PUBLIC

MANUAL

Market Manual 4: Market Operations

Part 4.2: Operation of the Day-Ahead Market

Issue 0.4~~Issue 0.3-MRP~~
September 3, 2024

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

This *market manual* provides information to *market participants* on the operation of the *day-ahead market*.

Document Change History

Issue	Reason for Issue	Date
0.1	Initial draft for Market Renewal Program stakeholder engagement	July 14, 2023
0.2	Updated after considering external stakeholder review	March 13, 2024
0.3	Updated for MRP – Final Alignment	June 7, 2024
0.4	Updated to address stakeholder feedback	September 3, 2024

Related Documents

Document ID	Document Title
MDP_PRO_0027	Market Manual 4.1: Submission of Dispatch Data in the Physical Markets
IMP_PRO_0034	Market Manual 4.3: Operation of the Real-Time Markets

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Reference	Description of Change

Market Transition

A.1.1 This *maket 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~~ prior to 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; or

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 pertaining to any matter 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

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

- the word 'shall' denotes a mandatory requirement;
- references to *market rule* sections and sub-sections may be appreviated in accordance with the following representative format: '**MR Ch.1 ss.1.1-1.2'** (i.e. *market rules,* Chapter 1, sections 1.1 to 1.2);
- references to *market manual* sections and sub-sections may be appreviated in accordance with the following representative format: **'MM 1.5 ss.1.1-1.2'** (i.e. *market manual* 1.5, sections 1.1 to 1.2);
- internal references to sections and sub-sections within this manual take the representative format: 'sections 1.1 – 1.2';
- terms and acronyms used in this *market manual* in its appended documents that are italicized have the meanings ascribed thereto in **MR Ch.11**
- data fields are identified in all capitals; and
- references to "Day 0" mean the current day, references to "Day 1" mean the day immediately after the current day, references to "Day 2" mean the day two days after the current day, and so on.

– End of Section –

1 Introduction

1.1 Purpose

This *market manual* contains the information associated with the operation of the *day-ahead market*. It is intended to provide a summary of the steps and interfaces between *market participants* and the *IESO* during the operation of the *day-ahead 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.7.3.5
- MR Ch.5 s.1.2.1
- MR Ch.5 s.3.2: Obligations of the IESO
- MR Ch.5 s.5.2.5
- MR Ch.5 s.6: Outage Coordination
- MR Ch.5 App.5.1: Performance Standards for Ancillary Services
- MR Ch.7 s.1.6.1.3
- MR Ch.7 s.2.3: Aggregated Generation Units, Electricity Storage Units or Sets of Load Equipment as Resources
- MR Ch,7 s.3.2.4: Submissions During the Day-Ahead Market Restricted Window
- MR Ch.7 s.3.2.5
- MR Ch.7 s.3.3.8: Obligation to Revise Dispatch Data
- MR Ch.7 s.3.3.9.1A
- MR Ch.7 s.3.4.1.8
- MR Ch.7 s.3.5: Energy Offers and Energy Bids
- MR Ch.7 s.3.12: Transmission System Information
- MR Ch.7 s.3A.1: Information Used by the IESO to Determine Schedules and Prices

- MR Ch.7 s.4.1: Day-Ahead Market Scheduling Process
- MR Ch.7 s.4.2: Determining the Day-Ahead Schedule
- MR Ch.7 s.4.3: Day-Ahead Market Scheduling Process Failure
- MR Ch.7 s.4.4: Administration of the Day-Ahead Market Calculation Engine
- MR Ch.7 s.4.5: Information Used by the Day-Ahead Market Calculation Engine
- MR Ch.7 s.4.6: Passes of the Day-Ahead Market Calculation Engine
- MR Ch.7 s.4.7: Publishing Day-Ahead Market Information
- MR Ch.7 s.4.8: Issuing Market Participant-Specific Day-Ahead Information
- MR Ch.7 s.5.2.2
- MR Ch.7 s.7.6: Dispatch Scheduling Errors
- MR Ch.7 s.8.4A: Administrative Pricing
- MR Ch.7 s.10.1.3
- MR Ch.7 s.10.3: Day-Ahead Operational Commitment and Pre-Dispatch Operational Commitment
- MR Ch.7 s.12.1.1.6
- MR Ch.7 s.12.1.3A
- MR Ch.7 s.19.4.2: Standby and Activation Notices
- MR Ch.7 s.22: Market Power Mitigation
- MR Ch.7 App.7.7: Radial Intertie Transactions
- MR Ch.9 s.3.3: Day-Ahead Market Balancing Credit
- MR Ch.9 s.4.11: Fuel Cost Compensation Credit

1.3 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 Operation of the Day-Ahead Market

2.1 Day-Ahead Market Calculation Engine

(MR Ch.7 s.4.6)

Day-ahead market calculation engine passes – The functions of each pass of the *day-ahead market calculation engine* are summarized in Appendix A.

2.2 Day-Ahead Market Process Timeline

The timeline for the operation of the *day-ahead market* on the day before the relevant *dispatch day* is summarized as follows:

1. The *IESO* issues an adequacy report for the next *dispatch day*, at 05:30 EPT prusuant to **MR Ch 7 s.12.1.1.6(a)**.
2. The *day-ahead market submission window* opens at 06:00 EPT. Standing *dispatch data* will be converted to *dispatch data* for the next day at 06:00 EPT (**MR Ch.7 s.3.3.9.1A**).
3. The submission deadline for *requests for segregation* for the *day-ahead market* time frame is:
    - 08:00 EPT if an *outage* to critical equipment is required; or
    - 09:00 EPT if no *outage* to critical equipment is required (**MR Ch.7 App 7.7 s.1.3.3)**.
4. The *day-ahead market regulation* submission window closes at 09:00 EPT (**MR Ch.5 App. 5.1 s.1.1**).
5. The *IESO* issues the following reports for the next day at 09:00 EPT:
    - updated Adequacy Report for the next *dispatch day* (**MR Ch.7 s.12.1.1.6(b)**)
    - Day-Ahead Intertie Scheduling Limit Report (**MR Ch.7 s.4.7.1.1**)
    - Day-Ahead Area Reserve Constraints Report (**MR Ch.7 s.4.7.2.10**)
6. The *day-ahead market submission window* closes at 10:00 EPT, marking the start of the *day-ahead market restricted window* and the start of the *day-ahead market calculation engine* run. *Dispatch data* may be accepted after 10:00 EPT only in accordance with **MR Ch.7 s.3.2.4-3.2.5**.

7. The *IESO* will typically issue *day-ahead market* results by 13:30 EPT. Upon the issuance of *day-ahead market* results, an updated Adequacy Report for the next day is issued (**MR Ch.7 s.12.1.1.6C)**.
8. The *IESO* will issue *day-ahead market* results or declare a failure, by 15:30 EPT in accordance **MR Ch.7 s.4.3.2**. The *day-ahead market restricted window* concludes upon the issuance of *day-ahead market results* or the declaration of a failure.
9. The *pre-dispatch calculation engine* runs at 20:00 EST and includes any *day-ahead operational commitments* resulting from the *day-ahead market*. Figure 2-1 illustrates the interplay of the *day-ahead market* with the *pre-dispatch process* time frame

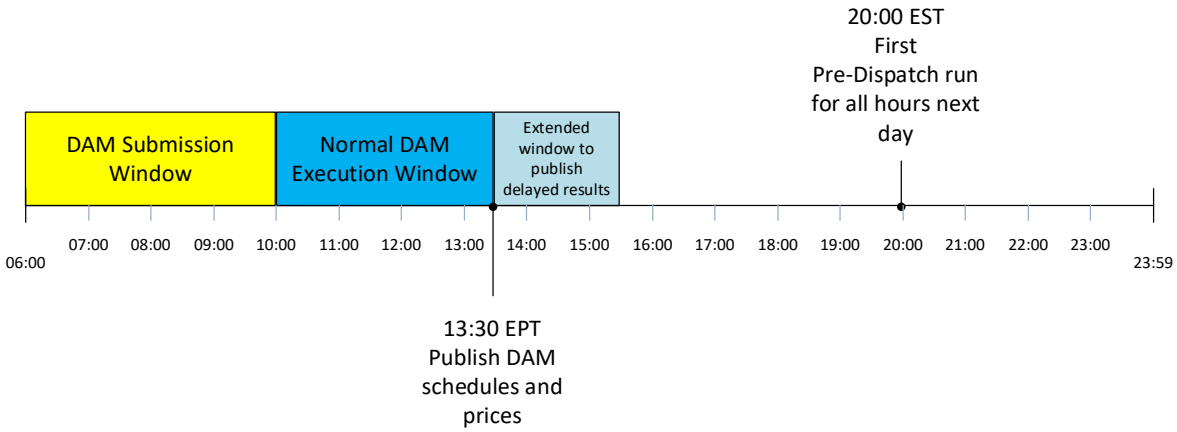

Figure 2-1: Day-ahead Market Process Timeline

2.3 Day-Ahead Market Calculation Engine Initializing Conditions

(MR Ch.7 s.4.4.1)

Role of initializing conditions in day-ahead market participation – The *day-ahead market calculation engine* establishes initializing conditions of the *IESO-administered markets* and *IESO-controlled grid* for the next *dispatch day*. This section describes those conditions to allow *market participants* to manage *dispatch data* accordingly and to understand the results of the *day-ahead calculation engine*.

