone to manually accept or reject the <i>dispatch instruction</i> on its behalf, if requested to do so.</p> <p>Alternatively, if the <i>registered market participant</i> does not accept or reject the <i>dispatch instruction</i>, or does not request the <i>IESO</i> to manually accept or reject the <i>dispatch instruction</i> on its behalf, the <i>IESO</i> will deem the <i>registered market participant</i> to have rejected the <i>dispatch instruction</i>. For <i>dispatch instructions</i> that are rejected or for which no response has been received, the <i>registered market participant</i> is required to maintain its <i>resource</i> at the level of the last accepted <i>dispatch instruction</i>.</p>
5	<i>Market participant</i>	<p>A <i>registered market participant</i> that expects its <i>resource</i> to operate in a manner that, for any reason, differs materially from the <i>IESO's dispatch instructions</i> shall notify the <i>IESO</i> as soon as possible in accordance with MR Ch.7 s.7.5.2. Refer to section 5.7 of this <i>market manual</i>.</p>
6	<i>IESO</i>	<p>If the <i>registered market participant</i>:</p> <ul style="list-style-type: none"> • confirms that it is rejecting a <i>dispatch instruction</i>; • does not acknowledge the <i>dispatch instruction</i>; or • notifies the <i>IESO</i> that the <i>resource</i> is operating or expects to operate in a manner that differs materially from the <i>dispatch instructions</i>; <p>then the <i>IESO</i> will assess the impact. The <i>IESO</i> may address the impact by:</p> <ul style="list-style-type: none"> • issuing additional <i>dispatch instructions</i>; and/or • transitioning from a <i>normal operating state</i> to a different operating state .
7	<i>IESO</i>	<p>In circumstances where the impact results in a shortfall that cannot be addressed via normal market mechanisms, the <i>IESO</i> will declare an <i>emergency operating state</i> under MR Ch.7 s.12.1.3.3 and MR Ch.5 s.2.3.3.¹⁶</p>

¹⁶ Refer to **MM 7.1**: IESO-Controlled Grid Operating Policies, **App.B** for the complete integrated list of *emergency operating state* control actions.

Emergency operating state – The key steps leading up to and during an *emergency operating state* under **MR Ch.7 s.7.7.** and **Ch.5 s.5.3** are outlined in Table 5-2.

While Table 5-2 provides the escalating order of control actions, the *IESO* may initiate control actions at any point in the table depending on the specific circumstances and conditions of the *IESO* or external *control area*. In addition, the *IESO* may alter the order in which the control actions are implemented or not implement certain actions, to respond to *reliability* concerns.

Table 5-2: IESO and Market Participant Actions leading up to and during an Emergency Operating State

Step	Completed by...	Action
1	<i>Market participant</i>	<i>Market participants</i> access the <i>IESO</i> website to view any <i>published</i> advisory notices <i>published</i> pursuant to MR Ch.7 s.12.1.3.3 which indicate any expected <i>emergency operating states</i> .
2	<i>IESO</i>	If required, the <i>IESO</i> requests the <i>market participant</i> for a <i>commissioning generation facility</i> or <i>commissioning electricity storage facility</i> to discontinue its testing referred to in MR Ch.7 s.2.2A.4.2 or MR Ch.7 s.2.2D.4.2 , as applicable.
3	<i>Market participant</i>	<i>Market participant</i> acknowledges receipt of, and complies with, the <i>IESO's</i> request to discontinue the commissioning test.
4	<i>IESO</i>	The <i>IESO</i> implements actions to continue to satisfy <i>ten-minute operating reserve</i> requirements. Refer to MM 7.1 App.B .
5	<i>IESO</i>	The <i>IESO</i> issues <i>NERC Energy Emergency Alert 2 (EEA-2)</i> indicating that the <i>IESO control area</i> has or is expected to initiate load management procedures.
6	<i>IESO</i>	The <i>IESO</i> implements actions to continue to satisfy 10-minute synchronized <i>operating reserve</i> requirements. Refer to MM 7.1 App.B.
7	<i>IESO</i>	When the requirements provided by MR Ch.5 s.2.3 and MM 7.1 App.B are satisfied, the <i>IESO</i> declares an <i>emergency operating state</i> pursuant to MR Ch.7 s.12.1.3.3 and MR Ch.7 s.2.3.3 .
8	<i>Market participant</i>	<i>Market participants</i> access the <i>IESO</i> website to view the <i>published</i> advisory notice.
9	<i>IESO</i>	The <i>IESO</i> implements <i>emergency operating state</i> control actions to continue to satisfy ten-minute synchronized <i>operating reserve</i> requirements, as described in MM 7.1 App.B.

Step	Completed by...	Action
10	<i>IESO</i>	The <i>IESO</i> implements actions to meet <i>regulation</i> reserve requirements, as described in MM 7.1 App.B.
11	<i>Market participant</i> (<i>Transmitters and/or Distributors</i>)	<i>Transmitters</i> and/or <i>distributors</i> receive and accept instructions to reduce voltage at the distribution level either by 3% or by 5%.
12	<i>IESO</i>	The <i>IESO</i> implements actions to avoid <i>curtailment</i> . Refer to MM 7.1 App.B.
13	<i>Market participant</i> (<i>Generators and Electricity Storage Participants</i>)	<i>Generators</i> and <i>electricity storage participants</i> apply for environmental variances to supply additional <i>energy</i> to the <i>IESO-controlled grid</i> .
14	<i>IESO</i>	The <i>IESO</i> issues <i>NERC Energy Emergency Alert 3 (EEA-3)</i> indicating that load interruption is imminent or in progress.
15	<i>IESO</i>	The <i>IESO</i> implements <i>curtailment</i> through emergency or rotational load shedding. The <i>IESO</i> notifies <i>market participants</i> under MR Ch.7 s.12.1.3A that load shedding is imminent, and subsequently directs emergency load shedding or controlled rotational load shedding. In the event of a <i>curtailment</i> , the <i>IESO</i> will <i>publish</i> an estimate of aggregate load <i>curtailed</i> as soon as practicable following the return to a <i>normal operating state</i> .
16	<i>Market participant</i> (<i>Transmitters and/or Distributors</i>)	<i>Transmitters</i> and/or <i>distributors</i> receive directions from the <i>IESO</i> via telephone to initiate <i>curtailment</i> .

5.2 Hourly Demand Response Resources

(MR Ch.7 ss.19.4.2 and 19.4.4)

Standby Report – For the purpose of **MR Ch.7 s.19.4.2**, the *IESO* issues a standby notice via the standby report to the *capacity market participant's* private report site to indicate that an *hourly demand response resource* must be on standby to provide *demand response*. **Standby notice price threshold** – For the purpose of **MR Ch.7 s.19.4.2**, the standby notice price threshold is set to \$200/MWh.

Activation Report – For the purpose of **MR Ch.7 s.19.4.4**, the *IESO* issues an activation notice via the activation report to the *capacity market participant's* private report site.

Availability window – If a *capacity market participant* does not receive an activation notice pursuant to **MR Ch.7 s.19.4.4**, for the first hour of the *availability window*, it must, unless activated earlier in the day, continue to monitor for the receipt of an activation notice resulting from subsequent runs of *pre-dispatch calculation engine* until the end of the *availability window*.

Hourly demand response bids outside the availability window – If the *capacity market participant* has submitted *bids* for an *hourly demand response resource* outside the *availability window* and has received an activation notice, then it must comply with that activation notice, unless cancelled or withdrawn by the *IESO*.

Activation period – *Hourly demand response resource* may be activated pursuant to **MR Ch.7 s.19.4.4** for an activation period consisting of one to four consecutive *dispatch hours*. The number of activations per *resource* will be limited to a maximum of one per day.

Process for activating HDR resources – The *IESO* activates *hourly demand response resources* pursuant to **MR Ch.7 s.19.4.4** following the process set out in Table 5-3.

Table 5-3: Procedural Steps for Activating Hourly Demand Response Resources

Step	Completed by...	Action
1	<i>Capacity market participant</i>	A <i>capacity market participant's</i> with a capacity obligation for an <i>hourly demand response resource</i> submits <i>demand response energy bids</i> .
2	<i>IESO</i>	The <i>IESO</i> runs the <i>pre-dispatch calculation engine</i> .
3	<i>IESO</i>	The <i>IESO</i> issues a standby report which may include a standby notice.
4	<i>Capacity market participant</i>	If the standby report does not include a standby notice, the <i>capacity market participant</i> removes its <i>bids</i> in accordance with the timelines set out in MR Ch.7 s.19.4.3 .
5	<i>IESO</i>	The <i>IESO</i> issues activation notices if the conditions under MR Ch.7 s.19.4.4 are satisfied.
6	<i>Capacity market participant</i>	Upon receipt of the activation notice, the <i>capacity market participant</i> complies with the activation notice by reducing its <i>energy</i> withdrawals as set out in MR Ch.7 s.19.4.5 .
7	<i>Capacity market participant</i>	A <i>capacity market participant</i> that expects its <i>hourly demand response resource</i> to operate in a manner that, for any reason, differs from the <i>IESO's</i> activation notice, notifies the <i>IESO</i> as set out in MR Ch.7 s.19.4.7 .

Step	Completed by...	Action
8	<i>Capacity market participant</i>	A <i>capacity market participant</i> that expects its <i>hourly demand response resource</i> to operate in a manner that, for any reason, differs from the <i>IESO's</i> activation notice, revises its <i>bid</i> as soon as possible.

5.3 Boundary Entity Resources

(MR Ch.7 s.6.1.3)

e-Tag submission – For the purpose of **MR Ch.7 App 7.2 s.1.2.8, App 7.3 ss.1.2.10 and 1.4.9**, a *registered market participant* intending to use a *boundary entity resource* must submit an e-Tag with a quantity that matches the *IESO interchange schedule*. If at anytime the e-Tag ID changes the *registered market participant* must revise the e-Tag ID accordingly in its *dispatch data*.

Modifying interchange schedules – The *IESO* may modify *interchange schedules* at anytime, including within the *dispatch hour*, for reasons that include incorrect or missing e-Tags, scheduling misalignments with external *control areas*, requests from an external *control area* operator, contingencies or other *reliability* concerns.

Notification – After the *IESO* modifies an *interchange schedule*, it will notify the *market participant* accordingly.

