PUBLIC

PROCEDURE

Part 14.1: Market Power Mitigation Procedures

Issue 7.0
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 describes the activities to be undertaken by the *IESO* and *market participants* to complete the market power mitigation procedures required to participate in the *day-ahead market* and the *real-time market*.

Document Change History

Issue	Reason for Issue	Date
1.0	Draft for Stakeholder Review	August 12, 2021
2.0	Updated after	December 17, 2021
3.0	Updated after considering external stakeholder review	July 14, 2022
4.0	Updated to reflect Market Renewal Program procedures as part of the Interim Alignment Batch	September 9, 2022
5.0	Updated to reflect changes to Market Renewal Program procedures as part of ongoing implementation	March 16, 2023
6.0	Updated to reflect changes to Market Renewal Program procedures as part of ongoing implementation	December 1, 2023
7.0	Updated for MRP – Final Alignment	June 7, 2024

Related Documents

Document ID	Document Title
TBD	Market Manual 14.2: Reference Level and Reference Quantity Procedures

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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 Manual Conventions

This *market manual* uses the following standard 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 *market manual* sections and sub-sections may be abbreviated in accordance with the following representative format: '**MM 1.5 ss.1.1-1.2**' (i.e. *market manual* 1.5, sections 1.1 to 1.2).

- Internal references to sections and sub-sections within this manual take the representative format: 'sections 1.1 – 1.2'

- Terms and acronyms used in this *market manual* in its appended documents that are italicized have the meanings ascribed thereto in **MR Ch.11**;

- All user interface labels and options that appear on the *IESO* gateway and tools are formatted with the bold font style; and

- Data fields are identified in all capitals.

1. Introduction

This *market manual* describes the market power mitigation framework and the processes by which the *IESO* shall assess the exercise of global market power and local market power, and specifically the:

- designation of constrained areas;

- designation of uncompetitive *intertie zones*;

- determination of *global market power reference intertie zones*;

- ex-post mitigation for *physical withholding*; and

- ex-post mitigation of *intertie economic withholding* on an uncompetitive *intertie zone*.

The *IESO's* assessment and mitigation of the exercise of market power, including testing and any related step by the *IESO*, shall not constitute a review for compliance with any *market rule*, including **MR Ch.1 s.10A** or **s.11**.

1.1. Purpose

This *market manual* provides administrative and procedural details to the *market rules* governing market power mitigation processes, including supplementary information relevant to understanding the rights and obligations of the *IESO* and *market participants*.

Market manuals must be read in conjunction with the applicable *market rules.* Where there is a conflict between a *market manual* and the *market rules*, the *market rules* shall prevail.

1.2. Scope

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

- MR Ch.7 s.22.1: Reference Levels - General

- MR Ch.7 s.22.10: Designation of Constrained Areas

- MR Ch.7 s.22.11: Global Market Power Reference Intertie Zones

- MR Ch.7 s.22.12: Uncompetitive Intertie Zones

- MR Ch.7 s.22.14: Ex-Ante Mitigation of Economic Withholding

- MR Ch.7 s.22.15: Ex-Post Mitigation of Physical Withholding

- MR Ch.7 App.7.5: The Day-Ahead Market Calculation Engine Process

- MR Ch.7 App 7.5A: The Pre-Dispatch Calculation Engine Process

- MR Ch.7 App 7.6: The Real-Time Calculation Engine Process

- MR Ch.9 s.5.4: Ex-Post Mitigation for Physical Withholding

- MR Ch.9 s.5.5: Ex-Post Mitigation for Economic Withholding on Uncompetitive Interties

1.3. Overview

1.3.1. Reference Levels and Reference Quantities

This manual describes how *reference levels* and *reference quantities* are used in some of the *IESO's* ex-ante and ex-post market power mitigation processes. For a detailed description of the processes used to establish and calculate *reference levels* and *reference quantities*, refer to **MM 14.2**.

1.3.2. Designation of Constrained Areas and Global Market Power Reference Intertie Zones

This manual describes the processes the *IESO* uses to designate *potential constrained areas*, *narrow constrained areas*, *dynamic constrained areas* and *global market power reference intertie zones* used in ex-ante market power mitigation. For the *market rules* that apply to the ex-ante market power mitigation processes, refer to **MR Ch.7 s.22.14, Appendix 7.5 – Appendix 7.5A**.

Section 2 describes the designation of constrained areas, which affect when *offers* are tested for ex-ante mitigation and which conduct and impact thresholds are used in these tests.

Section 4 describes the designation of *global market power reference interties*, which affect when *offers* are tested for ex-ante mitigation for global market power.