2.3.1 Initial Hours of Operation

Function of IHO – Initial Hours of Operation (IHO) refers to the number of consecutive hours a *GOG-eligible resource* is in operation at the end of the current *dispatch day*. The *day-ahead market calculation engine* uses the IHO to determine whether to process the *start-up offer* for the *resource* at the beginning of the next

dispatch day (HE 01) and to facilitate the treatment of *minimum generation block run-time* (MGBRT) over midnight (HE 24).

Refer to Appendix B: Detailed IHO Calculation for details on how IHO is calculated.

2.3.2 Treatment of Daily Dispatch Data over Midnight

(MR Ch.7 s.3.5.12)

Start-up offer treatment – When the *day-ahead market calculation engine* determines the schedule for the first hour of the next day, it does not consider the *start-up offers* for *GOG-eligible resources* that are already in operation in the last hour of the current *dispatch day* as determined by the IHO. Table 2-1 describes the conditions under which *start-up offers* for HE 01 are considered by the *day-ahead market calculation engine*.

2.3.3 Treatment of MGBRT over Midnight

(MR Ch.7 s.10.3.4)

Operational Commitments over midnight – The *day-ahead market calculation engine* commits a *generation resource* at the beginning of the next day for a minimum number of hours required to satisfy the balance of its *minimum generation block run time* (MGBRT) from the previous day's *day-ahead operational commitment* or *pre-dispatch operational commitment* (refer to Figure 2-2 below). It uses the MGBRT applicable to the *dispatch day* for which the *day-ahead market calculation engine* is being run to calculate the remaining MGBRT hours that carry over to the next *dispatch day*. If a *resource* is scheduled in HE24, but does not have a *day-ahead operational commitment* or *pre-dispatch operational commitment*, the *day-ahead market calculation engine* assumes that the *resource's* MGBRT has already been satisfied.

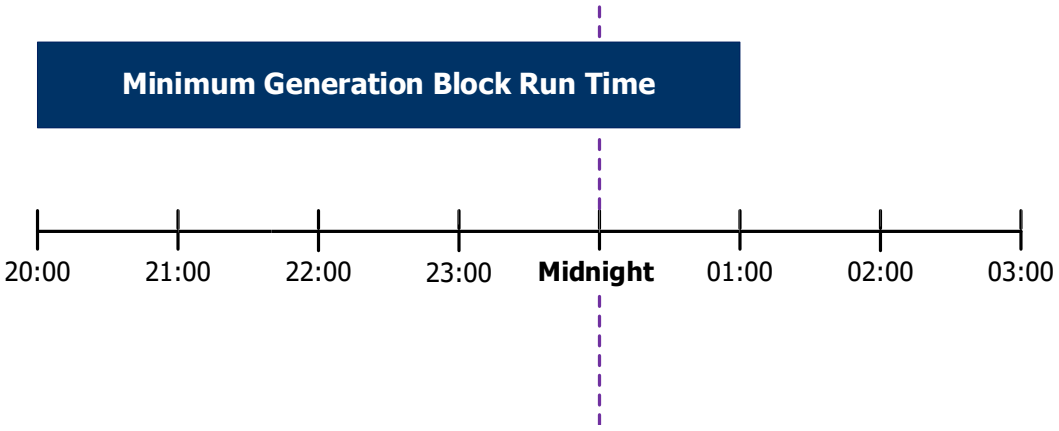

Figure 2-2: MGBRT Completion on the Next Dispatch Day

Conditions for completing MGBRT on the next dispatch day – The *day-ahead market* completes the process of establishing any remaining MGBRT hours of a *day-*

ahead operational commitment or *pre-dispatch operational commitment*, as described above, if it satisfies the following conditions:

- it is a *dispatchable generation resource* that is a *non-quick start resource* and is not a nuclear generation resource;
- it has valid *offers* for all the hours required to satisfy its remaining *MGBRT* in the next *dispatch day*; and
- *MGBRT* – IHO ≥ 1

Table 2-1: Satisfy MGBRT over Midnight

MLP Constraint Status HE 24 Day 0	*Pre-dispatch Initial Schedule HE 24 Day 0	Initial Hours of Operations (IHO)	Consider Start-up Offer HE 1 Day 1	Satisfy MGBRT over Midnight
YES = Constraint NO = No constraint	≠0 = In operation 0 = Not in operation		YES = Start-up offer is considered NO = Start-up offer is not considered	YES = MGBRT is satisfied NO = MGBRT is not satisfied
YES	≠0	0 < IHO ≤ 24	NO	YES
NO	≠0	24	YES	NO
NO	0	0	YES	NO
Input Data		**Calculated Value**	**Treatment by Day-Ahead Market Calculation Engine**	

***** As determined by the most recent *pre-dispatch schedule* results for the current *dispatch day* prior to the initialization of the *day-ahead calculation engine*.

2.3.4 Treatment of MGBDT over Midnight

Market participants must contact the IESO – The *day-ahead market calculation engine* does not respect a *GOG-eligible resource's minimum generation block down time* (MGBDT) after midnight, which may result in a *day-ahead operational commitment* before the *resource* has satisfied its MGBDT. In the event that a *GOG-eligible resource* is committed without sufficient time to complete MGBDT, the *market participant* must contact the *IESO*.

2.3.5 Treatment of Thermal States for GOG-Eligible Resources

(MR Ch.7 s.3.5.35)

Initial thermal state – *Registered market participants* for *GOG-eligible resources* select one *thermal state* for use in the *day-ahead market calculation engine*

applicable to *ramp up energy to minimum loading point* and *start-up offer* through the submission of the *thermal state dispatch data* parameter pursuant to **MR Ch.7 s.3.5.35**.

Thermal state for MGBDT – The *day-ahead market calculation engine* will use a hot *thermal state* for the *MGBDT*.

2.3.6 Treatment of Ramp Rates

(MR Ch.7 s.3.5.34)

Daily ramp rate – The *day-ahead market calculation engine* will establish *day-ahead* schedules using the daily ramp rate submitted for the next *dispatch day* in accordance with **MR Ch.7 s.3.5.34**.

2.3.7 Initial Schedules

Daily ramp rate over midnight – The *day-ahead market calculation engine* uses the most recent *pre-dispatch schedule* results for HE 24 for the current *dispatch day* to ensure that the *day-ahead schedule* respects the *resource's* ramp rate submitted pursuant to **MR Ch.7 s.3.5.34** for HE 01 of the next *dispatch day*.

2.3.8 Linked Forebays over Midnight

(MR Ch.7 s.3.5.23)

Dispatch data from previous dispatch day – The *day-ahead market calculation engine* uses the *dispatch data* parameters for establishing *linked forebays* as provided by **MR Ch.7 s.3.5.23** for each *dispatch day* independently from the previous day irrespective of the submissions and schedules from the prior *dispatch day*. This may lead to infeasible *day-ahead schedules*, which may be managed by *market participants* as described below.

Resource evaluated independently – The *day-ahead market calculation engine* evaluates *forebay*-related *dispatch data* submitted on an upstream *linked forebay* and a downstream *linked forebay* independently from each other during the first *h* hours of the *day-ahead market* look-ahead period, where *h* is the value of the *time lag* submitted. Similarly, in the last *h* hours of the *dispatch day*, the upstream *linked* forebay will be independently evaluated of *time lag* and *MWh ratio*.

Dispatch data parameters – *Market participants* are expected to manage the risk of infeasible *day-ahead schedules* for *resources* with *linked forebays* over the midnight boundary. *Registered market participants* may consider submitting appropriate *energy offer* quantities, *hourly must run* quantities, *minimum hourly output* values or an *outage* slip.