Table 5-4: Procedural Steps for Interchange Schedules

Step	Completed by...	Action
1	<i>Registered market participant</i>	The <i>registered market participant</i> creates an e-Tag, obtains an e-Tag ID, and submits dispatch data and the e-Tag ID.
2	<i>Registered market participant</i>	<p>The <i>registered market participant</i> receives an <i>IESO pre-dispatch schedule</i> including an <i>interchange schedule</i> for a <i>boundary entity resource</i> and a corresponding schedule from the external <i>control area</i>.</p> <p>Scenario 1 – No adjustments are required if the e-tag quantity and the quantities in both the <i>IESO</i> and neighboring control area schedules match.</p> <p>Scenario 2 – Revise the e-Tag quantity to the value of the scheduled quantity if the two schedules have the same scheduled quantity but this scheduled quantity does not match the e-tag quantity.</p> <p>Scenario 3 – Revise the e-Tag quantity to a value that equals the lesser amount scheduled by the <i>control areas</i> if the two schedules differ in quantity.</p>

Step	Completed by...	Action
		If the schedule in the external <i>control area</i> is for a quantity that is less than the <i>bid/offer</i> quantity and it is more than 60 minutes before the dispatch hour the <i>registered market participant</i> must reduce its <i>bid/offer</i> quantity in the <i>IESO</i> market to equal the external <i>control area</i> schedule.
3	<i>IESO</i>	The <i>IESO</i> issues <i>dispatch instructions</i> , in the form of <i>interchange schedules</i> , to each <i>boundary entity resource</i> for which a <i>dispatch instruction</i> is required.
4	<i>IESO</i>	The <i>IESO</i> reviews the <i>interchange schedule</i> to determine if changes to the <i>interchange schedule</i> are required and notifies <i>market participants</i> if their <i>interchange schedules</i> have been modified from quantities included in the Market Participant Interface at the conclusion of the <i>pre-dispatch process</i> .
5	<i>Registered market participant</i>	<i>Registered market participant</i> receives notice of <i>interchange schedule</i> revisions and submits the revised e-Tag and e-Tag ID, if required.
6	<i>IESO</i>	The <i>IESO</i> validates the e-Tag submitted or revised e-Tag from the previous step.
7	<i>IESO</i>	<i>IESO</i> confirms the quantity and e-Tag ID for each <i>interchange schedule</i> with adjacent <i>control areas</i> . The <i>IESO</i> and/or adjacent <i>control areas</i> may reduce <i>interchange schedules</i> in accordance with the checkout process.
8	<i>IESO</i> and <i>Market participants</i>	Ramps of <i>energy</i> between <i>control areas</i> are initiated over 10 minutes. <i>Energy</i> ramps typically begin at five minutes before the <i>dispatch hour</i> .
9	<i>IESO</i>	The <i>IESO</i> notifies <i>market participants</i> of <i>interchange schedules</i> that have been curtailed relative to the quantities confirmed with adjacent <i>control areas</i> in accordance with the checkout process.

5.4 Dispatch of Operating Reserve

(MR Ch.7 s.7.4)

Dispatchable loads and withdrawing dispatchable electricity storage resources (MR Ch. 7 s.7.4.3) – A *dispatchable load* or *dispatchable electricity storage resource* that is withdrawing must reduce its consumption, or remain at a

reduced consumption level, to provide at least the amount of *operating reserve* required for an activation.

Pseudo-units (MR Ch.7 s.7.1.2A.1) – To activate *operating reserve* for *pseudo-unit*, the *IESO* issues *dispatch instructions* on the *resources* for the corresponding combustion turbine *generation units* and steam turbine *generation unit*, respectively.

Recovery after an activation (MR Ch.7 s.7.4.5) – When *operating reserve* is activated as a result of an NPCC “reportable event” as such term is defined in the NPCC Glossary of Terms, as amended from time to time, the otherwise applicable *ten-minute operating reserve* requirements will be reduced by the amount of the activation. For the purpose of **MR Ch.7 s.7.4.5** and **Ch.5 s.4.5.10**, the *IESO* will subsequently recover to pre-contingency levels of *operating reserve* requirements within 105 minutes of the contingency.

Recovery after event other than activation (MR Ch.7 s.7.4.5) – For the purpose of **MR Ch.7 s.7.4.5** and **Ch.5 s.4.5.10**, for all events that cause the *IESO* to become deficient other than an *operating reserve* activation following an NPCC reportable event, the otherwise applicable *ten-minute operating reserve* requirements will be reduced by a corresponding amount. The *IESO* will subsequently recover to pre-contingency levels of *operating reserve* requirements within 90 minutes of the contingency.

5.5 Manual Procurement of Operating Reserve during Forced or Planned Tool Outages

(MR Ch.7 s.1.5)

Proportion of available operating reserve capacity – In the event of a *planned outage* described in **MR Ch.7 s.1.5.1** or a *forced outage* in respect of *IESO-administered markets* software, hardware or communication systems, the *IESO* will use reasonable efforts to procure *operating reserve* in amounts that are proportional with each *market participant’s* respective share in the total available *operating reserve* capacity.

Alternative procedure pursuant to MR Ch.7 s.1.5.3 – If, as a result of a *planned outage* described in **MR Ch.7 s.1.5.1** or a *forced outage* in respect of *IESO-administered markets* software, hardware or communication systems, and the *IESO* has requested that a *market participant* provide *operating reserve*, the *IESO* will:

- notify *market participants* that the *dispatch instruction* for *operating reserve* issued electronically is invalid, if applicable;
- indicate the amount of each class of *operating reserve* to be provided by the *market participant*;

- identify whether the request represents an activation of *operating reserve*;
- if practicable, indicate the duration of the request. If this is not practicable, the request will be valid until the *IESO* states otherwise; and
- indicate any restrictions applicable to the areas from which *operating reserve* must be provided, leaving the *market participant* to choose what *resources* will be used to meet the request.

5.6 Resource Commitment Notices

5.6.1 Start-up Notices

(MR Ch.7 s.10.1)

Content of start-up notices – *Start-up notices* contain the following elements in respect of a *GOG-eligible resource*:

- *resource name*;
- *start-up time*;
- synchronization time; and
- time the *resource* should reach its *minimum loading point*.

Form and timing of automated start-up notices – The *IESO* typically issues *start-up notices* via the *resource's dispatch workstation*. The *IESO* will aim to issue these *start-up notices* no later than 30 minutes before the beginning of the *resource's* start-up procedures, in accordance with the applicable *lead time*. The applicable *lead time* (hot, warm or cold) used to issue the *start-up notice* is based on the *resource's* calculated *thermal state* for the first hour of the commitment.

Form and timing of manual start-up notices – The *IESO* may elect to issue *start-up notices* manually via telephone call. This is most likely to occur for *start-up notices* issued in the following circumstances:

- under **MR Ch.7 s.10.1.2** (i.e. prior to 20:00 EST on the day prior to the relevant *dispatch day*);
- under **MR Ch.7 s.10.1.3**; or
- due to a failure or *planned outage* of *IESO-administered markets* software, hardware or communication systems.

Alternate synchronization times – When a *registered market participant* indicates whether it reasonably expects to comply with the *start-up notice* under **MR Ch.7 s.10.1.4**, it is permitted to propose an alternate synchronization time. For *GOG-eligible resources* other than *resources* for steam turbine *generation units* that are registered as *pseudo-units*, the *IESO* will approve the alternate

synchronization time if the alternative synchronization time satisfies each of the following requirements:

- it is no earlier than one hour prior to the synchronization time indicated in the *start-up notice*;
- it is no later than one hour after the synchronization time indicated in the *start-up notice*;
- it is no later than the time indicated to reach the *minimum loading point* in the *start-up notice*; and
- it is for a future time.

Alternate synchronization times for steam turbines – For *resources* for steam turbine *generation units* registered as *pseudo-units*, the *IESO* will approve the alternate synchronization time if the alternative synchronization time satisfies all of the following requirements:

- it is no earlier than one hour prior to the synchronization time indicated in the *start-up notice*;
- it is no later than the time indicated to reach the *minimum loading point* in the *start-up notice*; and
- it is for a future time.

Manual proposal for alternative synchronization time – In the event that the *registered market participant's* proposed alternative synchronization time does not satisfy the above requirements, the *registered market participant* may only request an alternative synchronization time by calling the *IESO*.

Failure to acknowledge start-up notice – If the *registered market participant* fails to comply with the obligation to duly acknowledge receipt of the *start-up notice* in accordance with **MR Ch.7 s.10.1.4**, the *IESO* will infer that the *registered market participant* does not intend to comply with the *start-up notice*.

5.6.2 Procedural Steps for Start-up Notices for GOG-Eligible Resources

Table 5-5 summarizes steps involved for issuing and responding to *start-up notices* under the automated process. In the event that the *IESO* issues a *start-up notice* under the manual process, the *IESO* and the *registered Pmarket participant* must satisfy the relevant requirements as soon as practicable, rather than in accordance with the timelines set out in the table:

Table 5-5: Procedural Steps for Start-up notices for GOG-Eligible Resources

Step	Completed by...	Action
1	<i>IESO</i>	The <i>IESO</i> determines that it will issue a <i>start-up notice</i> .

Step	Completed by...	Action
2	<i>IESO</i>	The <i>IESO</i> issues the <i>start-up notice</i> .
3	<i>Registered market participant</i>	The <i>registered market participant</i> acknowledges the <i>start-up notice</i> in accordance MR Ch.7 s.10.1.4 and, if appropriate, proposes an alternate synchronization time for the <i>resource</i> .
4	<i>Registered market participant</i>	Where the <i>registered market participant</i> has not responded to the <i>start-up notice</i> in accordance with MR Ch.7 s.10.1.4 , it should contact the <i>IESO</i> by phone to, <ul style="list-style-type: none"> request that the <i>IESO</i> manually indicate in the <i>IESO</i>'s tools whether it reasonably expects the <i>resource</i> to comply with the <i>start-up notice</i>, on the <i>registered market participant</i>'s behalf; or explain the reason for which it reasonably expects the <i>resource</i> not to comply with the <i>start-up notice</i>.
5	<i>IESO</i>	The <i>IESO</i> confirms whether the <i>registered market participant</i> intends to comply with the <i>start-up notice</i> .
6	<i>Registered market participant</i>	If the <i>registered market participant</i> indicates that it does not intend to comply with the <i>start-up notice</i> , or fails to acknowledge the <i>start-up notice</i> , the <i>registered market participant</i> revises the <i>resource's dispatch data</i> as soon as possible.
7	<i>Registered market participant</i>	If applicable, the <i>registered market participant</i> informs the <i>IESO</i> that it expects the <i>resource</i> to operate in a manner that differs materially from the <i>IESO's start-up notice</i> , in accordance with Ch.7 s.10.1.5 , after earlier informing the <i>IESO</i> that it intends to comply with the <i>start-up notice</i> .
8	<i>Registered market participant</i>	After notifying the <i>IESO</i> of circumstances provided by MR Ch.7 s.10.1.5 , the <i>registered market participant</i> revises the <i>resource's dispatch data</i> as soon as possible.