1.3.3. Ex-Post Mitigation

This manual describes processes the *IESO* uses to assess *physical withholding* and *intertie economic withholding.*

Section 5 describes how ex-post mitigation for *physical withholding* is carried out by the *IESO* including conditions for testing, conduct and impact thresholds, opportunities for *market participant* input and potential outcomes of a finding of *physical withholding*.

Section 6 describes how ex-post mitigation for *intertie economic withholding* is carried out by the *IESO*, including conditions for testing, conduct and impact thresholds,

opportunities for *market participant* input and potential outcomes of a finding of *intertie economic withholding*.

Section 3 describes the designation of uncompetitive *intertie zones*, which affect when *offers* or *bids* from *intertie* traders are tested for ex-post mitigation for *intertie economic withholding*.

1.3.4. Settlement Mitigation

This manual describes the conduct and impact thresholds used in make-whole payment mitigation. Refer to **MM 5.5** for more details on make-whole payments that are subject to *settlement* mitigation.

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.

As part of the authorization and registration process,[1] *market participants* are required to identify a Market Power Mitigation Contact. If a *market participant* has not identified a specific contact, the *IESO* will seek to contact the Primary Contact for activities within this procedure, unless alternative arrangements have been established between the *IESO* and the *market participant*.

To contact the *IESO*, *market participants* 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. The *IESO* Customer Relations staff will respond as soon as possible.

— End of Section —

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[1] Refer to **MM 1.5** for adding and updating contact roles with the *IESO*.

2.   Designation of Constrained Areas

The *IESO* identifies circumstances when competition may be restricted in localized areas and designates these areas as *potential constrained areas*. The *IESO* identifies *potential constrained areas* that are regularly impacted by binding transmission constraints. Depending on how frequently the transmission constraints bind in an area, a *potential constrained area* may be subsequently designated as one of the following:

- a *narrow constrained area* (*NCA*); or
- a *dynamic constrained area* (*DCA*).

2.1. Potential Constrained Area Designations

(MR Ch.7 s.22.10.1)

When identifying and revising *potential constrained area* designations, the *IESO* will consider relevant configuration changes to the *IESO-controlled grid*, which can include, but are not limited to:

- network model build updates, such as the addition or removal of a transmission *facility* or a *resource*;
- system configuration changes that can affect a *potential constrained area*, such as new or removed transmission *facilities* and changed operating *security limits* (OSLs);
- the need to add or remove a *dispatchable resource* to a *potential constrained area*;
- a long-term *outage* that could affect a *potential constrained area*, such as a transmission *facility outage* or a *generation facility outage*; and
- system element, transmission line, *resource*, or OSL name changes that may impact corresponding element names used in *potential constrained area*s.

2.1.1. Input Data

The data that the *IESO* will consult when identifying and revising *potential constrained area* designations may include, but is not limited to:

- the real-time *locational marginal price* (*LMP*) congestion component (based on five-minute intervals) for the previous 365 days;
- the sensitivity factors or generation shift factors (GSFs) of different *resources* on different transmission line constraints and OSLs;

- the Zone ID for each *resource*, which represents the zone the *resource* belongs to among the 10 zones in Ontario (e.g. Toronto, East, Northwest, etc.);

- the list of exisiting transmission *facilities*, branch groups, OSLs and previously identified *potential constrained area*s;

- the real-time five-minute historical binding data including shadow prices for transmission *facilities* and OSLs, *outages*, and the GSFs for the previous 365 days; and

- the impact of actual or expected material configuration changes to the *IESO-controlled grid* in the next 365 days on the congestion component of *LMPs*, sensitivity factors or GSFs and OSLs.

2.1.2. Methodology

The process by which the *IESO* identifies and revises *potential constrained area* designations consists of two activities:

1. grouping *resources* whose *real-time market LMP* congestion components are closely correlated into a *potential constrained area*; and

2. identifying the transmission *facilities*, branch groups and/or related OSLs for that *potential constrained area*, where the *resources* identified in the first activity can resolve import congestion on those constraints.

Inputs:

The *IESO* relies on various inputs in order to carry out the activities described above. These inputs include, but are not limited to, the following:

- analysis of the historical and prospective *resources'* annual real-time congestion *LMP* component; specifically:
  - the frequency that real-time congestion components are greater than zero; and
  - in areas with negative congestion components, the difference between real-time congestion components.

- temporal correlations between the real-time congestion *LMP* components; and

- other information that identifies relative electrical proximity of *resources*.