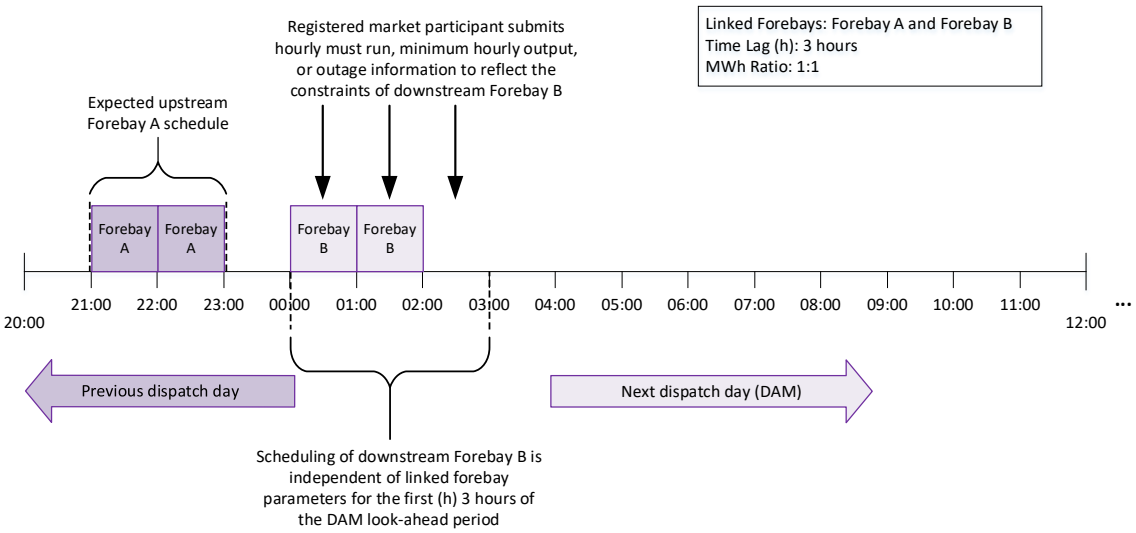

Figure 2-3: Managing Linked Forebays for the Start of the Day-ahead Market

– End of Section –

3 Day-Ahead Market Data Inputs

3.1 Market Participant Data

(MR Ch.7 s.4.5.1)

Supplied by market participant – The *day-ahead market calculation engine* uses the following information supplied by *market participants*:

- dispatch data;
- regulation offers;
- *outage* information including *segregated mode of operation* and planned *demand* control activities (e.g. *transmitter* or distributor voltage reductions, *load* disconnection); and
- thermal ratings for the relevant portions of the *transmission system* (**MR Ch.5 s.5.2.5**)

3.2 IESO Data Inputs

(MR Ch.7 s.4.5.1)

Supplied by IESO – The *day-ahead market calculation engine* considers the information supplied by the *IESO*, including information described in the following section. The *IESO* uses the most recent information available prior to the initiation of the *day-ahead market calculation engine* run.

3.2.1 Constraint Violation Penalty Curves

Overview – Constraint violation penalty curves are penalty functions used to prioritize the violation of constraints in the *day-ahead market calculation engine* **(MR Ch.7 s.1.6.1.3)**. Refer to Appendix C for further detail.

3.2.2 Market Power Mitigation Information

Overview – The data in connection with the market power mitigation process is established in accordance with **MR Ch.7 s.22.14**.

3.2.3 IESO Reliability Requirements

Overview – *Reliability* requirements refer to *reliability*-related system constraints 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* capacity requirements. The *IESO* updates this information to reflect anticipated conditions for every *dispatch hour*.

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 *day-ahead market calculation engine*, the *IESO* will create a scheduling constraint on the *resource* as an input to the *day-ahead market calculation engine* following notice to the affected *market participant*.

Timing of constraint – *Resource* constraints for *reliability* may be applied before or after the *DAM expiration*.

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

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

Average demand forecast – The average non-*dispatchable demand* forecast is used in Pass 1 and Pass 3 of the *day-ahead market calculation engine* and represents the forecast *demand* quantities for all *non-dispatchable loads* and forecast losses in the *demand* forecast areas. The forecast quantities for *demand* for all *non-dispatchable loads* and losses are determined using the average *demand* forecasts, load distribution factors and *bid* quantities submitted for virtual *hourly demand response resources* and physical *hourly demand response resources* and *self-scheduling storage resources* registered to withdrawal.

Peak demand forecast – The peak non-*dispatchable demand* forecast is used in Pass 2 of the *day-ahead market calculation engine* and represents the forecast *demand* quantities for all *non-dispatchable loads, price responsive loads*, *self-scheduling electricity storage resources* and both *dispatchable loads* and *dispatchable electricity storage resources* where no *bid* is submitted, including forecast losses in the *demand* forecast areas. This forecast quantity is determined using the peak *demand* forecasts, load distribution factors and *bid* quantities

submitted for virtual *hourly demand response resources* and physical *hourly demand response resources*.

3.2.6 Centralized Variable Generation Forecast

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

Pass 2 – The *IESO variable generation* centralized forecast is used in Pass 2 of the *day-ahead market calculation engine*.

Passes 1 and 3 – If submitted in accordance with **MR Ch.7 s.3.5.18**, the *IESO* will use the *variable generation forecast quantity* in Pass 1 and Pass 3 of the *day-ahead market calculation engine*. Otherwise, the *IESO* will use its *variable generation* centralized forecast in Pass 1 and Pass 3.

3.2.7 IESO-Controlled Grid Information

Overview – The *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.3.12**.

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**.

– End of Section –

4 Day-Ahead Market Scheduling Process

(MR Ch.7 s.4.7.2)

Timing – The *day-ahead market* scheduling process typically consists of one run of the *day-ahead market calculation engine*, beginning at 10:00 EPT and completing by 13:30 EPT.

4.1 Day-Ahead Market Scheduling Process Execution

(MR Ch.7 ss.4.1 – 4.3)

Validation – Upon completion of the *day-ahead market calculation engine,* the *IESO* validates the results. If the results are valid, they are *published* or *issued*, as applicable, pursuant to **MR Ch.7 s.4.7.2** or **MR Ch.7 s.4.8.2**, and final. If the *IESO* determines the results to be invalid, they are not *published*.

Invalid results – The *IESO* may determine results to be invalid, including for the purpose of **MR Ch.7 s.4.3.1,** for reasons that include:

- the results include *resources* that are not required, or exclude *resources* that are required, because of incorrect inputs or calculations;
- the *day-ahead market calculation engine* is unable to resolve two or more conflicting restrictions; or
- an incorrect input causes a material change in pricing or schedules.

4.2 Rerun Authority

(MR Ch.7 s.4.3.1)

Justification for rerun – The *IESO* may correct its inputs, such as *outage* information, centralized *variable generation forecast quantities* or *pre-dispatch process results*, and rerun the *day-ahead market calculation engine* pursuant to **MR Ch.7 s. 4.3.1** to produce valid *day-ahead market* results only in the event of *IESO* errors or technical issues.

No rerun – The *day-ahead market calculation engine* is not rerun for changing system conditions. Any such changes will be considered in subsequent pre-dispatch and real-time evaluation processes. Following **MR Ch.7 s.4.3.1,** once *day-ahead market* results are *published* by the *IESO*, there are no further reruns of the *day-ahead market calculation engine*.

Publication by 15:30 EPT – The *IESO* will not exercise its rerun authority pursuant to **MR Ch.7 s.4.3.1** unless it anticipates that the results can be published by 15:30 EPT. Refer to **MR Ch.7 s.4.3.2.**

DAM notification – The *IESO* will notify *market participants* of a rerun pursuant to **MR Ch.7 s.4.3.1** in the form of a DAM notification.

4.3 Delays to Day-Ahead Market Scheduling Process

(MR Ch.7 ss.4.7.2 and 4.8.2)

Timing of publication and issuance – In the event that issues arise during the execution of the *day-ahead market* scheduling process, the *IESO* will perform an assessment on whether the issue will cause a delay in meeting the 13:30 EPT *publishing* and issuance target.

DAM notification for delayed publication or issuance – If the *IESO* determines that the *publishing* or issuance target cannot be met, it will *publish* a **DAM notification** in accordance with **MR Ch. 7 s.4.3.1**. The DAM notification sets out the nature of the delay and an estimated time for results to be *published*. The *IESO* will use reasonable efforts to correct the issues, rerun the *day-ahead calculation engine,* and validate, *publish* and issue results by 15:30 EPT. A delay in the *day-ahead market* scheduling process also extends the *day-ahead market restricted window* until valid results are *published*.

4.4 Day-Ahead Market Scheduling Process Failure

(MR Ch.7 ss.4.3.2 and 4.3.3)

Triggers for day-ahead market failure – The *IESO* will declare a *day-ahead market* failure in accordance with **MR Ch.7 s.4.3.2** in the following circumstances:

- the *IESO* expects that valid *day-ahead market* results will not be produced by 15:30 EPT; or
- there is a failure or *planned outage* of the software, hardware or communications systems that prevents the *IESO* from *publishing* or issuing *day-ahead market* results.

DAM notification – The *IESO* will notify *market participants* about the failure of the *day-ahead calculation engine* in accordance with **MR Ch.7 s.4.3.2**, in the form of a DAM notification. In these circumstances, the DAM notification states that:

- no *day-ahead schedules* or prices will be produced; and
- no day-ahead operational commitments will be produced.

Day-ahead market restricted window – The *day-ahead market restricted window* will conclude upon declaration of a failure.

Market settlements – After the *IESO* has declared a *day-ahead market* failure, the *dispatch day* will be settled solely based on the *market participant's* participation in the *real-time market*.