5.6.3 Issuing Extended Pre-Dispatch Operational Commitments

(MR Ch.7 s.8.2.2)

Issued report – *Market participants* should consult the “Pre-dispatch Intertie Transactions and GOG Eligible Extensions Report” to determine whether their *GOG-eligible resource* has received an *extended pre-dispatch operational commitment*. Refer to Table 6-2 for details concerning the publication of this report.

Extension Notice – The *IESO* will also issue commitment extension notices in advance of an *extended pre-dispatch operational commitment*. The *IESO* will aim to

issue these notices to the *market participant's dispatch workstation* by 30 minutes past the hour.

5.6.4 Notice of Decommitment

(MR Ch.7 s.10.2)

Purpose – A notice of decommitment informs the market participant that a *GOG-eligible* resource may be decommitted by the *real-time scheduling process*.

Form of notice of – The *IESO* issues notice of decommitment via the *market participant's dispatch workstation* in accordance with **MR Ch.7 s.10.2.1**. Further the *IESO* may issue notices of decommitment manually via telephone call to maintain *reliability* under **MR Ch.7 s.10.2.2** or due to a failure or *planned outage* of *IESO-administered markets* software, hardware or communication systems.

Content of notice of decommitment – Notices of decommitment contain the following elements in respect of a *GOG-eligible resource*:

- *resource name*; and
- decommitment time

Failure to acknowledge notice of decommitment – If the *registered market participant* fails to comply with the obligation to duly acknowledge receipt of the notice of decommitment in accordance with **MR Ch.7 s.10.2.3** [unless the *registered market participant* indicates otherwise], the *IESO* will infer that the *registered market participant* does not intend to comply with the notice.

Table 5-6: Procedural Steps for DeCommitment notices for GOG-Eligible Resources

Step	Completed by...	Action
1	<i>IESO</i>	The <i>IESO</i> determines that it will issue notices of decommitment.
2	<i>IESO</i>	The <i>IESO</i> issues decommitment <i>notices</i> .
3	<i>Registered market participant</i>	The <i>registered market participant</i> acknowledges the notice of decommitment notice in accordance with MR Ch.7 s.10.2.3 .
4	<i>Registered market participant</i>	<p>A <i>registered market participant</i> should contact the <i>IESO</i> by phone:</p> <ul style="list-style-type: none"> • If the <i>registered market participant</i> has not duly acknowledged the notice of decommitment within 45 minutes after the hour, and wishes to request that the <i>IESO</i> manually indicate in the <i>IESO's</i> tools whether it reasonably expects the <i>resource</i> to comply with the notice of decommitment, on the <i>market participant's</i> behalf; • to explain the reason for which it reasonably expects the <i>resource</i> not to comply with the notice of decommitment.

Step	Completed by...	Action
5	<i>IESO</i>	The <i>IESO</i> confirms whether the <i>registered market participant</i> intends to comply with the notice of decommitment.
6	<i>Registered market participant</i>	If applicable, the <i>registered market participant</i> informs the <i>IESO</i> it expects to operate in a manner that differs materially from the <i>IESO</i> 's notice of decommitment, in accordance with Ch.7 s.10.2.4 .
7	<i>Registered market participant</i>	After notifying the <i>IESO</i> of circumstances provided by MR Ch.7 s.10.2.4 , the <i>registered market participant</i> revises its <i>dispatch data</i> as soon as possible.

5.7 Compliance with Dispatch Instructions

Variable generation resources (MR Ch.7 ss.7.1.2A and 7.5.1) – *Variable generation resources must comply with dispatch instructions* (i.e., with a mandatory obligation indicator as discussed in [section 5.1](#)) if the *resource* has sufficient fuel to satisfy the *dispatch instructions*.

Materiality threshold (MR Ch.7 ss.7.5.1 and 7.5.2) – For the purpose of **MR Ch.7 s.7.5.1** and **7.5.2**, *registered market participants'* determination of whether they expect their *resources* to operate in a manner that "differs materially from the *dispatch instructions*" shall be based on the materiality thresholds provided by the interpretation bulletin, "Compliance with Dispatch instructions Issued to Dispatchable Facilities", IMO_MKRI_0001 v.7.0, as may be amended from time to time, except for *resources* associated with *cogeneration facilities*, *enhanced combined cycle facilities* and *hourly demand response resources*, as described below:

- For *resources* associated with a *cogeneration facility*, a deviation is material if it exceeds the compliance band established by the *IESO* during the Market Registration process (**MR Ch.7 s.2.2.6.10**).
- For *resources* associated with an *enhanced combined cycle facility*, a deviation is material if it exceeds the compliance band established by the *IESO* during the market registration process (**MR Ch.7 s.2.2.6.10**).
- For an *hourly demand response resource*, a deviation is material if it deviates from the activation notice by 5 MW or more (**MR Ch.7 s.19.4.5**).

Registered market participant actions – When notifying the *IESO* of an expected material deviation from *dispatch instructions* pursuant to **MR Ch.7 s.7.5.2**, *registered market participants* must take the following additional steps:

- revise *dispatch data* to reflect the *resource's* expected capability in accordance with **MR Ch.7 s.3.3.8**; and

- reject subsequent *dispatch instructions* that the *registered market participant* does not expect to comply with, within the 60-seconds after receiving the prompt via the *dispatch workstation*.

If *registered market participants* do not expect to comply with *dispatch instructions* as a result of an *outage*, they must take the following additional steps at the time of submitting the notice under **MR Ch.7 s.7.5.2**:

- Submit or revise an *outage* slip in accordance with **MR Ch.5 s.6.3**, using the *outage* submission tools to reflect the *resource's* capability (refer to **MM 7.1** and, **MM 7.3 s.2** for more information); and
- Notify the *IESO* by telephone if the *outage* is a *forced outage*.

Operating reserve – *Registered market participants* must notify the *IESO*, pursuant to **MR Ch.7 s.7.5.2**, when they:

- have been scheduled for *ten-minute operating reserve* and do not expect to be able to provide the full amount of *ten-minute operating reserve* scheduled; or
- have been scheduled for *thirty-minute operating reserve* and do not expect to be able to provide the full amount of *thirty-minute operating reserve* scheduled;

Operating reserve activations (MR Ch.7 ss.7.5.1 – 7.5.2) – When the *IESO* issues *dispatch instructions* for *energy* for the purpose of activating *operating reserve*, the *dispatch instructions* include an “**ORA**” flag. The *IESO* will treat a *registered market participant's* departure from these *dispatch instructions* as a material deviation for the purpose of **MR Ch.7 s.7.5.2**, and therefore, as non-compliant with *the market rules*, if:

- for a *dispatchable generation resource* or *dispatchable electricity storage resource* that proposed to inject *energy*, the *resource* fails to inject at levels at or above the *dispatch instruction* within the applicable timeframe; or
- for a *dispatchable load resource* or *dispatchable electricity storage resource* that proposed to withdraw *energy*, the *resource* fails to withdraw at levels at or below the *dispatch instruction* within the applicable timeframe.

Content of notification to the IESO – A *registered market participant* that expects to materially depart from *dispatch instructions* must include the following information in its notification to the *IESO* under **MR Ch.7 s.7.5.2**:

- the reason the *resource* will not comply with the *dispatch instruction*;
- the expected duration of the condition that is preventing the *resource* from complying with the *dispatch instruction*; and

- the minimum or maximum MW levels that the *resource* can safely operate at for the remainder of the relevant condition.

Further, a *market participant* may request that the *IESO* constrain the *resource* to a viable operating range.

Deemed rejection (MR Ch.7 s.7.1.2A) – *Registered market participants* are expected to accept or reject *dispatch instructions*, within 60 seconds after receiving the prompt via the *dispatch workstation*. If the *registered market participant* fails to accept or reject a *dispatch instruction* (i.e. the message timer times-out before the *registered market participant* responds to the *dispatch instruction*), the *IESO* will deem the reject *registered market participant* as having rejected the *dispatch instruction*.

Consequence of rejection (MR Ch.7 s.7.1.2A) – If a *registered market participant* rejects a *dispatch instruction* (or is deemed to have rejected a *dispatch instruction*), the *resource* must comply with the last accepted *dispatch instruction*.

5.8 Compliance Aggregation

Overview – The compliance aggregation program allows *registered market participants* to share and satisfy *dispatch instructions* across eligible *resources* when system conditions permit, for the purpose of complying with *dispatch instructions*. Compliance aggregation does change the requirements or tools and processes in respect of a *resource's* participation in the *IESO-administered markets* other than for the purpose of complying with *dispatch instructions*.

Registration – The compliance aggregation program is only available to generation resources that do not qualify for network model aggregation. For additional eligibility requirements to participate in the compliance aggregation program, refer to the registration process described in **MM 1.5 s.3.6.1**. In addition, *market participants* may wish to opt for the meter disaggregation model. The registration process for the meter disaggregation model is described in MM 3.7.

Materiality threshold – For the purpose of **MR Ch.7 ss.7.5.1-7.5.2**, *registered market participants'* determination of whether they expect their *resources* that are authorized to participate in the compliance aggregation program to operate in a manner that “differs materially from the *dispatch instructions*” shall be based on the applicable materiality thresholds provided by the interpretation bulletin, Compliance with Dispatch instructions Issued to Dispatchable Facilities”, IMO_MKRI_0001 v.7.0, as may be amended from time to time.

Suspension to maintain reliability – If the *IESO* determines that it is necessary to maintain *reliability*, the *IESO* may suspend the ability of one or more *resources* to comply with *dispatch instructions* in accordance with the compliance aggregation program. Under such circumstances, each *resource* is required to comply with its

dispatch instructions issued by the *IESO* (i.e., without allowing for other *resources* to satisfy the *dispatch instructions* on their behalf).

Example – Instances of circumstances that may trigger the *IESO* to suspend the compliance aggregation program to maintain system *reliability* might include but is not limited to:

- load rejection and/or generation rejection arming;
- *outages*;
- configuration changes; and
- *security* limit violations.

Notice to suspend compliance aggregation – If the *IESO* determines that it is necessary to suspend the compliance aggregation program in respect of one or more resources to maintain reliability, the *IESO* will issue a notice to the *market participant*, which includes the following information:

- that compliance with *dispatch instructions* is required on individual *resource* basis by using terminology similar to: “[**Compliance Aggregate Name**] **must abide by resource specific dispatch**”; and
- if available, a time frame for the expected reinstatement of the compliance aggregation program.

Notice of reinstatement of compliance aggregation – The *IESO* will notify *market participants* when their *resources* may participate in the Compliance Aggregation program, by using terminology similar to: “[**Compliance Aggregate Name**] **may return to compliance aggregate operation at [specified time]**.”

Submission of dispatch data – While operating within the compliance aggregation program, *registered market participants* are required to follow the normal *dispatch data* process including by submitting *offers* on individual *resources*, in accordance with the requirements provided by the *market rules*.