Activity 1: Grouping Resources into Potential Constrained Areas

The *IESO* may group the resources according to *potential constrained area* by:

- determining the electrical zone that each *resource* is located within;
- comparing annual average of the congestion *LMPs*;

- calculating the mean square error of the congestion LMP probability density functions;
- calculating the temporal correlation coefficient for all *resources* against other *resources* to identify occasions when congestion at one *resource* moves similarly to congestion at other *resources*;
- comparing sensitivity factors of *resources* on the same transmission *facilities,* branch groups or OSLs to determine the electrical proximity of *resources* to other *resources* and the direction of their power injection*.*

The above analysis will be jointly considered to identify which *resources* should be grouped into each *potential constrained area.*

Activity 2: Identifying Transmission Facilities and Branch Groups for each Potential Constrained Area

The *IESO* will determine the transmission *facilities* and branch groups for each *potential constrained area* by first calculating the temporal correlation between the congestion LMP component and the real-time five-minute historical and prospective shadow prices for *transmission facilities* and OSLs.

This will identify a list of prospective transmission *facilities* and branch groups that may be added to a particular *potential constrained area.*

The *IESO* will then identify the sensitivity factors that apply for each *resource* in each group for each transmission *facility* and OSL related to a relevant branch group.

Where the group of *resources* in a *potential constrained area* have a significantly high sensitivity factor against a particular transmission *facility* or OSL related to a relevant branch group, that constraint will be added to the *potential constrained area.*

To supplement this analysis, the *IESO* may confirm the relationship between a particular OSL or transmission *facility* and a *resource* through historical analysis. This involves comparing the sensitivity factor of a resource against the transmission *facility* or OSL to the historical congestion component that occurred at a *resource*. Where this historical analysis shows that the transmission *facility* or OSL is not strongly related to the congestion component at a *resource*, that transmission *facility* or OSL will not be included in the *potential constrained area.*

2.2. Narrow Constrained Area Designation

2.2.1.Applying Designation Criteria
(MR Ch.7 s.22.10.2.2)

When designating a *potential constrained area* as a *narrow constrained area*, the *IESO* considers a *potential constrained area* import constrained if at least one transmission

facility or OSL related to a relevant branch group is binding in either the *day-ahead market (DAM)* or the *real-time market (RTM)*. A transmission *facility* or OSL is considered to be binding when the shadow price on the relevant constraint is non-zero.

When multiple transmission *facilities* or OSLs related to a relevant branch group in a *potential constrained area* are binding in the same hour, a single hour will be counted toward the 4% condition for *narrow constrained area* designation (see Figure 2-1).

The *IESO* assesses whether a *potential constrained area* is import constrained in the *day-ahead market* on an hourly basis. For the *real-time market*, if the *potential constrained area* was import constrained for one interval within an hour, the entire hour will be considered to have been import constrained. If the full data set is not for the *IESO*-determined study period, the *IESO* will use the data that is available in the study period to make the designation and whether the *potential constrained area* was import constrained in more than 4% of the hours will be assessed against that reduced data set.
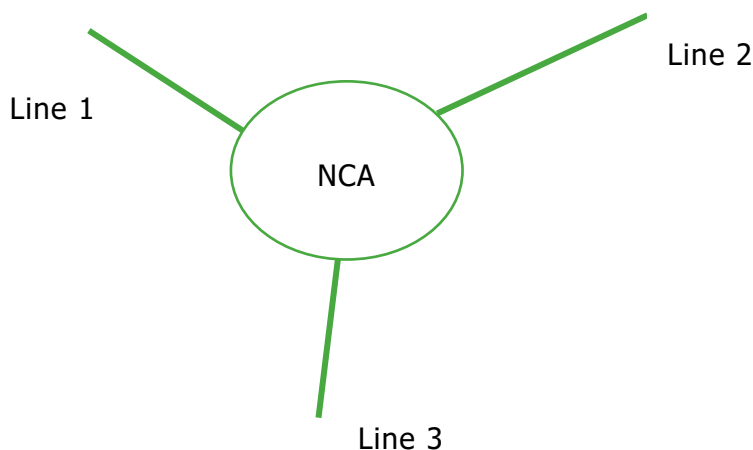
In this hypothetical *narrow constrained area*, Line 1 and Line 2 were binding at the same hour. This would be counted as 1 hour toward satisfying the requirement that 4% of the transmission *facilities* or OSLs were binding in the previous 365 days.

Figure 2-1: Sample NCA

2.2.2. Publication

(MR Ch.7 s.22.10.2.1 and 22.10.2.3)

Although the *IESO* designates *NCAs* once a year, it *publishes* a daily report pursuant to **MR Ch.7 s.22.10.2.1** that includes the following information:

- version number;
- *publication* date and the dates upon which an *NCA* designation or removal takes effect;

- the *dispatchable generation resources* and *dispatchable electricity storage resources* within each *NCA*;

- a list of the transmission *facilities* and branch groups that make up each *NCA*; and

- the congestion frequency data that the *IESO* used to determine such designation.