Approach to next-day scheduling – In the event of a *day-ahead market* failure, the *IESO* will conduct a *reliability* assessment based on the latest system conditions for the following *dispatch day*. If any control actions are required to ensure the secure and *reliable* operation of the *IESO-controlled grid* as a result of the *reliability* assessment, they will be communicated to the affected *market participants* prior to the first run of the *pre-dispatch calculation engine* at 20:00 EST. Following the *reliability* assessment, the *IESO* may issue *reliability commitments* as described in section 5.1.

Boundary entity resources – In the event of a failure of the *day-ahead market*, the *IESO* may facilitate scheduling on *boundary entity resources* in accordance with **MR Ch.7 s.5.2.2.2**.

– End of Section –

5 IESO Day-Ahead Reliability Commitments for GOG-Eligible Resources

(MR Ch.5 s.1.2.1)

Reliability commitments in the day-ahead timeframe – Pursuant to **MR Ch.5 s.1.2.1**, the *IESO* may be required to issue *reliability* commitments for *GOG-eligible resources* in the day-ahead timeframe, including inputs into the *day-ahead market calculation engine*.

5.1 Principles for Applying Reliability Commitments

(MR Ch.5 s.1.2.1 and Ch.7 s.10.1.3)

General principles – **MR Ch.5 s.1.2.1** permits the *IESO* to implement a *reliability commitment* in the *day-ahead* timeframe only if intervention is necessary to ensure or maintain *reliability*. The *IESO* will give market mechanisms priority in scheduling *resources*; however, the *IESO* will intervene and commit a *resource* that is critical for meeting the next day's *reliability* needs in accordance with the principles described below.

Least-cost evaluation – When more than one *resource* is available to satisfy the *IESO's reliability* needs for the next *dispatch day*, the *IESO* will perform, to the extent possible, a least-cost evaluation to determine the *resource(s)* that should be committed.

Reliability commitments prior to 10:00 EPT – The *IESO* may implement *reliability commitments* prior 10:00 EPT where there is evidence suggesting that the market mechanisms will not schedule the *resource* during the *day-ahead market* or the *pre-dispatch process*. These commitments will be included as inputs into the *day-ahead market calculation engine*.

Reliability commitments after *DAM expiration* and before 20:00 EST – The *IESO* may implement *reliability commitments* after *DAM expiration* and before the first *pre-dispatch calculation engine* run at 20:00 EST when:

- there is evidence suggesting that the market mechanisms will not schedule the *resource* in pre-dispatch or real time; and
- it is necessary to issue a *start-up notice* prior to the *pre-dispatch process* pursuant to **MR Ch.7 s.10.1.3**.

5.2 Process for Applying Reliability Commitments

(MR Ch.5 s.1.2.1)

Minimum constraints – The *IESO* will issue *reliability* commitments to a *GOG-eligible resource* by applying minimum constraints to ensure that the *resource* is scheduled to at least its submitted MLP and for at least its MGBRT. If the *reliability* commitment is implemented prior to 10:00 EPT, the constraints will be included in *day-ahead schedules* in addition to future *pre-dispatch schedules*. Alternatively, if implemented after *DAM expiration*, the constraints will only be included in future *pre-dispatch schedules*.

Market participant input – Before committing any *resources*, the *IESO* will contact the *market participant* to confer about any commitment actions the *IESO* is considering during the day-ahead timeframe.

– End of Section –

6 Results from the Day-Ahead Market

(MR Ch.7 s.4.1)

6.1 Day-Ahead Market Resource Schedules

(MR Ch.7 ss.4.1 and 4.8.2)

Eligible resources – The *IESO* issues a *day-ahead schedule* only for *resources* for which the *registered market participant* submitted *dispatch data* in the *day-ahead market*.

6.2 Day-Ahead Market Prices

(MR Ch.7 ss.4.7.2.5 – 4.7.2.8)

Price calculations – Table 7-1 includes additional information related to *day-ahead market* prices.

6.3 Day-Ahead Operational Commitments

(MR Ch.7 s.4.8.1.4)

Constraints – If a *GOG-eligible resource* receives a *day-ahead operational commitment,* the *IESO* will implement minimum constraints to the submitted *MLP* for the lesser of the hours where it received a *day-ahead schedule* or its MGBRT. For each separate start, the constraint will be applied to the beginning of the *day-ahead schedule* where the *resource* is scheduled at or above its submitted MLP.

Figure 6-1 provides an example of an applied constraint and the underlying *day-ahead market* schedule.

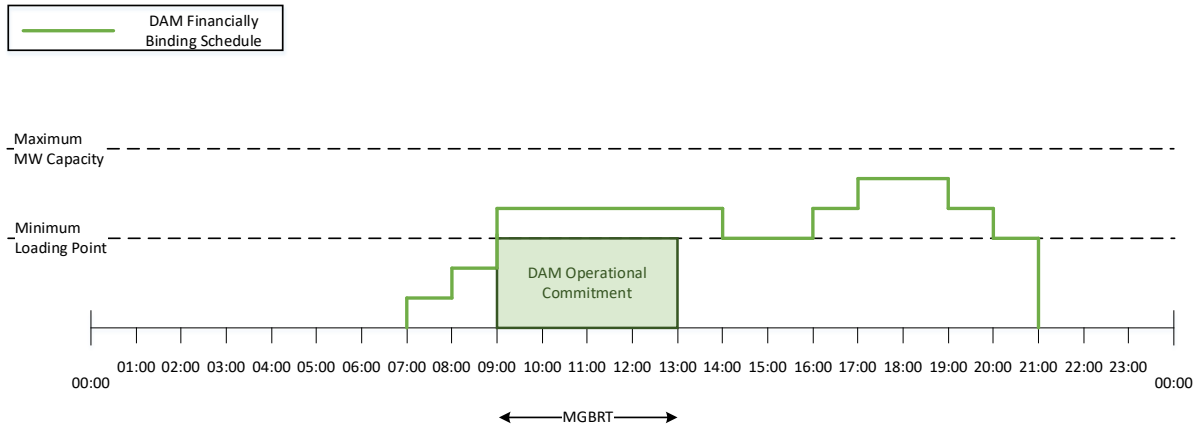

Figure 6-1: Day-Ahead Schedule and Day-Ahead Operational Commitment

Example – In the above example, a *GOG-eligible generation resource* has a *day-ahead schedule* that varies in MW quantity from 07:00 ~~ESPT~~ EST to 21:00 EST. Even though the entire *day-ahead schedule* will be financially binding, the *day-ahead operational commitment* will only be up to the *resource's* submitted MLP and for the duration of the MGBRT. The *day-ahead operational commitment* is applied to the first available time associated with the *day-ahead schedule*, immediately after the *resource* ramps up.

Where withdrawal is necessary – *Day-ahead operational commitments* cannot be rejected by the *market participant*. If the *resource* cannot satisfy its *day-ahead operational commitment*, the associated *market participant* must complete the withdrawal process in accordance with **MR Ch.7 s.10.3.2** or **MR Ch.7 s.10.3.3**, as applicable. Refer to section 8.1.

6.3.1 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 MLP with a constraint code of "DA-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 "DA-CMT", where one or zero associated CTs are committed in a given hour, and the ST is scheduled to at least the 1-on-1 ST MLP.
- The n-on-1 ST MLP with a constraint code of "DA-CMT", where n>1, there are n associated CTs committed in a given hour, and the ST is scheduled to at least the n-on-1 ST MLP.
- If the ST received a *day-ahead schedule* that is less than the n-on-1 ST MLP, the ST constraint will be equal to the next lowest ST MLP for which it was economic with a constraint code of "DA-CMT". There will be an additional constraint to the n-on-1 ST MLP with a constraint code of "COMCYC".

For STs using the *pseudo-unit* model:

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

6.4 Day-Ahead Market Boundary Entity Resource Schedules

(MR Ch 7 s.5.2.2)

The *day-ahead schedules* for *boundary entity resources* will be used for the *pre-dispatch calculation engine*'s validation in accordance with **MR Ch.7 s.5.2.2**.

6.5 Day-Ahead Market Economic Operating Points

Economic Operating Points – The *IESO* calculates the day-ahead lost cost economic operating points for *resources*. Refer to **MR Ch.7 App.7.8** for more information.

– End of Section –

7 Publishing and Issuing Day-Ahead Market Results

This section describes the reports the *IESO publishes* and issues relating to the *day-ahead market*.