Operating reserve – For requirements pertaining to the provision of *operating reserve* from compliance aggregates, refer to the interpretation bulletin, Compliance with Dispatch Instructions Issued to Dispatchable Facilities, IMO_MKRI_0001 v.7.0, ss.2.2-2.3.

Pseudo-units – Unlike other *GOG-eligible resources*,¹⁷ for *combined cycle plants* registered as *pseudo-units*, the *generation resources* for each of the combustion turbine *generation units* and steam turbine *generation unit* may operate as a compliance aggregate when operating below their *minimum loading point*.

¹⁷ Interpretation Bulletin. “Compliance with Dispatch Instructions Issued to Dispatchable Facilities”, IMO_MKRI_0001 v.7.0, s.1.3.

5.9 Withdrawal from Commitment

(MR Ch.7 ss.10.3.2 and 10.3.3)

Form of notice – For the purpose of providing notice to the *IESO* under **MR Ch.7 ss.10.3.2** or **10.3.3**, a *registered market participant* must call the *IESO* prior to removing or revising its *real-time market offers*.

Revise dispatch data – If a *registered market participant* for a *GOG-eligible resource* expects not to satisfy a *day-ahead operational commitment* or *pre-dispatch operational commitment*, it must revise the applicable *dispatch data* in accordance with **MR Ch.7 s.3.3.8**.

5.10 IESO Cancellation of Commitment for Generator Offer Guarantee Eligible Resources

(MR Ch.7 s 10.3.1)

Reasons for IESO cancelling commitment – The *IESO* will not cancel a *day-ahead operational commitment* or *pre-dispatch operational commitment* under section **MR Ch.7 s.10.3.1** unless doing so is necessary to maintain *reliability*, and not for economic reasons.

Form of notice – For the purpose of providing notice to *market participants* under **MR Ch.7 s.10.3.1**, the *IESO* will call the *market participant* before cancelling the *day-ahead operational commitment* or *pre-dispatch operational commitment*.

Revise dispatch data – Where the *IESO* cancels a *day-ahead operational commitment* or *pre-dispatch operational commitment* in accordance with **MR Ch.7 s.10.3.1**, the *registered market participant* must revise the applicable *dispatch data* in accordance with **MR Ch.7 s.3.3.8**.

5.11 Pre-Dispatch Operational Commitment Cancellation Cost Recovery

(MR Ch.9 s.4.11)

Cancellation after the start of a pre-dispatch operational commitment – In the event that the *IESO* cancels a *pre-dispatch operational commitment* after the *resource* has reached its *minimum loading point*, the total *start-up offer* will be included in the assessment of the *GOG* compensation as well as the *speed no-load offer* incurred for the hours that the *resource* was operating at or above its *minimum loading point*.

Cancellation before the start of a pre-dispatch operational commitment – If the *IESO* cancels a *pre-dispatch operational* before the *resource* has reached its *minimum loading point*, the *start-up offer* will not be included in the assessment of the *GOG* compensation. The *IESO* may compensate *market participants* for the cost

incurred in securing unused fuel. Refer to **MM 5.5 s.2.25** for further information regarding the fuel compensation credit.

– End of Section –

6 Publishing and Issuing Pre-Dispatch and Real-Time Reports

This section describes the reports the *IESO publishes* and issues as part of the *pre-dispatch process* and real-time scheduling processes.

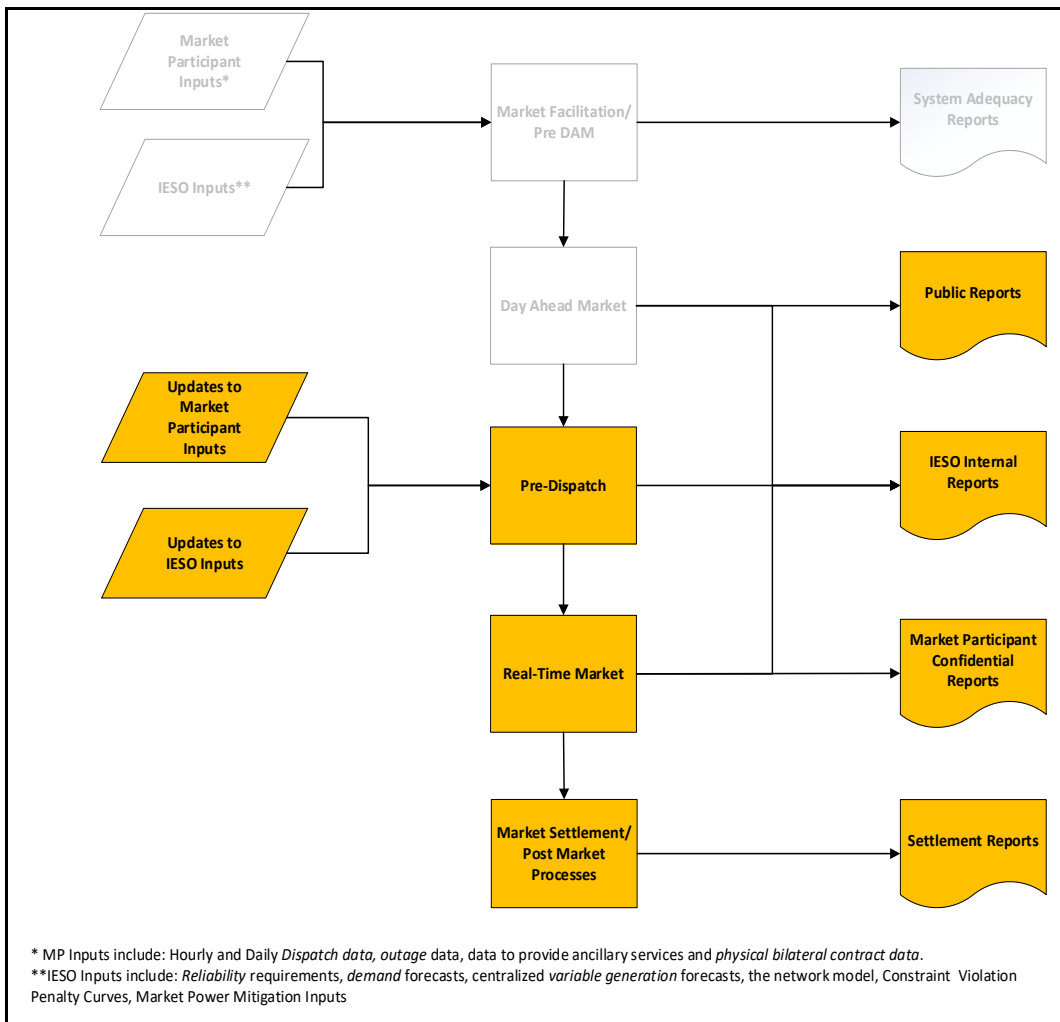


Figure 6-1: Pre-dispatch and Real-time Scheduling Process Reports

6.1 Pre-Dispatch Reports

(MR Ch.7 ss.5.7-5.8)

Table 6-1 provides a list and description of each *pre-dispatch process* report that is *published* by the *IESO* in accordance with the applicable section of the *market rules*. Public reports are available to all *market participants* and to the broader public.

Table 6-1: Pre-dispatch Process Public Reports

Report Name	Report Description
Adequacy Report (MR Ch.7 s.12.1.1.6)	The Adequacy Report: <ul style="list-style-type: none"> to support the <i>real-time market</i>, is typically published in accordance with MR Ch.7 ss.12.1.1.6.d and 12.1.1.6.e at approximately 15 minutes and 45 minutes past the hour on the <i>dispatch day</i>; and presents information with hourly granularity.
Predispatch Totals Report (MR Ch.7 s.5.7.1.5)	The Predispatch Totals Report: <ul style="list-style-type: none"> contains forecasts and schedules of system-wide information; and presents information with hourly granularity.
Variable Generation Tie Breaking Rankings Report (MR Ch.7 s.5.7.3)	The Variable Generation Tie Breaking Rankings Report: <ul style="list-style-type: none"> contains <i>variable generation</i> tie-breaking rankings for the 90-day period; is typically <i>published</i> on the first calendar day of every month; is typically <i>published</i> if the tie-breaking ranking is updated to account for newly registered <i>variable generation resources</i> coming into service; and presents information with daily granularity.
Variable Generation Forecast Summary Report	The Variable Generation Forecast Summary Report: <ul style="list-style-type: none"> contains regional <i>energy</i> forecast for the next 48 hours, by fuel type, for all <i>variable generation resources</i> subject to centralized forecasting; is typically published approximately five minutes prior to every hour; and presents information with hourly granularity.
Predispatch Hourly Energy LMP Report (MR Ch.7 s.5.7.1.1)	The Predispatch Hourly Energy LMP Report: <ul style="list-style-type: none"> contains the <i>locational marginal price</i> information in respect of <i>energy</i> for every <i>delivery point</i>, including the Energy Congestion Price and Energy Loss Price; and presents information with hourly granularity.
Predispatch Hourly Virtual Zonal Energy Price Report (MR Ch.7 s.5.7.1.2)	The Predispatch Hourly Virtual Zonal Energy Price Report: <ul style="list-style-type: none"> contains the <i>virtual zonal price</i> for each <i>virtual transaction zone</i>; and presents information with hourly granularity.