The *IESO publishes* a daily *NCA* report because it may update the *NCA* designations pursuant to **MR Ch.7 s.22.10.2.3** at any time to:

- remove a *resource* from an existing *NCA* if that *resource* no longer requires *reference levels* in accordance with **MR Ch.7 s.22.1.1**; and

- update the name of for any system element (transmission *facility*, *resource*, or branch group) used in existing *NCAs*.

Transmission *facilities* and OSLs will not be added or removed from an *NCA*, nor will *NCA* designations be changed, in updates made pursuant to **MR Ch.7 s.22.10.2.3**.

2.2.3. Effective Date

(MR Ch.7 s.22.10.2.4)

NCA designations made pursuant to **MR Ch.7 s.22.10.2.1** will come into effect no sooner than thirty *business days* following the *publication* of the report. Any changes made pursuant to **MR Ch.7 s.22.10.2.3** will come into effect no sooner than two days following the update.

2.3. Dynamic Constrained Area Designation

2.3.1. Applying Designation Criteria

(MR Ch.7 s.22.10.3)

When designating a *potential constrained area* as a *dynamic constrained area* pursuant to **MR Ch.7 s.22.10.3.1**, the *IESO* considers a *potential constrained area* import constrained if at least one transmission *facility* or OSL related to a relevant branch group is binding for a *dispatch hour*. A transmission *facility* or OSL is considered to be binding when the shadow price on the relevant constraint is non-zero.

When multiple transmission *facilities* or OSLs related to a relevant branch group in a *potential constrained area* are binding in the same hour, a single hour will be counted toward the 4% condition for *NCA* designation made pursuant to **MR Ch.7 s.22.10.3.2**.

For the *real-time market*, if the *potential constrained area* was import constrained for one interval within an hour, the entire hour will be considered to have been import constrained.

For example, Table 2-1 displays the designation for a hypothetical *DCA* in the *day-ahead market* based on the accumulated hours for a period of 12 days. The table shows that the area was binding for four hours for five days in a row (Day-1 to Day-5).

At 06:00 on Day-6, 20 hours were binding in the previous 120 hours (Day-1 to Day-5). As this is more than 15% of the previous 120 hours (i.e. 18 hours), the criterion for designating the *DCA* is satisfied.

The *DCA* was designated from Day-6 onward from Day-6 to Day-10 (i.e., for five days), regardless of the number of binding hours in those days because 120 hours must pass before the designation will be reassessed.

After the first 120 hours following a *DCA* designation, the status of the designation is reassessed every day on a rolling basis. For the *day-ahead market*, the status is assessed at 06:00 every day for the next *dispatch day*.

At 06:00 on Day-10, the status of the designation is determined for Day-11. At that time the number of binding hours is calculated for the preceding 120 hours, which in this case was 21 hours (higher than 18 hours). Therefore, the *DCA* designation is extended for Day-11 in the *day-ahead market*.

At 06:00 on Day-11, the status of the designation is determined for Day-12. At that time, the number of binding hours for the last 120 hours was only 14 hours (lower than 18 hours), so the *DCA designation* is removed for Day-12 in the *day-ahead market*.

Table 2-1: Designation of DCAs in DAM Based on the Accumulated Hours

Day	Day -1	Day -2	Day -3	Day -4	Day -5	Day -6	Day -7	Day -8	Day -9	Day -10	Day -11	Day -12
Number of Binding Hours	4	4	4	4	4	7	0	4	5	5	0	7
Accumulated Binding Hours (for the last 120 hours)	0	4	8	12	16	20	23	19	19	20	21	14
DCA Active	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No

2.3.2.Publication

(MR Ch.7 s.22.10.3.4)

The *IESO* publishes the DAM DCA Designation Report daily and the RTM DCA Designation Report hourly.

Both the DAM DCA Designation Report and the RTM DCA Designation Report include the following information:

- version number;

- *publication* and effective dates; *publication* date and the date and time when the *DCA* designation or removal of designation takes effect;

- information that indicates whether the *DCA* designations in that report apply to the *day-ahead market* or the *real-time market*;

- information that indicates that a *potential constrained area* is designated as a *DCA*;

- the *dispatchable* and *non-dispatchable generation resources* and *dispatchable loads* within each *DCA*;

- a list of the transmission *facilities* and branch groups that make up the *DCA* including the number of binding hours for each transmission *facility*; and

- the congestion frequency data that the *IESO* used to determine such designation.

– End of Section –

3. Designation and Removal of Designation for Uncompetitive Intertie Zones

(MR Ch.7 s.22.12)

This section provides additional details with respect to the processes the *IESO* uses to designate and remove designations for uncompetitive *intertie zones* in accordance with **MR Ch.7 s.22.12**.

The process that the *IESO* uses to assess *intertie economic withholding* on an uncompetitive *intertie zone* is further detailed in [section 6](#) of this manual.