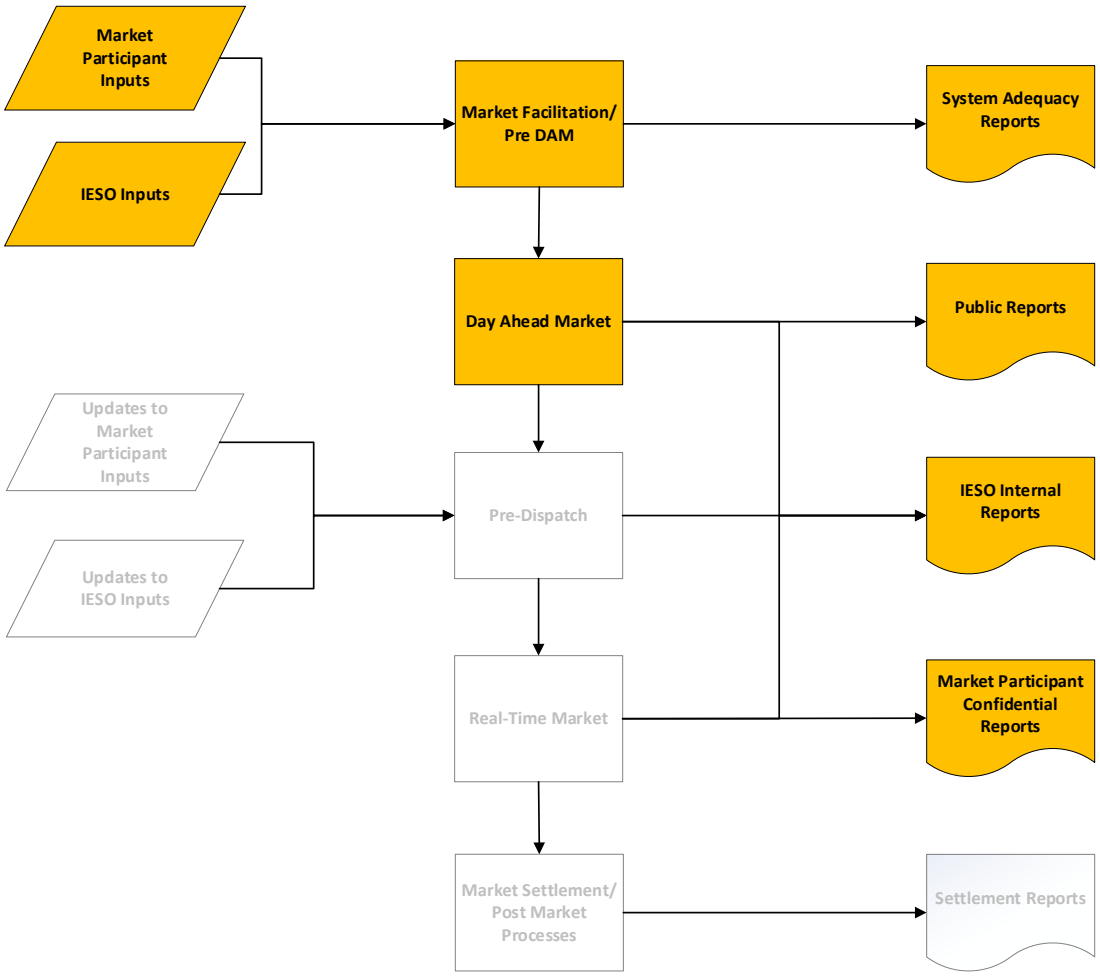

Figure 7-1: Day-Ahead Publishing and Reporting Processes

7.1 Day-Ahead Market Reports

(MR Ch.7 ss.4.7 and 4.8)

Table 7-1 provides a list and description of each *day-ahead market* 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 7-1: Day-Ahead Market Public Report Descriptions

Report Name	Report Description
Adequacy Report (**MR Ch.7 s.12.1.1.6**)	The Adequacy Report: • To support the *day-ahead market,* is published in accordance with **MR Ch.7 ss.12.1.1.6(a), 12.1.1.6(b), 12.1.1.6(c)**; • refer to **MM 7.2 s.3.1.1** for more information; and • presents information with hourly granularity.
Day-Ahead Area Operating Reserve Shortfall Report (**MR Ch.7 s.4.7.2.1**)	The Day-Ahead Area Operating Reserve Shortfall Report: • contains *operating reserve* included in *day-ahead schedule* and any shortfalls in each hour, by area; and • presents information with hourly granularity.
(Pre-Day-Ahead Market) Day-Ahead Area Reserve Constraints Report (**MR Ch.7 s.4.7.1.2**)	The (Pre-Day-Ahead Market) Day-Ahead Area Reserve Constraints Report: • contains expected hourly maximum and minimum constraints for the area *operating reserve* regions expected to be used as inputs for the *day-ahead market calculation engine*; • is typically *published* at approximately 09:00 EPT; and • presents information with hourly granularity.
Day-Ahead Area Reserve Constraints Report	The Day-Ahead Area Reserve Constraints Report: • contains hourly maximum and minimum constraints for the area *operating reserve* regions used as inputs for the *day-ahead market calculation engine*; • presents information with hourly granularity; and. • is typically published at approximately 13:30 EPT
Day-Ahead Totals Report (**MR Ch.7 s.4.7.2.2**)	The Day-Ahead Totals Report: • contains forecasts and schedules of system-wide information; and • presents information with hourly granularity.
(Pre-Day-Ahead Market) Day-Ahead Intertie Scheduling Limits Report (**MR Ch.7 s.4.7.1.1**)	The (Pre-Day-Ahead Market) Day-Ahead Intertie Scheduling Limits Report: • contains expected *intertie* scheduling limits for each *intertie zone* to be used as inputs to the *day-ahead market calculation engine* run; • is typically *published* at approximately 09:00 EPT; and • presents information with hourly granularity.

Report Name	Report Description
Day-Ahead Intertie Scheduling Limits Report (**MR Ch.7 s.4.7.1.1**)	The Day-Ahead Intertie Scheduling Limits Report: • contains *intertie* scheduling limits for each *intertie zone* used as inputs to the *day-ahead calculation engine*; • presents information with hourly granularity; and • is typically published at approximately 13:30 EPT
Day-Ahead Security Constraints Report (**MR Ch.7 s.4.7.2.3**)	The Day-Ahead Security Constraints Report: • contains binding security constraints applicable to the *transmission system*, as determined by the *day-ahead market calculation engine*; and • presents information with hourly granularity.
Day-Ahead Virtual Transactions Report (**MR Ch.7 s.4.7.2.4**)	The Day-Ahead Virtual Transactions Report: • contains aggregated sums of *energy offers* and *bids* submitted for each *virtual transaction zone*; • contains aggregated sums of cleared *virtual transactions* for each *virtual zonal resource*; and • presents information with hourly granularity.
Day-Ahead Hourly Energy LMP Report (**MR Ch.7 s.4.7.2.5**)	The Day-Ahead Hourly Energy LMP Report: • contains the *locational marginal pricing* information in respect of *energy* for every *delivery point*, including the Energy Congestion Price and Energy Loss Price; and • presents information with hourly granularity.
Day-Ahead Hourly Virtual Zonal Energy Price Report (**MR Ch.7 s.4.7.2.6**)	The Day-Ahead Hourly Virtual Zonal Energy Price Report: • contains the *virtual zonal price* for each *virtual zonal transaction zone*; and • presents information with hourly granularity.
Day-Ahead Hourly Ontario Zonal Energy Price Report (**MR Ch.7 s.4.7.2.7**)	The Day-Ahead Hourly Ontario Zonal Energy Price Report: • contains the *Ontario zonal price* for the *day-ahead market*; and • presents information with hourly granularity.
Day-Ahead Hourly Operating Reserve LMP Report (**MR Ch.7 s.4.7.2.5**)	The Day-Ahead Hourly Operating Reserve LMP Report: • contains the *locational marginal pricing*-related information in respect of each class of *operating reserve* for every *delivery point*, including the Operating *Reserve* Congestion Price; and • presents information with hourly granularity.

Report Name	Report Description
Day-Ahead Hourly Intertie Energy LMP Report (**MR Ch.7 s.4.7.2.8**)	The Day-Ahead Hourly Intertie Energy LMP Report: • contains *locational marginal price* information for *intertie* zones in respect of *energy*, including internal congestion, losses, congestion due to *intertie* limits and congestion due to NISL constraints; and • presents information with hourly granularity.
Day-Ahead Hourly Intertie Operating Reserve LMP Report (**MR Ch.7 s.4.7.2.8**)	The Day-Ahead Hourly Intertie Operating Reserve LMP Report: • contains *intertie* zone *locational marginal prices* in respect of the non-spinning *ten-minute operating reserve* and *thirty-minute operating reserve*, internal congestion, congestion due to *intertie* limits and congestion due to NISL constraints; and • presents information with hourly granularity.
Variable Generation Forecast Summary Report	The Variable Generation Forecast Summary Report: • contains regional *energy* forecast for the next 48 hours, by fuel type, for all *variable generation resources* subject to centralized forecasting; • is typically *published* approximately five minutes prior to every hour; • presents information with hourly granularity.
Variable Generation Tie Breaking Rankings Report (**MR Ch.7 s.4.7.4**)	The Variable Generation Tie Breaking Rankings Report: • contains *variable generation* tie-breaking rankings for the 90-day period; • is typically *published* on the 1st calendar day of every month; • is typically *published* if the tie-breaking ranking is updated to account for newly registered *variable generation resources* coming into service; and • presents information with daily granularity.
Day-Ahead Constraints Shadow Prices Report (**MR Ch.7 s.4.7.4**)	The Day-Ahead Constraints Shadow Prices Report: • contains shadow prices for the binding *security* constraints applicable to the *transmission system*, as determined by the *day-ahead market calculation engine*. • contains information from five days before the date of publication; • is typically *published* at approximately 08:00 EST; and • presents information with hourly granularity.