Report Name	Report Description
Predispatch Hourly Ontario Zonal Energy Price Report (MR Ch. 7 s.5.7.1.3)	The Predispatch Hourly Ontario Zonal Energy Price Report: <ul style="list-style-type: none"> contains the pre-dispatch <i>Ontario zonal price</i> presents information with hourly granularity.
Predispatch Hourly Operating Reserve LMP Report (MR Ch.7 s.5.7.1.1)	The Predispatch Hourly Operating Reserve LMP Report: <ul style="list-style-type: none"> contains the <i>locational marginal pricing</i>-related information in respect of each class of <i>operating reserve</i> for every <i>delivery point</i>, including the Operating Reserve Congestion Price; and presents information with hourly granularity.
Predispatch Hourly Intertie Energy LMP Report (MR Ch.7 s.5.7.1.4)	The Predispatch Hourly Intertie Energy LMP Report: <ul style="list-style-type: none"> contains <i>locational marginal price</i> information for <i>intertie zones</i> in respect of <i>energy</i>, including internal congestion, losses, congestion due to <i>intertie</i> limits and congestion due to NISL constraints; and presents information with hourly granularity.
Predispatch Hourly Intertie Operating Reserve LMP Report (MR Ch.7 s.5.7.1.4)	The Predispatch Hourly Intertie Operating Reserve LMP Report: <ul style="list-style-type: none"> contains <i>locational marginal price information</i> for <i>intertie zones</i> in respect of the 10-minute non-spinning and <i>30-minute operating reserve</i>, internal congestion, congestion due to <i>intertie</i> limits and congestion due to NISL constraints; and presents information with hourly granularity.
Predispatch Area Reserve Constraints Report (MR Ch.7 s.5.7.1.8)	The Predispatch Area Reserve Constraints Report: <ul style="list-style-type: none"> contains hourly maximum and minimum constraints for the area <i>operating reserve</i> regions used as inputs for the <i>pre-dispatch calculation engine</i>; and presents information with hourly granularity.
Predispatch Area Operating Reserve Shortfalls Report (MR Ch.7 s.5.7.1.6)	The Predispatch Area Operating Reserve Shortfalls Report: <ul style="list-style-type: none"> contains <i>operating reserve</i> requirements, the total quantity of <i>operating reserve</i> in <i>pre-dispatch schedules</i>, and resulting shortfalls in each hour of the <i>dispatch day</i>, by <i>operating reserve</i> area; and presents information with hourly granularity

Report Name	Report Description
Predispatch Intertie Scheduling Limits Report (MR Ch.7 s.5.7.1.9)	The Predispatch Intertie Scheduling Limits Report: <ul style="list-style-type: none"> contains <i>intertie</i> scheduling limits for each <i>intertie zone</i> used as inputs to the <i>pre-dispatch calculation engine</i>; and presents information with hourly granularity.
Predispatch Security Constraints Report (MR Ch.7 s.5.7.1.7)	The Predispatch Security Constraints Report: <ul style="list-style-type: none"> contains binding security constraints applicable to the <i>transmission system</i>, as determined by the <i>pre-dispatch calculation engine</i>; and presents information with hourly granularity.
Predispatch Global Market Power Conditions for Energy Report (MR Ch.7 s.5.7.4)	The Predispatch Global Market Power Conditions for Energy Report: <ul style="list-style-type: none"> contains a summary of the hours in the study period when the price and import restriction conditions in respect of <i>energy</i> are met in the <i>real-time market</i>; and Presents information with hourly granularity.

Confidential reports – Table 6-2 provides a list and description of each *pre-dispatch process* confidential report issued by the *IESO*. Confidential reports are available only to the *market participant* to which the information relates.

Table 6-2: Pre-dispatch Process Confidential Reports

Report Name	Report Description
Predispatch Pseudo-Unit Computed Values Report (MR Ch.7 s.5.8.2.10)	The Predispatch Pseudo-Unit Computed Values Report: <ul style="list-style-type: none"> contains the values used by the <i>pre-dispatch calculation engine</i> for <i>pseudo-units</i> and <i>generation resources</i> associated with the corresponding combustion turbine <i>generation units</i> and steam turbine <i>generation units</i>; is based on <i>market participant</i> submitted registration and <i>dispatch data</i> for <i>generation resources</i> associated with the corresponding combustion turbine <i>generation units</i> and steam turbine <i>generation units</i>, and <i>outages</i> and constraints; and presents information with hourly granularity.

Report Name	Report Description
Variable Generation Forecast by Resource Report (MR Ch.4 s.7.3.5)	The Variable Generation Forecast by Resource Report: <ul style="list-style-type: none"> contains an hourly <i>energy</i> forecast for each of the <i>variable generator's variable generation resources</i> for the next 48 hours; is typically issued approximately five minutes prior to each <i>dispatch hour</i>; and presents information with hourly granularity.
Predispatch Intertie Transaction Schedule and GOG Eligible Extensions Reports (MR Ch.7 ss.5.8.2.1 and 5.8.2.2)	The Predispatch Intertie Transaction Schedule and GOG Eligible Resource Extensions Report: <ul style="list-style-type: none"> contains <i>interchange schedules</i> for <i>energy</i> and <i>operating reserve</i> for the next two <i>dispatch hours</i>; contains <i>extended pre-dispatch operational commitments</i>; is typically issued at approximately 15 minutes after the <i>dispatch hour</i>; and presents information with hourly granularity.
Predispatch Schedules Report (MR Ch.7 ss.5.8.2.3 and 5.8.2.11)	The Predispatch Schedules report: <ul style="list-style-type: none"> contains <i>pre-dispatch schedules</i> for <i>energy</i> and <i>operating reserve</i>; notifies <i>market participants</i> that they have failed the conduct and impact test for price impact, if applicable; is typically issued approximately 30 minutes after each <i>dispatch hour</i>; and presents information with hourly granularity
Predispatch Commitments Report (MR Ch.7 ss.5.8.2.2 and 5.8.2.4, 5.8.2.5, and 10.1 Ch.5 ss.1.2 and 3.2)	The Predispatch Commitments Report: <ul style="list-style-type: none"> contains operational constraints for <i>GOG-eligible resources</i>, including <i>pre-dispatch operational commitments</i> and commitments to maintain <i>reliability</i>; is typically issued approximately 30 minutes after the <i>dispatch hour</i>; and presents information with hourly granularity
Predispatch GOG-Eligible Unit Inferred State Report (MR Ch.7 s.5.8.2.6)	The Predispatch GOG-Eligible Unit Inferred State Report: <ul style="list-style-type: none"> contains the MGBDT values used by the <i>pre-dispatch calculation engine</i> to infer the <i>thermal state</i>; contains the number of consecutive hours that the <i>resource</i> has been below its <i>minimum loading point</i>; and

Report Name	Report Description
	<ul style="list-style-type: none"> • is issued approximately 30 minutes after each <i>dispatch hour</i>.
Hourly Demand Response Standby Report (MR Ch.7 s.19.4.2)	The Hourly Demand Response Standby Report: <ul style="list-style-type: none"> • notifies the <i>capacity market participants</i> when their <i>hourly demand response resources</i> are on standby for <i>demand response</i> activations; • If applicable, is issued after the <i>day-ahead market calculation engine</i> or <i>pre-dispatch calculation engine</i> produces valid results in respect of a <i>business day</i>; • may be issued until 07:00 EST of the relevant <i>dispatch day</i>; and • If a <i>capacity market participant</i> will not be placed on standby for the relevant <i>dispatch day</i>, it will receive confirmation of same via this report by approximately 7:00 EST.
Demand Response Activation Report (MR Ch.7 s.19.4.4)	The Demand Response Activation Report: <ul style="list-style-type: none"> • notifies <i>capacity market participants</i> for <i>hourly demand response resources</i> to activate to provide <i>demand response</i>; • contains the schedule for the <i>resource</i> to provide <i>demand response</i>; • is typically issued approximately 2.5 hours prior to the activation period; and • presents information with hourly granularity
Predispatch Daily Energy Limit Tracking Report (MR Ch.7 s.5.8.2.12)	The Predispatch Daily Energy Limit Tracking Report: <ul style="list-style-type: none"> • contains the cumulative <i>energy</i> schedules for the <i>dispatch day</i> for the purpose of tracking the resource's operation relative to its submitted <i>minimum daily energy limit</i> and <i>maximum daily energy limit</i>; and • presents information with hourly granularity.
Predispatch Number of Starts Tracking Report (MR Ch.7 s.5.8.2.13)	The Predispatch Number of Starts Tracking Report: <ul style="list-style-type: none"> • contains the actual and forecast number of starts for the <i>dispatch day</i> relative to the <i>resource's</i> submitted <i>maximum number of starts per day</i>; and • presents information with hourly granularity.

6.2 Real-Time Reports

(MR Ch.7 ss.6.7-6.8)

Table 6-3 provides a list and description of each real-time scheduling process public report that is published by the *IESO* in accordance with the applicable section of the *market rules*. Public reports are available to all *market participants* and to the broader public.

Table 6-3: Real-Time Scheduling Process Public Reports

Report Name	Report Description
Adequacy Report (MR Ch.7 s.12.1.1.6)	The Adequacy Report: <ul style="list-style-type: none"> to support the <i>real-time market</i>, is typically published in accordance with MR Ch.7 s.12.1.1.6(d) and s.12.1.1.6(e) at approximately 15 minutes and 45 minutes past the hour on the <i>dispatch day</i>; and presents information with hourly granularity. Refer to MM 7.2 s.3.1 for more information.
Realtime Totals Report (MR Ch.7 s.6.6.1.5)	The Realtime Totals Report: <ul style="list-style-type: none"> contains forecasts and schedules of system-wide information; and presents information with five-minute granularity.
Generator Output and Capability Report (MR Ch.4 s.7.3.4) (MR Ch.4 s.7.3A.3)	The Generator Output and Capability Report: <ul style="list-style-type: none"> contains output and capability levels for <i>generation resources</i> associated with one or more <i>generation units</i> with a capacity of 20 MW or greater; contains output and capability levels for <i>electricity storage resources</i> associated with one or more <i>electricity storage units</i> with a capacity of 20 MW or greater; is typically published approximately 15 minutes after each <i>dispatch hour</i>; and presents information with hourly granularity.
Variable Generation Tie Breaking Rankings Report (MR Ch.7 s.6.6.6)	The Variable Generation Tie Breaking Rankings Report: <ul style="list-style-type: none"> contains <i>variable generation</i> tie-breaking rankings for the 90-day period; is typically published on the first calendar day of every month;

Report Name	Report Description
	<ul style="list-style-type: none"> is typically published if the tie-breaking ranking is updated to account for newly registered <i>variable generation resources</i> coming into service; and presents information with daily granularity.
Realtime 5-min Energy LMP Report (MR Ch.7 s.6.6.1.1)	<p>The Realtime 5-min Energy LMP Report:</p> <ul style="list-style-type: none"> contains the <i>locational marginal price</i> information in respect of <i>energy</i> for every <i>delivery point</i>, including the Energy Congestion Price and Energy Loss Price; and presents information with five-minute granularity.
Realtime 5-min Virtual Zonal Energy Price Report (MR Ch.7 s.6.6.1.2)	<p>The Realtime 5-min Virtual Zonal Energy Price Report:</p> <ul style="list-style-type: none"> contains the <i>virtual zonal price</i> for each <i>virtual transaction zone</i>; and presents information with five-minute granularity
Realtime 5-min Ontario Zonal Energy Price Report (MR Ch.7 s.6.6.1.3)	<p>The Realtime 5-min Ontario Zonal Energy Price Report:</p> <ul style="list-style-type: none"> contains the <i>Ontario zonal price</i> for the <i>real-time market</i>; and presents information with five-minute granularity
Realtime 5-min Operating Reserve LMP Report (MR Ch.7 s.6.6.1.1)	<p>The Realtime 5-min Operating Reserve LMP Report:</p> <ul style="list-style-type: none"> contains <i>locational marginal prices</i> for 10-minute synchronized, 10-minute non-synchronized and 30-minute types of <i>operating reserve</i>; and presents information with five-minute granularity
Realtime 5-min Intertie Energy LMP Report (MR Ch.7 s.6.6.1.4)	<p>The Realtime 5-min Intertie Energy LMP Report:</p> <ul style="list-style-type: none"> contains <i>locational marginal price</i> information for <i>intertie zones</i> in respect of <i>energy</i>, including internal congestion, losses, congestion due to <i>intertie</i> limits and congestion due to NISL constraints; and presents information with five-minute granularity
Realtime 5-min Intertie Operating Reserve LMP Report (MR Ch.7 s.6.6.1.4)	<p>The Realtime 5-min Intertie Operating Reserve LMP Report:</p> <ul style="list-style-type: none"> contains <i>locational marginal price</i> information for <i>intertie zones</i> in respect of the 10-minute non-spinning and 30-minute <i>operating reserve</i>, internal congestion, losses, congestion due to <i>intertie</i> limits and congestion due to NISL constraints; and presents information with five-minute granularity