3.1. Conditions Restricting Competition in an Intertie Zone

(MR Ch.7 s.22.12.1)

The conditions for designating an *intertie zone* as uncompetitive are provided in **MR Ch.7 s.22.12.1**. If full data set is not available for a calendar quarter, the *IESO* will use the data that is available to make the designation and whether a *market participant* received ninety percent of the *day-ahead market* scheduled *energy* withdrawals or injections will be assessed against that reduced data set.

The *IESO* considers the following conditions as restricting competition when determining whether effective competition in an *intertie zone* is or will be restricted as described in **MR Ch.7 s.22.12.1.2**:

- lack of a market for supply of imports or demand for exports with open access to transmission in the neighbouring *control area*;
- the existence of institutional or regulatory barriers to trading in the neighbouring *control area*;
- the existence of physical barriers to trading in the neighbouring *control area*, such as limited transmission controlled by one party or captive load at the *intertie zone*; and
- the existence of economic barriers to trading in the neighbouring *control area*, such as substantial transmission access fees.

If, following the *IESO's* assessment, an *intertie zone* that is designated as uncompetitive no longer meets the criteria that resulted in the designation, but the *IESO* reasonably expects that the criteria will be met following a transitory period, the designation will not be removed.

If the *IESO* designates an *intertie zone* as uncompetitive under **MR Ch.7 s.22.12.1.2** due to an expected future restriction to competition on that *intertie zone*, then the effective date for the designation will be no sooner than the date when competition is expected to be restricted.

3.2. Publication

(MR Ch.7, s.22.12.4)

The *IESO publishes* the following information regarding a change to an *intertie zone's* designation status:

- the relevant *intertie zone*;

- whether the *intertie zone* was designated as uncompetitive or had its designation removed;

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- the *publication* date of the change;

- the effective date of the change;

- the criteria the *IESO* used in its decision to designate the *intertie zone* as uncompetitive or to remove such designation, as the case may be.

– End of Section –

4. Determination of Global Market Power Reference Intertie Zones

4.1. Evaluating Designations of Global Market Power Reference Intertie Zones

(MR Ch.7 s.22.11.1)

The *IESO* considers *intertie zones* that have at least 500 MW of total transfer capacity absent de-rates, *outages* or effects of ambient conditions, to be of sufficient size relative to the *IESO-administered markets* to be able to provide effective competitive discipline.

The *IESO* may modify and evaluate the designation of *global market power reference intertie zones* when:

- a new *intertie zone* is added;

- there is a material change in the amount of electricity trade that an existing *intertie zone* can accommodate; or

- there is a material change in market structure or regulation in a neighbouring *control area*.

4.2. Publication

(MR Ch.7 s.22.11.3)

The *IESO publishes* the following information regarding a change to a *global market power reference intertie zone* designation status:

- the relevant *global market power reference intertie zone*;

- the criteria that resulted in a change to a designation;

- the *publication* date of the change; and

- the effective date of the change.

Designations remain in effect until a new designation takes effect.

— End of Section —

5. Ex-Post Mitigation for Physical Withholding

(MR Ch.7 s.22.15)

The *IESO* may assess *physical withholding* by a *resource* in both or either of the *day-ahead market* and the *real-time market* for a *dispatch day*. If the *IESO* selects a single market, the *IESO* will deem the MWs withheld in the other market to be 0 for all relevant *dispatch hours* when calculating the ex-post mitigation for *physical withholding settlement amount*.

5.1. Physical Withholding Timeline

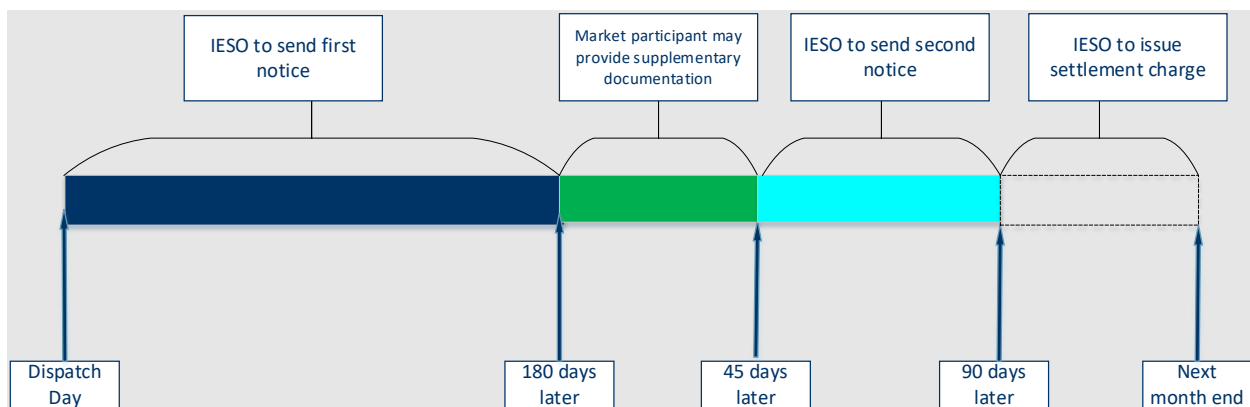Figure 5-1 illustrates the timeline associated with *physical withholding* assessment activities described above.