Report Name	Report Description
Planned Transmission Outages Occurring Next 30 Days (**MR Ch.5 s.6.5.2**)	The report Planned Transmission Outages Occurring Next 30 Days: • contains planned transmission *outages* that are requested by transmitters for the next 30 days; • contains planned starting dates and end dates for transmission *outages*; and • is typically *published* daily at approximately 17:00 EST
Day-Ahead Global Market Power Conditions for Energy Report (**MR Ch.7 s.4.7.5**)	The Day-Ahead Global Market Power Conditions for Energy Report**:** • contains a summary of the hours in the study period when the price and import restriction conditions in respect of energy are met in the *day-ahead market*; and • presents information with hourly granularity.

Confidential reports –Table 7-2 provides a list and description of each *day-ahead market* confidential report issued by the *IESO*. Confidential reports are available only to the *market participant* to which the information relates.

Table 7-2: Day-Ahead Market Confidential Report Descriptions

Report / Display Name	Report Description
Dispatch Data Report for the Day-Ahead Market Scheduling Process (**MR Ch.7 s.4.8.1.1** and 4.8.1.7)	The Dispatch Data Report for Day-ahead Market Scheduling Process: • contains a summary of the *dispatch data for energy* submitted for the *day-ahead market* for each of the *market participant's resources,* including the quantities that define the *availability declaration envelope*; • is typically issued at approximately 13:30 EPT; and • presents information with hourly and daily granularity, respectively.
Day-Ahead Market Operating Reserve Offer Report	The Day-Ahead Market Operating Reserve Offer Report: • contains the *offers* for *operating reserve* used by the *day-ahead market calculation engine*; • is typically issued at approximately 13:30 EPT; and presents information with hourly granularity.
Day-Ahead Pseudo-Unit Computed Values Report (**MR Ch.7 s.4.8.1.2**)	The Day-Ahead Pseudo-Unit Computed Values Report: • contains the values used by the *day-ahead market calculation engine* for *pseudo-units* and *generation resources* associated with

Report / Display Name	Report Description
	the corresponding combustion turbine *generation units* and steam turbine *generation units*; • is based on *market participant* submitted registration and *dispatch data* for *generation resources* associated with the corresponding combustion turbine *generation units* and steam turbine *generation units,* and *outages* and constraints; and • presents information with hourly granularity.
Day-Ahead Schedule Report (**MR Ch.7 ss.4.8.1.3** and **4.8.1.8**)	The Day-Ahead Schedule Report: • contains *day-ahead schedules* for *energy* and *operating reserve*; • notifies *market participants* that they have failed the conduct and impact test for price impact, if applicable; • for *combined cycle plants* with *pseudo-units*, contains schedules for *pseudo-units* and for the corresponding *resources* for the combustion turbine and steam turbines *generation units*; and • presents information with hourly granularity.
Day-Ahead Commitments Report (**MR Ch.7 s.4.8.1.4**)	The Day-Ahead Commitments Report: • Includes *day-ahead operational commitments* and commitments implemented to maintain *reliability;* and • presents information with hourly granularity.
Variable Generation Forecast by Resource Report (**MR Ch.4 s.7.3.5**)	The Variable Generation Forecast by Resource Report: • contains an hourly *energy* forecast for each of the *variable generator's variable generation resources* for the next 48 hours; • is typically issued approximately five minutes prior to every hour; and • presents information with hourly granularity.
Demand Response Standby Report (**MR Ch.7 s.19.4.2**)	The Demand Response Standby Report: • notifies the *capacity participants* when their *resources* are on standby for *demand response* activations; • if applicable, is issued after the *day-ahead market calculation engine* or *pre-dispatch calculation engine* produces valid results in respect of a *business day*; • may be issued until 07:00 EST of the relevant *dispatch day;* and • if *a capacity market participant* will not be placed on standby for the relevant *dispatch day*, it will receive confirmation of same at approximately 07:00 EST**.**

7.2 DAM Notifications

(MR Ch.7 s.12.1.3A)

Website interface – *Market participants* can receive DAM notifications by accessing "DAM Notifications" on the ***IESO's* website** or:

- by logging onto the Energy Market Interface; or
- by using the Application Programmers Interface.
- Table 7-3 contains notices published pursuant to **MR Ch.7 ss.4, 8.4A and 7.6** that pertain to the *day-ahead market.*

Table 7-3: Notifications – Day-Ahead Market

Notification	Description
DAM Notification: Additional Dispatch Data	The *IESO* is approving revisions to *dispatch data* during the *day-ahead market restricted window* for all *market participants*.
DAM Notification: Delay in Initialization of Day-Ahead Market Calculation Engine	The *IESO* delays the initialization of the *day-ahead market calculation engine*. The *IESO* inputs into the *day-ahead market calculation engine* will reflect the information available at the initialization, which may have changed since 10:00 EPT.
DAM Notification: Delay to Publication of Day-Ahead Market Results	The *IESO* delays the publication of *day-ahead market* results later than 13:30 EPT. An expected time of publication may be indicated, if available.
DAM Notification: DAM Failure	The *IESO* declares a *day-ahead market* failure for the affected *dispatch day*. The *IESO* will indicate any changes to scheduling of boundary entity resources in accordance with **MR Ch.7 s.5.2.2.2.**
Administrative Pricing Notification	The *IESO* establishes administrative prices for the *day-ahead market* in accordance with **MR Ch.7 s.8.4A**.
Dispatch Scheduling Error Notification	The *IESO* declares a *dispatch scheduling error* with respect to the *day-ahead market* results in accordance with **MR Ch.7 s.7.6.1.2**.

7.3 Standby Notices and Reports for Hourly Demand Response Resources

(MR Ch.7 s.19.4.2)

Standby reports – After the successful completion of the *day-ahead market calculation engine* run, the *IESO* may issue a Standby Notice in accordance with

MR Ch.7 s.19.4.2. *Hourly demand response resources* that did not receive a standby notice resulting from the *day-ahead market* are assessed during the *pre-dispatch process* to determine if they are required to be on standby.

– End of Section –

8 Cancellation and Withdrawal of Day-Ahead Operational Commitments

(MR Ch.7 s.10.3)

8.1 Withdrawal from Commitment

(MR Ch.7 ss.3.3.8, 10.3.2 and 10.3.3)

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

Revise dispatch data – If a *market participant* for a *GOG-eligible resource* expects not to satisfy a *day-ahead operational commitment* in accordance with **MR Ch.7 s.10.3.2** or **10.3.3.**, it must revise the applicable *dispatch data* in accordance with **MR Ch.7 s.3.3.8**.

8.2 IESO Cancellation of Day-Ahead Operational Commitments for GOG-Eligible Resources

(MR Ch.7 ss.3.3.8 and 10.3.1)

Reasons for IESO cancelling commitment – The *IESO* will only cancel a *day-ahead operational commitment* under **MR Ch.7 s.10.3.1** if 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 *market participants* before cancelling the *day-ahead operational commitment*.

Revise dispatch data – Where a *market participant* for *GOG-eligible resource* will not be supplying committed energy as a result of the *IESO* cancelling a *day-ahead 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**.

8.3 Day-Ahead Operational Commitment Cancellation Cost Recovery

(MR Ch.9 ss.3.3 and 4.11)

Cancellation after the start of a day-ahead operational commitment – In the event that the *IESO* cancels a *day-ahead operational commitment* after the *resource* has reached its MLP, the total *start-up offer* will be included in the assessment of the generator offer guarantee as well as the *speed no-load offer* incurred for the hours that the *resource* was operating at or above *MLP*.

Cancellation before the start of a day-ahead operational commitment – If the *IESO* cancels a *day-ahead operational commitment* before the *resource* has reached its MLP, the *start-up offer* will not be included in the assessment of the generator offer guarantee. 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 cost compensation credit.

Potential compensation for cancelled commitments – The *resource* may be eligible for the *day-ahead market* balancing credit, refer to **MM 5.5 s.2.9**.

– End of Section –

9 Day-Ahead Market Remediation

(MR Ch.7 ss.7.6 and 8.4A)

No DAM failure – Market remediation may be conducted if the *IESO* identifies an error after the *day-ahead market* results are *published* or issued that was caused by an *IESO* input error. This is only applicable where the *IESO* has not declared a failure of the *day-ahead market*.

Retroactive administrative pricing – The *IESO* will retroactively establish *day-ahead market 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**.

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 *day-ahead market* where:

- the *IESO* identifies a pricing error in the *day-ahead market* 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**;
- the *IESO* does not identify a pricing error that has occured in the *day-ahead market* within four *business days* after the *dispatch day* (**MR Ch.7 s.8.4A.3**); and
- the *IESO* identifies an error that has impacted *day-ahead schedules,* regardless of how many days have elapsed since the relevant *dispatch day*.