Report Name	Report Description
Realtime Constraints Shadow Prices Report (MR Ch.7 s.6.6.4)	The Realtime Constraints Shadow Prices Report: <ul style="list-style-type: none"> contains shadow prices for the binding <i>security</i> constraints applicable to the <i>transmission system</i>, as determined by the <i>real-time calculation engine</i>. contains information from five days before the date of publication; is typically <i>published</i> at approximately 08:00 EST; and presents information with five-minute granularity.
Realtime Area Reserve Constraints Report (MR Ch.7 s.6.6.2.2)	The Realtime Area Reserve Constraints Report: <ul style="list-style-type: none"> contains maximum and minimum constraints for the area <i>operating reserve</i> regions used as inputs for the <i>real-time calculation engine</i>; and presents information with five-minute granularity
Dispatch Area Operating Reserve Shortfalls Report (MR Ch.7 s.6.6.2.1)	The Dispatch Area Operating Reserve Shortfalls Report: <ul style="list-style-type: none"> contains <i>operating reserve</i> requirements, the total quantity of <i>operating reserve</i> in <i>real-time schedules</i>, and resulting shortfalls for the <i>dispatch intervals</i> in the previous <i>dispatch hour</i>, by <i>operating reserve</i> area; and presents information with five-minute granularity
Dispatch Area Operating Reserve: Total Scheduled and Total Energy Called Report (MR Ch.7 s.6.6.2.4)	The Dispatch Area Operating Reserve: Total Scheduled and Total Energy Called Report: <ul style="list-style-type: none"> indicates the total quantities of <i>operating reserve</i> included in <i>real-time schedules</i> and quantities of <i>operating reserve</i> that have been activated, by <i>operating reserve</i> area; and presents information with five-minute granularity.
Realtime Intertie Scheduling Limits Report (MR Ch.7 s.6.6.2.2)	Realtime Intertie Scheduling Limits Report <ul style="list-style-type: none"> contains <i>intertie</i> scheduling limits for each <i>intertie zone</i> used by the <i>real-time calculation engine</i>; and presents information with five-minute granularity.
Intertie Schedule and Flow Report (MR Ch.7 s.6.6.2.3)	The Intertie Schedule and Flow Report: <ul style="list-style-type: none"> contains the total quantities of <i>energy</i> included in <i>interchange schedules</i> and quantities of <i>energy</i> that have been conveyed to and from each <i>intertie zones</i>; presents quantities conveyed in imports and exports for each five-minute interval using hourly averages.

Report Name	Report Description
All Transmission Outages Occurring Today Report (MR Ch.7 s.6.6.3.2)	The All Transmission Outages Occurring Today Report: <ul style="list-style-type: none"> contains information on any <i>outages</i> in respect of the <i>transmission facilities</i> for the <i>dispatch day</i>; and is typically <i>published</i> hourly.
Transmission Facility Outage Limits Report (MR Ch.7 s.6.6.3.1)	The Transmission Facility Outage Limits Report: <ul style="list-style-type: none"> contains information on transmission capacity between the <i>IESO-controlled grid</i> and each <i>intertie zone</i>; and is typically <i>published</i> twice per hour.
Dispatch Security Constraints Report (MR Ch.7 s.6.6.2.2)	The Dispatch Security Constraints Report: <ul style="list-style-type: none"> contains binding security constraints applicable to the <i>transmission system</i>, as determined by the <i>real-time calculation engine</i>; and presents information with five-minute granularity.
Dispatch Deviation Report (MR Ch.7 s.6.6.5)	The Dispatch Deviation Report: <ul style="list-style-type: none"> is typically <i>published</i> once per calendar month; and presents information with five-minute granularity.

Confidential reports – Table 6-4 provides a list and description of each real-time *scheduling* process private report issued by the *IESO* in accordance with the applicable section of the *market rules*. Confidential reports are available only to the *market participant* to which the information relates.

Table 6-4: Real-Time Scheduling Process Confidential Reports

Report Name	Report Description
5-Minute Energy Schedule Report (MR Ch.7 s.6.7.1.1)	The 5-Minute Energy Schedule Report: <ul style="list-style-type: none"> contains <i>real-time schedules</i> for <i>energy</i>; and presents information with five-minute granularity.
Realtime Energy Dispatch Report (MR Ch.7 s.6.7.2.1)	The Realtime Energy Dispatch Report: <ul style="list-style-type: none"> contains a summary of <i>dispatch instructions</i> for <i>energy</i> for the previous dispatch hour; and presents information with five-minute granularity
5-Minute Operating Reserve Schedule Report (MR Ch.7 s.6.7.1.1)	The 5-Minute Operating Reserve Schedule Report: <ul style="list-style-type: none"> contains <i>real-time schedules</i> for <i>operating reserve</i>; and presents information with five-minute granularity.

Report Name	Report Description
Realtime Operating Reserve Dispatch Report (MR Ch.7 s.6.7.2.1)	The Realtime Operating Dispatch Reserve Report: <ul style="list-style-type: none"> contains a summary of the <i>dispatch instructions</i> for <i>operating reserve</i> for the previous <i>dispatch hour</i>; and presents information with five-minute granularity.
5-Minute Energy and Operating Reserve Schedule Report (MR Ch.7 s.6.7.1.1)	The 5-Minute Energy and Operating Reserve Schedule Report: <ul style="list-style-type: none"> contains <i>real-time schedules</i> for <i>energy</i> and <i>operating reserve</i>; and presents information with five-minute granularity.
Realtime Energy and Operating Reserve Dispatch Report (MR Ch.7 s.6.7.2.1)	The Realtime Energy and Operating Reserve Dispatch Report: <ul style="list-style-type: none"> contains a summary of the <i>dispatch instructions</i> for <i>energy</i> and <i>operating reserve</i> for the previous <i>dispatch hour</i>; and presents information with five-minute granularity.
Dispatch Advisory Report (MR Ch.7 s.7.1.6)	The Dispatch Advisory Report: <ul style="list-style-type: none"> contains <i>dispatch</i> advisories – consisting of anticipated <i>dispatch instructions</i> – for <i>energy</i> and all classes of <i>operating reserve</i> up to 55 minutes before the relevant <i>dispatch interval</i>; and presents information with five-minute granularity; <p>The IESO will not issue missed Dispatch Advisory Reports that it was unable to issue during the applicable five-minute interval.</p>
Dispatch Data Report for the RealTime Scheduling Processes for Resources (MR Ch.7 s.6.7.4)	The Dispatch Data Report for RealTime Scheduling Processes for Resources: <ul style="list-style-type: none"> contains the <i>dispatch data</i> for <i>energy</i> used by the <i>real-time calculation engine</i>; is typically issued daily for the previous <i>dispatch day</i> at approximately 06:00 EST; and presents information with hourly and daily granularity.
Dispatch Data Report for the RealTime Scheduling Processes for Forebays (MR Ch.7 s.6.7.4)	The Dispatch Data Report for RealTime Scheduling Processes for Forebays: <ul style="list-style-type: none"> contains the <i>dispatch data</i> for Forebays used by the <i>real-time calculation engine</i>; is typically issued daily for the previous <i>dispatch day</i> at approximately 06:00 EST; and

Report Name	Report Description
	<ul style="list-style-type: none"> presents information with hourly and daily granularity.
Realtime Market Operating Reserve Offer Report (MR Ch.7 s.6.7.4)	The Realtime Market Operating Reserve Offer Report: <ul style="list-style-type: none"> contains the <i>offers</i> for <i>operating reserve</i> used by the <i>real-time calculation engine</i> is typically issued daily for the previous <i>dispatch day</i> at approximately 6:00 EST; and presents information with hourly granularity.
Realtime Schedule Bid Offer Report (MR Ch.7 s.6.7.4)	The Realtime Schedule Bid Offer Report: <ul style="list-style-type: none"> contains the <i>dispatch data</i> used by the <i>real-time calculation engine</i> for <i>self-scheduling generation resources</i> and <i>intermittent generation resources</i>, notably, <i>self-schedules</i> and <i>forecast of intermittent generation</i>; is typically issued daily at approximately 06:00 EST for the previous <i>dispatch day</i>; and presents information with hourly granularity.
Realtime Pseudo-Unit Computed Values Report (MR Ch.7 s.6.7.2.2)	The Realtime Pseudo-Unit Computed Values Report: <ul style="list-style-type: none"> contains the values used by the <i>real-time dispatch calculation engine</i> for <i>pseudo-units</i> and <i>generation resources</i> associated with the corresponding combustion turbine <i>generation units</i> and steam turbine <i>generation units</i>; and is based on <i>market participant</i> submitted registration and <i>dispatch data</i> for <i>generation resources</i> associated with the corresponding combustion turbine <i>generation units</i> and steam turbine <i>generation units</i>, and <i>outages</i> and constraints. presents information with five-minute granularity.
Variable Generation 5 Minute Forecast Report (MR Ch.4 s.7.3.6)	The Variable Generation 5 Minute Forecast Report: <ul style="list-style-type: none"> contains the five-minute <i>energy</i> forecast values used for each of the <i>variable generator's variable generation resources</i> for the previous hour; is typically issued approximately five to ten minutes after each <i>dispatch hour</i>; and presents information with five-minute granularity.

6.3 Retrieving Pre-Dispatch and Real-Time Reports and Notifications

Website interface - *Market participants* can receive *IESO* notifications by accessing “Pre-dispatch and real-time notifications” on the *IESO’s* website,

- by logging onto the Market Operation System – Energy Market Interface ; or
- by using the Application Programmers Interface (API).

Pre-dispatch and Real-Time reports are located on the *IESO* website:

<http://reports.ieso.ca/index.html>.

– End of Section –

7 Real-Time Market Remediation

No pre-dispatch process remediation – The *IESO* will not correct or otherwise remediate invalid *pre-dispatch schedules*, nor will it establish *administrative prices* in respect of pre-dispatch prices, including where the pre-dispatch process produces invalid prices under **MR Ch.7 s.5.3**.