Figure 5-1: Sample Physical Withholding Assessment Timeline

The *IESO* will only issue one first notice per *dispatch day* to a *resource.* If the *IESO* discontinues an assessment after sending a first notice to the *market participant*, the *IESO* will notify the *market participant* of the discontinuation.

5.2. Using Reference Quantities

A *resource's* day-ahead *reference quantity value* is used to assess *physical withholding* by that *resource* in the *day-ahead market.*

A *resource's* real-time *reference quantity value* is used to assess *physical withholding* by that *resource* in the *real-time market.*[2]

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[2] For more information on how *reference quantities* are determined, refer to MM 14.2: Reference Level and Reference Quantity Procedures.

5.3. Determining Which Dispatchable Resources Meet the Conditions to Test for Physical Withholding

(MR Ch.7 ss.22.15.4 and 22.15.11)

The *IESO* considers the conditions in the *day-ahead market calculation engine* and the hour-ahead run of the *pre-dispatch calculation engine* when determining which *dispatchable resources* meet the conditions for testing for *physical withholding* of energy (**MR Ch.7 s.22.15.4**) or *operating reserve* (**MR Ch.7 s.22.15.11**).

In addition, to assess *physical withholding* that can impact a commitment decision for a *GOG-eligible resource*, the *IESO* considers the conditions in the hour-ahead run of the *pre-dispatch calculation engine* that was the last opportunity to operationally commit that *GOG-eligible resource* for a given *dispatch hour*. In these cases, a *GOG-eligible resource* must meet conditions for a given *dispatch hour* in both of these hour-ahead runs of the *pre-dispatch calculation engine*.

5.4. Conduct Test for Energy: Example

(MR Ch.7 ss.22.15.5, 22.15.6, and 22.15.7)

The following examples illustrate the conduct test for a set of hypothetical *resources* that share a *market control entity for physical withholding*:

- Table 5-1 represents the hypothetical *resources* assessed in accordance with the '*resource* conduct test', related to **MR Ch.7 ss.22.15.5.1.1** and **22.15.5.2.1**.

- Table 5-2 represents the same hypothetical *resources* assessed in accordance with the '*market control entity* conduct test', related to **MR Ch.7 ss.22.15.5.1.2** and **22.15.5.2.2**.

Note that the same *resources* may be assessed with respect to both the *resource* conduct test and the *market control entity* conduct test.

Table 5-1: Resource Conduct Test (Energy)

Resource Name	Constrained Area Condition	Eligible to be Tested for Resource Conduct Test?	Resource's Offered Energy Quantity	Resource's Reference Quantity	Resource Conduct Test Outcome
GENERATOR A	MR Ch.7 s.22.15.4.5	Yes	999 MW	1000 MW	Pass

Resource Name	Constrained Area Condition	Eligible to be Tested for Resource Conduct Test?	Resource's Offered Energy Quantity	Resource's Reference Quantity	Resource Conduct Test Outcome
GENERATOR B	None	No	N/A	N/A	N/A
GENERATOR C	MR Ch.7 s.22.15.4.3	Yes	0 MW	100 MW	Fail
GENERATOR D	MR Ch.7 s.22.15.4.3	Yes	198 MW	200 MW	Pass
GENERATOR E	MR Ch.7 s.22.15.4.4	Yes	198 MW	200 MW	Pass
GENERATOR F	MR Ch.7 s.22.15.4.4	Yes	198 MW	200 MW	Pass
GENERATOR G	MR Ch.7 s.22.15.4.4	Yes	198 MW	200 MW	Pass
GENERATOR H	MR Ch.7 s.22.15.4.4	Yes	0 MW	1000 MW	Fail
GENERATOR I	MR Ch.7 s.22.15.4.4	Yes	198 MW	200 MW	Pass
GENERATOR J	MR Ch.7 s.22.15.4.4	Yes	198 MW	200 MW	Pass

All of the *dispatchable resources* listed above (Generators A through J) are registered under the same *market control entity for physical withholding*.

GENERATOR B is not eligible to be tested for *physical withholding* as it has not met any constrained area condition.

GENERATOR C and GENERATOR H failed the *resource* conduct test and therefore will be tested under the impact test regardless of the outcome of the *market control entity* conduct test.

GENERATOR A and GENERATOR D have passed the *resource* conduct test with respect to the constrained area conditions that they have met but are still subject to be tested under the *market control entity* conduct test.