Administrative pricing notification – The *IESO* will publish an administrative pricing notification in accordance with **MR Ch.7 s.8.4A.3A** in the following circumstance:

- the *IESO* has established *day-ahead 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: Day-Ahead Market Calculation Engine

Day-ahead market calculation engine passes – Figure A-1 summarizes the functions of each pass of the *day-ahead calculation engine*.

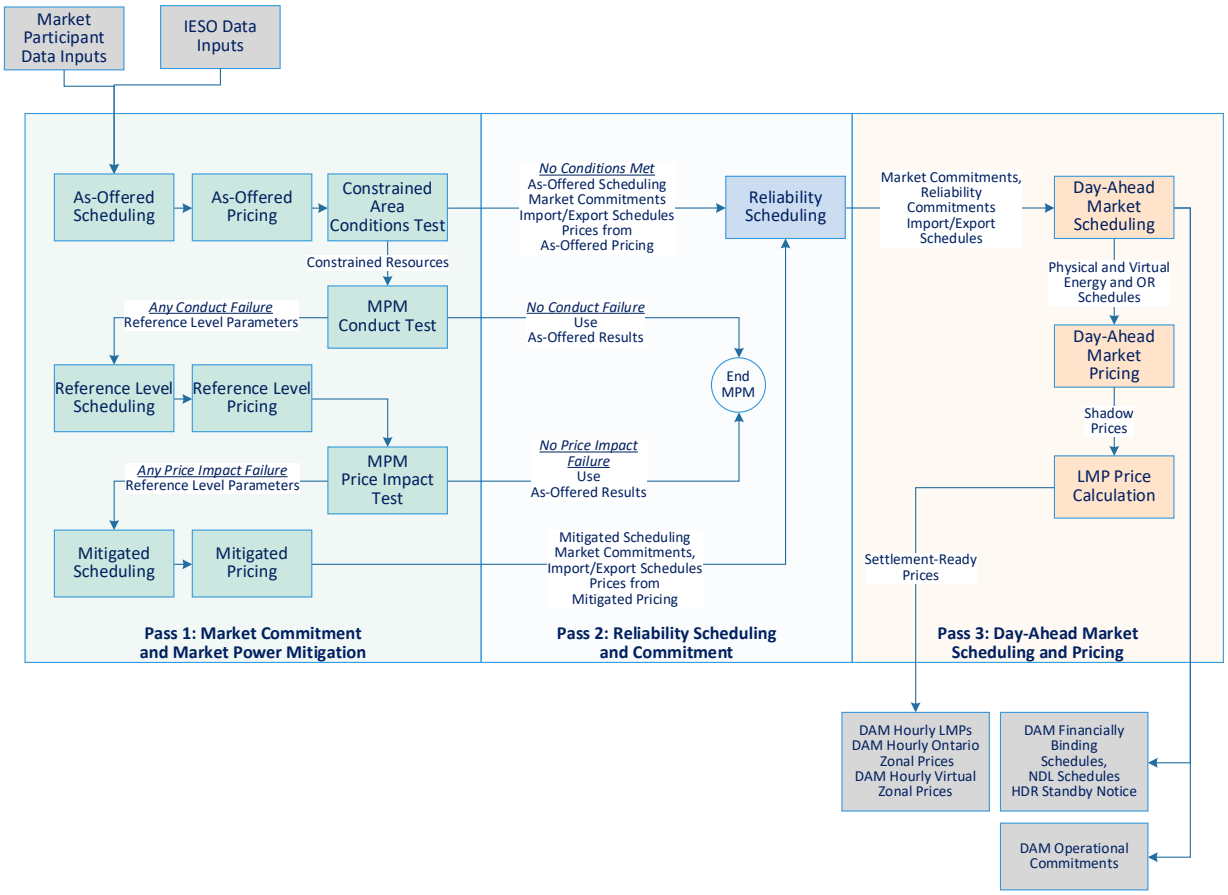

Figure A-1: Day-Ahead Market Calculation Engine Passes

A.1 Pass 1 – Market Commitment and Market Power Mitigation

(MR Ch.7 s.4.6.1.1)

Co-optimization – The Market Commitment and Market Power Mitigation pass (Pass 1) co-optimizes *energy* and *operating reserve* for the next *dispatch day* to meet the *IESO's* hourly zonal average non-*dispatchable demand* forecasts and hourly *operating reserve* requirement. Pass 1 determines a set of initial prices,

resource schedules and, for *GOG-eligible resources*, *day-ahead operational commitments*.

Evaluation – The data evaluated in Pass 1 includes *non-dispatchable generation resource schedules* and *dispatch data* for *dispatchable generation resources* or *electricity storage resources*, *self-scheduling generation resources*, *dispatchable loads*, *price responsive loads*, *hourly demand response resources*, imports, exports and *virtual transactions*.

Ex-ante market power mitigation – Pass 1 will perform the tests related to the ex-ante market power mitigation process provided by **MR Ch.7 ss.22.13** and **22.14**.

A.2 Pass 2 – Reliability Scheduling and Commitment

(MR Ch.7 s.4.6.1.2)

Reliability scheduling – The Reliability Scheduling and Commitment pass (Pass 2) assesses whether additional *resources* are required to meet hourly zonal peak non-*dispatchable demand* and hourly *operating reserve* requirements.

Virtual transactions – Pass 2 does not evaluate *virtual transactions*.

Price responsive loads/variable generation resources – Pass 2 will use the *IESO* centralized *variable generation forecast quantities* provided by **MR Ch.4 s.7.3.5** and the *IESO's* forecast of *demand* from *price responsive loads* and *self-scheduling electricity storage resources* intending to withdraw. Pass 2 will use this information in lieu of *bids* submitted for *price responsive loads* and *self scheduling electricity storage resources*, and submitted *variable generation forecast quantities*.

Day-ahead operational commitments – Pass 2 may establish any *day-ahead operational commitments* in addition to those established in Pass 1.

Boundary entity resource schedules – Import schedules for *boundary entity resources* will not decrease and export schedules for *boundary entity resources* will not increase from Pass 1.

Information carried over from Pass 1 – Pass 2 will use the following information from Pass 1:

- provisional day-ahead schedules and day-ahead operational commitments from Pass 1; and
- *dispatch data* used in Pass 1, including any revisionsin accordance with the applicable market power mitigation processes provided by **MR Ch.7 s.22**.

A.3 Pass 3 – Day-Ahead Market Scheduling and Pricing

(MR Ch.7 s.4.6.1.3)

Financially-binding outcomes – The Day-Ahead Market Scheduling and Pricing pass (Pass 3) produces the financially binding *day-ahead schedules* and prices, and *day-ahead operational commitments*.

Day-ahead operational commitments – Pass 3 may establish any *day-ahead operational commitments* in addition to those established in Passes 1 and 2.

Boundary entity resource schedules – Import schedules for *boundary entity resources* will not decrease and export schedules for *boundary entity resources* will not increase from Pass 2.

Information carried over from Pass 1 – Pass 3 uses the same set of *market participant* and *IESO* inputs used in Pass 1, including any revisions in accordance with the applicable market power mitigation processes provided by **MR Ch.7 s.22**.

– End of Appendix –

Appendix B: Detailed IHO Calculation

Initial hour of operation (IHO) is used to process *start-up offers* for *generators* for input to the *day-ahead market calculation engine* and facilitate the treatment of MGBRT over midnight. The *day-ahead market calculation engine* will not consider *start-up offers* for *dispatchable generation resources* that are already in operation in the last hour of the current day to determine the first hour of the *day-ahead schedule*. The *day-ahead market calculation engine* will determine the number of hours the *generation resource* must run to satisfy any MGBRT requirement remaining from the previous day's commitment.

Determining IHO will be triggered by the calculation of resource initial schedule (RIS). RIS is computed as part of each *day-ahead market calculation engine* run, and represents the *dispatchable resource's* schedule in HE24 as determined by the most recent *pre-dispatch schedule* results for the current *dispatch day*. RIS is determined only for *dispatchable generation resources* and *loads*.

The calculation of IHO will use:

- the results of the most recent *pre-dispatch calculation engine* results for Day 0; and
- the Day 0 'constrained on' status in the Contract Manager application from the most recent *pre-dispatch calculation engine* results for Day 0.

For *pseudo-units*, this determination is based on the combustion turbine (CT) associated with the *pseudo-unit*, not the ST.