Invalid results – The *IESO* may determine the results from the *pre-dispatch calculation engine* or *real-time-calculation engine* to be invalid, including for the purpose of **MR Ch.7 s.5.3**, the applicable provisions of **5.5, 5.8, 6.6, 6.7** and **7.2.1A.2**, for reasons that include:

- the results include *resource* that are not required, or exclude *resource* that are required, because of incorrect inputs or calculations;
- the *pre-dispatch calculation engine* or *real-time calculation engine*, as applicable, is unable to resolve two or more conflicting restrictions; or
- an incorrect input causes a material change in pricing or schedules.

Failure of real-time calculation engine – The *IESO* will determine that there has been a failure of the *real-time calculation engine*, including for the purpose of the applicable provisions of **MR Ch.7 ss.6.6** and **6.7** and for **s.8.4A.2.2**, where the tools do not generate *real-time schedules* or real time prices, other than provisional default values pulled from the previous *dispatch interval*. In such circumstances, the default values applied may be subsequently updated by the *IESO*.

Notification – The *IESO* will notify *market participants* of a *planned outage* in respect of its tools pursuant to **MR Ch.7 s.1.5.2.1** by *publishing* the relevant information. The *IESO* may *publish*, at its discretion, information in respect of a *forced outage* relating market tools. These notices will indicate that that the *IESO* will not *publish* results from the *pre-dispatch process* for the affected hour(s).

Interchange schedules – If the *pre-dispatch process* fails to produce a valid *interchange schedule*, the *IESO* will use the last valid set of results from the *pre-dispatch calculation engine* (i.e., from the previous run) to form the basis of the *interchange schedule*. If the *pre-dispatch process* fails to produce valid *interchange schedules* for multiple consecutive runs of the *pre-dispatch calculation engine*, these results of the *pre-dispatch calculation engine* will not include quantities above those included in the *registered market participant's boundary entity resource day-ahead schedule* for the corresponding *dispatch hour* pursuant to **MR Ch.7 s.5.2.2**.

Retroactive administrative pricing – The *IESO* will retroactively establish real-time *administrative prices* provided the requirements under **MR Ch.7 s.8.4A** are

satisfied, including, but not limited to, the requirement to be administered within four *business days* after the affected *dispatch day* pursuant to **MR Ch.7 s.8.4A.2**.

Real-time price error – The *IESO* establishes *administrative prices* to remedy a pricing or publication error pursuant to **MR Ch.7 s.8.4A.2.3**, irrespective of whether the error impacted the *real-time schedule*. Real-time *market prices* may be recalculated and/or re-*published* after-the-fact to ensure that pricing and scheduling in the *real-time market* align to the extent practicable.

Scope of administrative pricing – In response to an eligible error, the *IESO* may establish *administrative prices* for one or more *locational marginal prices*.

Dispatch Scheduling error – Further to **MR Ch.7 s.7.6.1.2**, the *IESO* will declare a *dispatch scheduling error* in the *real-time market* where:

- the *IESO* identifies a pricing error in the *real-time dispatch process* which is identified within four *business days* after the *dispatch day* and cannot be corrected by normal administration methods in accordance with **MR Ch. 7 ss.8.4A.2** and **8.4A.3**; and
- the *IESO* does not identify a pricing error that has occurred in the *real-time dispatch process* within four *business days* after the *dispatch day* (**MR Ch. 7 s.8.4A.3**).

Administrative pricing notification – The *IESO* will publish an administrative pricing notification in the following circumstance:

- the *IESO* has established *real-time market administrative prices* in accordance with **MR Ch.7 s.8.4A**.

Dispatch scheduling error notification – The *IESO* will publish a dispatch scheduling error notification in the following circumstance:

- A *dispatch scheduling error* has occurred in accordance with **MR Ch.7 s.7.6.1**.

– End of Section –

Appendix A: Constraint Violation Penalty Curves

(MR Ch.7 s.1.6.1.3)

Constraint violation penalty curves are defined as the penalty functions for the violation of constraints in the *day-ahead market calculation engine*, *pre-dispatch calculation engine*, and *real-time calculation engine*. They are specified from time to time by the *IESO*.

The form of the constraint violation penalty curves differs between the scheduling algorithm and pricing algorithm of the *day-ahead market calculation engine*, *pre-dispatch calculation engine* and *real-time calculation engine*. This difference is used to establish a reliability based priority between constraint violations when determining scheduling results while also setting appropriate *market prices*.

The following constraints will have corresponding constraint violation penalty curves applied:

- all three classes of *operating reserve*;
- minimum and maximum area *operating reserve*;
- *energy balance* (over or under generation);
- *security limits*;
- net interchange scheduling limit (NISL);
- maximum import and export limits;
- *minimum daily energy limits*;
- *maximum daily energy limits*; and
- hydroelectric *generation resource* associated with the downstream *linked forebay*.

Penalty price curves applied to each of these constraints in the scheduling and pricing algorithms of the *day-ahead market calculation engine*, *pre-dispatch calculation engine* and the *real-time calculation engine* are described in sections [A.1](#) and [A.2](#).

A.1 Penalty Price Curves in the Scheduling Algorithm

Penalty price curves specific to the scheduling algorithm are used by the calculation engines to ensure they continue to produce schedules when constraint violations

occur. The scheduling algorithm uses a single *price-quantity pair* penalty price curve.

Table A-1 summarizes the penalty price curves and corresponding penalty prices used for each constraint violation in the *day-ahead market* and *real-time market*.

Table A - 1: Penalty Curves in the Scheduling Algorithm

Penalty Curve Name	Penalty Price	Calculation Engine(s)	Description
<i>Operating Reserve</i> – system wide (Total 30-min requirement)	\$6,000/MW	All	The penalty price for total <i>thirty-minute operating reserve</i> is high enough to allow the calculation engine to consider all valid combinations of <i>offers</i> and <i>bids</i> for <i>energy</i> and <i>offers</i> for <i>operating reserve</i> before it allows an <i>operating reserve</i> constraint to be violated.
<i>Operating Reserve</i> – system wide (Total 10-min reserve requirement)	\$10,000/MW	All	The total <i>ten-minute operating reserve</i> penalty price allows for the <i>thirty-minute operating reserve</i> constraint to be violated before the <i>10-minute operating reserve</i> constraint is violated.
<i>Operating Reserve</i> – system wide (10-min synchronized reserve requirement)	\$12,000/MW	All	The penalty price for the synchronized <i>ten-minute operating reserve</i> ensures that 10-minute synchronized reserve is given higher priority than the total 10-minute requirement.
<i>Operating Reserve</i> -flexibility	Variable	All	The penalty prices used for flexibility <i>operating reserve</i> are consistent with the penalty prices used in the pricing algorithm.
<i>Operating Reserve</i> - Area	Maximum \$60,000/MW Minimum \$4,000/MW	All	The <i>day-ahead market</i> , pre-dispatch and <i>real-time calculation engines</i> use a penalty price of \$60,000 for maximum area <i>operating reserve</i> constraints. This penalty price prevents transmission constraint violations that may otherwise occur when <i>operating reserve</i> is activated from <i>facilities</i> within the area. The three calculation engines use a penalty price of \$4,000/MW for the minimum area <i>operating reserve</i> constraint.

Penalty Curve Name	Penalty Price	Calculation Engine(s)	Description
<i>EnergyBalance</i>	Under generation: \$30,000/MWh Over generation: (-\$30,000)/MWh	All	The <i>IESO</i> uses a penalty price of \$30,000/MWh for under generation violations and a negative penalty price of \$30,000/MWh for over generation violations.
Transmission Security	\$60,000/MW	All	The penalty price is set at \$60,000 and the constraint exceedance percentage shall be for all possible security limit violations ranging from 0% to infinity.
NISL	\$35,000/MW	DAM, PD	The <i>day-ahead market</i> and <i>pre-dispatch calculation engines</i> use a \$35,000/MW penalty price for all magnitudes of NISL violations.
Downstream under or over generation ¹⁸	\$37,000	DAM, PD	The penalty price for all magnitudes of downstream over or under generation is \$37,000. This penalty price enables the <i>day-ahead market</i> and <i>pre-dispatch calculation engines</i> to resolve when hydroelectric constraints are in conflict.
<i>Intertie</i>	\$40,000/MW	DAM, PD	The penalty price for all magnitudes of <i>intertie</i> limit violations is \$40,000.
Daily Energy Limits	\$100,000/MW	DAM, PD	The penalty price for all magnitudes of daily <i>energy</i> limit violations is \$100,000

A.2 Penalty Price Curves in the Pricing Algorithm

Penalty price curves specific to the pricing algorithm are used by the calculation engines to ensure that they continue to produce prices when constraint violations occur. Multiple *price-quantity pair* penalty curves are may be used in the pricing algorithm of the *day-ahead market* and *real-time market* to provide the *IESO* and *market participants* with price signals for scarcity conditions. The penalty price curves are comprised of up to 20 *price-quantity pairs* or price-percentage pairs where:

- prices are defined in dollars (\$ per MW);
- breakpoint quantities are defined in megawatts (MW); and

¹⁸ During implementation the *IESO* will consider separate penalty prices for downstream under generation and downstream over generation, with input from participants.

- breakpoint percentages (%) are defined in constraint exceedance amounts, which is the measurable amount of units that exceed a transmission limit.

The constraint violation penalty curves are represented as either a *demand* or a supply curve, depending on the type of constraint. The *day-ahead market calculation engine* and the *pre-dispatch calculation engine* uses constraint violation penalty curves that may vary from hour to hour. The *real-time calculation engine* uses constraint violation penalty curves that may vary from five-minute interval to five-minute interval when crossing the top of the hour.

The *IESO* uses the methodologies described in Table A-2 to set the pricing for each of the constraint violation penalty curves.

The penalty prices used may be adjusted from time to time by the *IESO* where the *IESO* determines that constraint violation price signals may either overstate or understate the cost of managing the constraint violation given prevailing market conditions. The *IESO* will advise *market participants* of such changes.

Table A-2 summarizes the penalty curve inputs for each of the constraints in relation to the pricing algorithm and provides a description.