Seven *dispatchable resources* passed the *resource* conduct test and are, therefore, subject to be tested under the *market control entity* test. Of these seven, five (E, F, G, I and J) are tested under the *market control entity* test for **MR Ch.7 s.22.15.4.4**, one is tested under the *market control entity* test for **MR Ch.7 s.22.15.4.5** and one is tested under the *market control entity* test for **MR Ch.7 s.22.15.4.3**.

Table 5-2: Market Control Entity Conduct Test (Energy)

Resource Name	Constrained Area Condition	Eligible to be Tested for MCE Conduct Test?	Resources' Aggregate Offered Energy Quantity	Resources' Aggregate Reference Quantity	MCE Conduct Test Outcome
GENERATOR E, GENERATOR F, GENERATOR G, GENERATOR I, GENERATOR J	MR Ch.7 s.22.15.4.4	Yes	990 MW	1000 MW	Fail
GENERATOR A	MR Ch.7 s.22.15.4.5	Yes	999	1000	Pass
GENERATOR D	MR Ch.7 s.22.15.4.3	Yes	198	200	Pass

Each of the five *resources* (E, F, G, I and J) have failed the *market control entity* conduct test for the **MR Ch.7 s.22.15.4.4** constrained area condition. This is because these *resources'* aggregated *energy offer* quantities were less than the applicable conduct threshold.

Resource A passes the *market control entity* conduct test for the **MR Ch.7 s.22.15.4.5** constrained area condition as *resource* (A)'s *energy offer* quantity was equal to or greater than the applicable conduct threshold.

Similarly, *resource* D passes the *market control entity* conduct test for the **MR Ch.7 s.22.15.4.3** constrained area condition as *resource* (D)'s *energy offer* quantity was equal to or greater than the applicable conduct threshold.

5.5. Conduct Test for Operating Reserve: Example
(MR Ch.7 s.22.15.12)

Table 5-3 shows how the conduct test for *operating reserve* treats *offers* of different classes of *operating reserve*.

Note that the *resource* conduct test for *offers* for *operating reserve* is applied for each class of *operating reserve*. With respect to the classes of *operating reserve*:

- 10S *operating reserve* is counted as 10S, 10N and 30R for the purposes of the conduct test;

- 10N *operating reserve* is counted as 10N and 30R *operating reserve* for the purposes of the conduct test; and

- 30R *operating reserve* is counted as only 30R for the purposes of the conduct test.

Table 5-3: Adjusted Operating Reserve Offer

Reserve Class	Adjusted Operating Reserve Offer for Physical Withholding Conduct Test
10-minute synchronized (10S)	= 10S OR Offer
10-minute non-synchronized (10NS)	• **For NQS Resources** = MIN (10S OR Offer + 10NS OR Offer, Maximum Generator Resource Active Power Capability - Min Loading Point) • **For QS Resources** = MIN (10S OR Offer + 10NS OR Offer, Maximum Generator Resource Active Power Capability) • **For Dispatchable Load Resources** = MIN (10S OR Offer + 10NS OR Offer, Maximum Load Active Power)
30-minute synchronized (30R)	• **For NQS Resources** = MIN (10S OR Offer + 10NS OR Offer + 30R OR Offer, Maximum Generator Resource Active Power Capability - Min Loading Point) • **For QS Resources** = MIN (10S OR Offer + 10NS OR Offer + 30R OR Offer, Maximum Generator Resource Active Power Capability) • **For Dispatchable Load Resources** = MIN (10S OR Offer + 10NS OR Offer + 30R OR Offer, Maximum Load Active Power)

Table 5-4 illustrates an example of *offers* of *operating reserve* and how these *offers* would be reflected as inputs to the conduct test for *physical withholding* for *operating reserve*.

Table 5-4: Adjusted Operating Reserve Offer Example

Market Participant Operating Reserve Offers	Adjusted Operating Reserve Offer for Physical Withholding Conduct Test
40 MW of 10S	= 10S OR Offer = 40 MW
50 MW of 10NS	= 10S OR Offer + 10NS OR Offer = 40 MW + 50 MW = 90 MW
60 MW of 30R	= 10S OR Offer + 10NS OR Offer + 30R OR Offer = 40 MW + 50 MW + 60 MW = 150 MW

5.6. Impact Test Simulation Methodology

(MR Ch.7 ss.22.15.8-22.15.10 and ss.22.15.15-22.15.17)

5.6.1. Resource Grouping

(MR Ch.7 ss.22.15.10 and 22.15.17)

When the *IESO* applies an impact test for *physical withholding* pursuant **to MR Ch.7 s.22.15.10** or **s.22.15.17** the specific *resource offers* that will be modified in a particular simulation for a *dispatch day* will be determined based on the constrained area conditions met by each relevant *resource* and which of those *resources* share a *market control entity for physical withholding*.