For the nth *resource* IHO is determined as follows:

If $RIS_n \neq 0$ for HE24 and $CMSC24_n$ = "No:

$$IHO_n = 24$$

Otherwise:

$$IHO_n = \min(0, CMIHOn)$$

Where:

IHO_n	=	A non-negative integer representing the consecutive hours of operation of a *resource* before the end of the current day (Day 0)
RIS_n	=	*Dispatchable generation resource* n initial *resource* schedule
$CMCS24_n$	=	*Dispatchable generation resource n* constrained on status in the last study time of Day 0 as determined by whether it has an active

minimum constraint contract in the last study time of Day 0 in *Resource* Constraint Data:

- Yes – denotes constrained on with minimum constraint contracts
- No – denotes no constraint

$CMIHO_n$ = The number of consecutive hours the *dispatchable generation resource n* is constrained on in *Resource* Constraint Data at the end of Day 0 as determined by its active minimum constraint contracts Day 0

Based on the above formula, the IHO can have the following values:

IHO = 0 The *dispatchable generation resource* is not in operation in the last study time of Day 0 (i.e. RIS = 0)

$0 < IHO \leq 24$ The *dispatchable generation resource* is in operation in the last study time of Day 0 (i.e. RIS ≠ 0); and

The *dispatchable generation resource* has a constraint in the last study time of Day 0 in *Resource* Constraint Data as determined by the active minimum constraint contracts in Day 0

IHO = 24 The *dispatchable generation resource* is in operation in the last study time of Day 0 (i.e. RIS ≠ 0); and

The *dispatchable generation resource* does not have a constraint in the last study time of Day 0 in *Resource* Constraint Data as determined by the active minimum constraint contracts in Day 0

B.1 Last Status Change Time

The Last Status Change Time represents the time when the last status change occurred. The rules for calculating the Last Status Change Time are listed in Table B-1.

Table B-1: Last Status Change Time

Initial Status	Initial Schedule (RIS)	IHO	CMCS24	Last Status Change Time (YYYYMMDD HH:MM:00)
OFF	0	0	No	The timestamp of the last hour of Day 0 – MGBDT hours This is to ensure that the *generation resource* will not be kept off at the

Initial Status	Initial Schedule (RIS)	IHO	CMCS24	Last Status Change Time (YYYYMMDD HH:MM:00)
				beginning of the day due to MGBDT constraint.
ON	≠ 0	0 < *IHO* ≤ 24	Yes	The timestamp of the first hour of Day 1 – IHO hours
OFF	≠ 0	24	No	The timestamp of the first hour of Day 1 – Max (24, MGBRT) hours This is to ensure that the *generation resource* will not be kept on at the beginning of the day due to MGBRT constraint.

Note: To satisfy the *generation resource* MGBRT over midnight, the *day-ahead market calculation engine* uses IHO and Day 1 MGBRT (not Day 0 MGBRT). A *dispatchable generation resource* may receive a *day-ahead market* schedule at the end of a day prior to the *dispatch day,* even if MGBRT has not been completed within that day. On the next day prior to the *dispatch day* (Day 1), the *day-ahead market calculation engine* will commit the *dispatchable generation resource* at the beginning of the day to satisfy its incomplete MGBRT from the previous day (Day 0).

B.2 Net Interchange Schedule Calculation

The initial net *interchange schedule* is calculated as Total Imports minus Total Exports, where:

- Total imports = $\sum$ *Energy* imports from all external sources for the last study time from the most recent pre-dispatch run
- Total exports = $\sum$ *Energy* exports to all external sinks for the last study time from the most recent pre-dispatch run

– End of Appendix –

Appendix C: 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 used in the *day-ahead market* and the *real-time market* and 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 C.1 and C.2.

C.1 Penalty Price Curves in the Scheduling Algorithm

Penalty price curves specific to the scheduling algorithms 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 C-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 C-1: Penalty Curves in the Scheduling Algorithm

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

Penalty Curve Name	Penalty Price	Calculation Engine(s)	Description
Energy Balance	Under generation: $30,000/MWh Over generation: (-$30,000)/MWh	All	The *IESO* 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 *day-ahead market* and *pre-dispatch calculation engines* use a $35,000/MW penalty price for all magnitudes of NISL violations.
Downstream under or over generation[1]	$37,000	DAM, PD	The penalty price for all magnitudes of downstream over or under generation is $37,000. This penalty price enables the *day-ahead market* and *pre-dispatch calculation engines* to resolve when hydroelectric constraints are in conflict.
Intertie	$40,000/MW	DAM, PD	The penalty price for all magnitudes of *intertie* limit violations is $40,000.
Daily Energy Limits	$100,000/MW	DAM, PD	The penalty price for all magnitudes of daily energy limit violations is $100,000

C.2 Penalty Price Curves in the Pricing Algorithm

Penalty price curves specific to the pricing algorithms are used by the calculation engines to ensure that they continue to produce prices when constraint violations occur. Multiple *price-quantity pair* penalty curves may be used in the pricing algorithms 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);

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

- breakpoint quantities are defined in megawatts (MW); and
- 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 B-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 Board* 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* shall advise *market participants* of such changes.

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

Table C-2: Penalty Curves in the Pricing Algorithm

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

Penalty Curve Name	Description
	highest price point of the *price-quantity pairs* used for the *30-minute operating reserve* constraint. The penalty prices used for the synchronized *ten-minute operating reserve* constraint are higher than the prices used for the total *ten-minute operating reserve* constraint such that the cumulative prices in the *operating reserve* constraint violation price curve rise in a graduated fashion as the *operating reserve* shortage progresses from a shortage in total *thirty-minute operating reserve* to a shortage in total *ten-minute operating reserve* and then finally to a shortage in synchronized *ten-minute operating reserve*.
Operating Reserve - area	The *day-ahead market*, *pre-dispatch* and *real-time calculation engines* use penalty prices for the maximum area *operating reserve* constraint that are equal to the penalty prices used for the second price-percentage pair in the transmission *security limit* constraint violation penalty curve described further below. The *day-ahead market*, *pre-dispatch* and *real-time calculation engines* use a penalty price for the minimum area *operating reserve* constraint that is equal to the lowest penalty price used for the system-wide total *10-minute operating reserve* constraint violation penalty curve.
Operating Reserve - flexibility	The *day-ahead market*, *pre-dispatch* and *real-time calculation engines* use a penalty price for the flexibility *operating reserve* constraint that is equal to or below the constraint violation penalty curve for the system-wide total *thirty-minute operating reserve*.
Energy Balance	The *day-ahead market*, *pre-dispatch* and *real-time calculation engines* 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 *offers* of *energy* for *registered facilities* will be evaluated first. The penalty prices will be set high enough so that it does not displace an *offer* of *energy* at up to *MMCP* while taking into account transmission losses and the impact of *operating reserve* joint optimization. For over-generation constraints, the *day-ahead market*, pre-dispatch and *real-time calculation engines* use penalty prices low enough so that the calculation engines do not use the violation price before using a *dispatchable load bid* at negative *MMCP* with high transmission losses.

Penalty Curve Name	Description
Transmission Security	The *day-ahead market*, *pre-dispatch* and *real-time calculation engines* will use two price ($) / percentage (%) pairs for all transmission *security limit* 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 *security limit*. The second price-percentage pair shall represent any constraint exceedance above 2%. The *IESO* will determine the penalty prices used based on historical shadow prices for binding and violated transmission *security* constraints. 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. The price of the second price-percentage pair shall be greater than *MMCP* and based on the division of the *MMCP* 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 *security* constraints.
NISL	The *day-ahead market*, *pre-dispatch* and *real-time calculation engines* use a single penalty price for all magnitudes of NISL constraint violations that is based on the 99th percentile of historical NISL congestion prices.
Intertie	The *day-ahead market* and *pre-dispatch calculation engines* use a single penalty price for all magnitudes of *intertie* constraint violations. 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 *energy* balance constraints and the second *price-quantity pair* of the transmission *security* constraint violation price curve.
Daily Energy Limits	The *day-ahead market* and *pre-dispatch calculation engines* use a single penalty price for all magnitudes of daily energy limit violations. The penalty price is set above all other penalty prices in order to minimize the daily energy limit violations, while still providing a feasible region for the calculation engine to be solved.

– End of Appendix –

List of Acronyms

Acronym	Term
ADE	*availability declaration envelope*
CRS	commercial reconciliation system
CT	combustion turbine
DAM	*day-ahead market*
DSO	*dispatch* scheduling and optimization
EPT	Eastern Prevailing Time
EST	Eastern Standard Time
GOG	*generator offer guarantee*
IHO	initial hour of operation
MGBDT	*minimum generation block down-time*
MGBRT	*minimum generation block run-time*
MIN	minimum
MLP	*minimum loading point*
MMCP	*maximum market clearing price*
MW	megawatt
MWh	megawatt hour
NISL	net interchange scheduling limit
RIS	resource initial schedule
SMO	*segregated mode of operation*
ST	steam turbine
VG	*variable generation*

– End of Section –

References

Document ID & Link	Document Title
MDP_RUL_0002	Market Rules
TBD	Market Manual 5.5: IESO-administered Markets Settlement Amounts
MDP_PRO_0040	Market Manual 7.1: IESO-controlled Operating Procedures
IMP_PRO_0033	Market Manual 7.2: Near-Term Assessments and Reports

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