Table A - 2: Penalty Curves in the Pricing Algorithm

Penalty Curve Name	Description
Operating Reserve – system wide	<p>The pricing algorithms for all calculation engines use separate penalty price <i>demand</i> curves for the three <i>operating reserve</i> constraints. The MW quantity ranges of the <i>price-quantity pairs</i> used for each <i>operating reserve</i> constraint are based on the <i>operating reserve</i> requirement for each class of <i>operating reserve</i>. When the requirement is changed, the relative proportion of each MW quantity range is scaled to maintain the relative proportions of each MW range.</p> <p>The central price point of the <i>price-quantity pairs</i> used for the total <i>thirty-minute operating reserve</i> constraint will be based on the 99th percentile of historical <i>thirty-minute operating reserve</i> prices. The price points above and below the central price point will be priced in a graduated fashion with respect to the central price point.</p> <p>The central price point of the <i>price-quantity pairs</i> used for the total <i>ten-minute operating reserve</i> constraint will be based on the 99th percentile of historical <i>ten-minute operating reserve</i> prices. Price points above and below the central price point are priced in a graduated fashion with respect to the central price point.</p> <p>The lowest price point of the <i>price-quantity pairs</i> used must be no less than the highest price point of the <i>price-quantity pairs</i> used for the <i>thirty-minute operating reserve</i> constraint.</p>

Penalty Curve Name	Description
	The penalty prices used for the 10-minute synchronized <i>operating reserve</i> constraint are higher than the prices used for the total 10-minute constraint such that the cumulative prices in the <i>operating reserve</i> constraint violation price curve rise in a graduated fashion as the <i>operating reserve</i> shortage progresses from a shortage in total <i>thirty-minute operating reserve</i> to a shortage in total <i>10-minute operating reserve</i> and then finally to a shortage in 10-minute synchronized <i>operating reserve</i> .
Operating Reserve - area	<p>The <i>day-ahead market</i>, pre-dispatch and <i>real-time calculation engines</i> use penalty prices for the maximum area <i>operating reserve</i> constraint that are equal to the penalty prices used for the second price-percentage pair in the transmission <i>security limit</i> constraint violation penalty curve described further below.</p> <p>The <i>day-ahead market</i>, pre-dispatch and <i>real-time calculation engines</i> use a penalty price for the minimum area <i>operating reserve</i> constraint that is equal to the lowest penalty price used for the system-wide total <i>ten-minute operating reserve</i> constraint violation penalty curve.</p>
Operating Reserve - flexibility	The <i>day-ahead market</i> , pre-dispatch and <i>real-time calculation engines</i> use a penalty price for the flexibility <i>operating reserve</i> constraint that is equal to or below the constraint violation penalty curve for the system-wide total <i>thirty-minute operating reserve</i> .
Energy Balance	<p>The <i>day-ahead market</i>, pre-dispatch and <i>real-time calculation engines</i> use different constraint violation penalty curves for the under-generation and over-generation constraints. The penalty prices used for the under-generation constraint are set high enough to ensure that valid <i>offers</i> of <i>energy</i> for <i>resources</i> will be evaluated first. The penalty prices will be set high enough so that it does not displace an <i>offer</i> of <i>energy</i> at up to <i>MMCP</i> while taking into account transmission losses and the impact of <i>operating reserve</i> joint optimization.</p> <p>For over-generation constraints, the <i>day-ahead market calculation engine</i>, <i>pre-dispatch calculation engine</i>, and <i>real-time calculation engines</i> use penalty prices low enough so that the calculation engines do not use the violation price before using a <i>bid</i> from a <i>dispatchable load</i> or <i>electricity storage participant</i> at negative <i>MMCP</i> with high transmission losses.</p>
Transmission Security	The <i>day-ahead market</i> , pre-dispatch and <i>real-time calculation engines</i> will use two price (\$) / percentage (%) pairs for all transmission <i>security limit</i> constraints. The constraint exceedance percentage for the first price-percentage pair shall be for any constraint exceedance at or below 2% of the applicable transmission <i>security limit</i> .

Penalty Curve Name	Description
	<p>The second price-percentage pair shall represent any constraint exceedance above 2%. The <i>IESO</i> will determine the penalty prices used based on historical shadow prices for binding and violated transmission <i>security</i> constraints.</p> <p>The price of the first price-percentage pair shall be based on the price that best minimizes the differences between the surplus during violations and the uplift occurring during both violations and when there are binding constraints for historical occurrences.</p> <p>The price of the second price-percentage pair shall be greater than <i>MMCP</i> and based on the division of the <i>MMCP</i> by a shift factor coefficient of less than 1. The shift factor measures the relative electrical proximity and directness of a pricing node to a constraint, derived through the historical review of transmission <i>security</i> constraints.</p>
NISL	The <i>day-ahead market</i> , pre-dispatch and <i>real-time calculation engines</i> use a single penalty price for all magnitudes of NISL constraint violations that is based on the 99 th percentile of historical NISL congestion prices.
<i>Intertie</i>	<p>The <i>day-ahead market calculation engine</i> and <i>pre-dispatch calculation engine</i> use a single penalty price for all magnitudes of <i>intertie</i> constraint violations.</p> <p>In order to maintain the scheduling hierarchy for constraints in the pricing algorithm that were used in the scheduling algorithm, the penalty price is based on the mid-point between the penalty price for the over-generation <i>energy</i> balance constraints and the second <i>price-quantity pair</i> of the transmission <i>security</i> constraint violation price curve.</p>
Daily Energy Limits	The <i>day-ahead market calculation engine</i> and <i>pre-dispatch calculation engine</i> use a single penalty price for all magnitudes of daily <i>energy</i> limit violations. The penalty price is set above all other penalty prices in order to minimize the daily <i>energy</i> limit violations, while still providing a feasible region for the calculation engine to be solved.

– End of Appendix –

Appendix B: Coding of Commitments and Constraints

The *IESO* applies constraints to *resources* when establishing commitment or in order to achieve needed scheduling and *dispatch* outcomes. These constraints are coded in order to drive the correct *settlement* outcome. When these constraints are binding on *real-time schedules* and *dispatches* they will be included in the associated reports. Below is a table describing the constraints and coding.

Table B-1: Coding of Constraints

Circumstances	Constraint Description	Constraint Type / Code
A <i>GOG-eligible resource</i> has received a <i>day-ahead operational</i> commitment	A minimum constraint applied for a <i>day-ahead operational</i> commitment.	DA-CMT
A <i>GOG-eligible resource</i> has received a <i>day-ahead reliability</i> commitment	A minimum constraint applied by operators for a <i>day-ahead reliability</i> commitment.	DARCMT
A <i>GOG-eligible resource</i> has received a <i>pre-dispatch operational</i> commitment	A minimum constraint applied for a <i>pre-dispatch operational</i> commitment.	PD-CMT
A <i>GOG-eligible resource</i> has received a <i>reliability</i> commitment	A minimum constraint applied for a <i>reliability</i> commitment.	PDRCMT
A steam turbine <i>generation resource</i> requires a minimum constraint to an n-on-1 MLP	A minimum constraint applied for combined cycle operation consistent with combustion turbine commitment.	COMCYC
<i>Operating reserve</i> is activated on a <i>resource</i>	A minimum constraint applied for an <i>operating reserve</i> activation	ORA
A hydroelectric <i>generation resource</i> requires a steady output	After some hydroelectric <i>generation resources</i> change their <i>dispatch</i> level, they are “locked out” and cannot change <i>dispatch</i> from that level for a specified period of time.	LKO
A <i>resource</i> is required to operate in a certain manner to maintain <i>reliability</i>	A minimum, maximum or fixed constraint applied manually by operators to address <i>reliability</i> concerns.	REL

Circumstances	Constraint Description	Constraint Type/Code
A <i>market participant</i> request to operate in a manner that avoids endangering people, equipment damage or the violation of an <i>applicable law</i> (SEAL)	A minimum, maximum or fixed constraint applied manually by operators at the request of <i>market participants</i> .	SEAL
A hydroelectric <i>generation resource</i> specifies an <i>hourly must run</i> value	A minimum constraint applied to ensure that a hydroelectric <i>generation resource</i> is <i>dispatched</i> to at least its <i>hourly must run</i> value.	HMR
The current <i>dispatch</i> for a <i>variable generation resource</i> has a “release” obligation indicator and the next <i>dispatch</i> has a “mandatory” obligation indicator	The next <i>dispatch</i> (the one with the mandatory obligation indicator) is less than the current <i>dispatch</i> (the one with the release obligation indicator) and is blocked by the <i>IESO</i> and not released to the <i>market participant</i> .	VGRN
The current <i>dispatch</i> for a <i>variable generation resource</i> has a “mandatory” obligation indicator.	The next <i>dispatch</i> is blocked by the <i>IESO</i> and not released to the <i>market participant</i> .	VGMD

– End of Appendix –

List of Acronyms

Acronym	Term
CMP	<i>capacity market participant</i>
CSP	constrained scheduling point
CT	combustion turbine
DAM	<i>day-ahead market</i>
EEA	Energy Emergency Alert
FIX	fixed
GOG	<i>generator offer guarantee</i>
HDR	<i>hourly demand response</i>
HE	hour ending
HOEP	hourly Ontario <i>energy</i> price
HQEM	Hydro Quebec <i>Energy</i> Marketing
HQT	Hydro Quebec TransÉnergie
ICG	<i>IESO-controlled grid</i>
IDC	Interchange Distribution Calculator
IOG	<i>intertie offer guarantee</i>
<i>LMP</i>	<i>locational marginal prices</i>
MAX	maximum
MAX DEL	<i>maximum daily energy limit</i>
MGBDT	<i>minimum generation block down-time</i>
MGBRT	<i>minimum generation block run-time</i>
MHEB	Manitoba Hydro-Electric Board
MIN	minimum
MIN DEL	<i>minimum daily energy limit</i>
MISO	Midcontinent Independent System Operator
MLP	<i>minimum loading point</i>

Acronym	Term
<i>MMCP</i>	<i>maximum market clearing price</i>
MNSPD	<i>maximum number of starts per day</i>
MPM	market power mitigation
MSP	market scheduling point
MW	megawatt
MWh	megawatt hour
<i>NERC</i>	<i>North American Electric Reliability Corporation</i>
NISL	net interchange scheduling limit
<i>NPCC</i>	<i>Northeast Power Coordinating Council, Inc.</i>
NQS	non-quick start
NYISO	New York Independent System Operator
PD	pre-dispatch
PJM	PJM Interconnection
PSU	<i>pseudo-unit</i>
RMR	<i>reliability must-run</i>
RT	real-time
RTC	real-time commitment
ST	steam turbine
UCM	unit commitment manager

– End of Section –

References

Document ID & Link	Document Title
MDP_RUL_0002	Market Rules for the Ontario Electricity Market
PRO-408	Market Manual 1.5: Market Registration Procedures
MDP_PRO_0022	Market Manual 2.6: Treatment of Compliance Issues
IMP_PRO_0047	Market Manual 3.7: Totalization Table Registration
MDP_PRO_0030	Market Manual 4.5: Market Suspension and Resumption
IMO_MAN_0024	Market Manual 6: Participant Technical Reference Manual
MDP_PRO_0040	Market Manual 7.1: IESO-Controlled Grid Operating Procedures
IMP_PRO_0033	Market Manual 7.2: Near Term Assessments and Reports
IMP_PRO_0035	Market Manual 7.3: Outage Management
IMP_POL_0002	Market Manual 7.4: IESO-Controlled Grid Operating Policies
PRO-357	Market Manual 13: Capacity Export Requests

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