Because a *resource* can appear in more than one *narrow constrained area*, *dynamic constrained area* or local *operating reserve* area, it could have its *offers* modified in more than one simulation for *physical withholding*. The *IESO* will issue a first notice of *physical withholding* based on the simulation that produces the lowest *simulated reference quantity locational marginal price*.

No Grouping

A *resource* will be placed in the "no grouping" category if it fails a conduct test for *physical withholding* for a *dispatch hour* in a particular *dispatch day* and does not

share a *market control entity for physical withholding* with another *resource* that fails a conduct test for *physical withholding* for a *dispatch hour* in the same *dispatch day*.

The *IESO* will determine the *simulated reference quantity locational marginal prices* for each *resource* in the "no grouping" category by modifying *offers* for each of these resources in isolation (no other *resource offers* will be modified in that simulation).

Grouping

Resources that met one or more of the conditions in **MR Ch.7 s.22.15.4.5, 22.15.4.6** or **22.15.11.3**, failed a conduct test for *physical withholding* for a *dispatch hour* in a *dispatch day* and share a *market control entity for physical withholding* will be grouped according to the condition that they met to determine *simulated reference quantity locational market prices* and *simulated as-offered locational market prices*.

Resources that met one or more of the conditions in **MR Ch.7 s.22.15.4.3, 22.15.4.4** or **22.15.11.4**, failed a conduct test for *physical withholding* for a *dispatch hour* in a *dispatch day* and share a *market control entity for physical withholding* will be grouped according to the particular *narrow constrained area*, *dynamic constrained area* or *operating reserve* area they belong to in order to determine *simulated reference quantity locational market prices* and *simulated as-offered locational market prices*.

5.6.2.Inputs for Simulated Reference Quantity Locational Marginal Price

(MR Ch.7 ss.22.15.10 and 22.15.18)

For resources that did not submit offers:

If a *market participant* did not submit an *energy offer* or an *offer* for *operating reserve* for a *resource*, the *IESO* shall calculate the *simulated reference quantity energy locational marginal price* and the *simulated reference quantity operating reserve locational marginal price* using the *resource's reference level values* up to the relevant *reference quantity value*.

For resources that submitted offers:

If a *market participant* submitted an *energy offer* or an *offer* for *operating reserve* with a maximum quantity lower than the *resource's energy* or *operating reserve reference quantity*, the *IESO* determines the *simulated reference quantity energy locational marginal price* and the *simulated reference quantity operating reserve locational marginal price* by creating a combined *offer-reference level* curve.

This combined *offer-reference level* curve will be identical to the *offer* used to determine *schedules* and *LMPs* up to the maximum quantity of the submitted *offer*. For the MWs of the combined *offer-reference level* curve between the maximum quantity in the submitted *offer* and the maximum quantity in the *reference quantity value*, the prices and quantities in the combined *offer-reference level* curve will match the

reference level values as long as these laminations will not result in the combined *offer-reference level* curve violating price monotonicity.

If following this approach results in combined *offer-reference level* curve laminations that violate price monotonicity, then the *offer* prices for the laminations in the *reference quantity values* above the maximum *offer* lamination will be set to the maximum price in the *offer* used to determine *schedules* and *LMPs*.

5.6.3. Electricity Storage Resource Impact Test

(MR Ch.7 ss.22.15.8)

If an *electricity storage resource* fails a conduct test for *physical withholding* in the *day-ahead market* or the *real-time market*, the *IESO* selects a single *dispatch hour* to carry out the impact test to assess *physical withholding* pursuant to **MR Ch.7 s.22.15.8** as follows:

  (1)   The *IESO* reviews *dispatch hours* when the *resource* failed the conduct test and selects any *dispatch hour(s)* when the *resource* met the conditions below as follows:

   a. For *energy offers*:

   i.   The *IESO* selects any *dispatch hour(s)* when the *resource* met the conditions in **MR Ch.7 s.22.15.8.1**.

   ii.   If the *resource* did not meet the conditions above in any of the *dispatch hours* reviewed, the *IESO* selects any *dispatch hour(s)* that met the conditions in **MR Ch.7 s.22.15.8.2**.

   iii. If the *resource* did not meet the conditions above in any of the *dispatch hours* reviewed, the *IESO* selects any *dispatch hour(s)* that met the conditions in **MR Ch.7 s.22.15.8.3**.

   iv.   If the *resource* did not meet the conditions above in any of the *dispatch hours* reviewed, the *IESO* selects any *dispatch hour(s)* that met the conditions in **MR Ch.7 s.22.15.8.4**.

   b. For *offers* for *operating reserve*:

   i.   The *IESO* will select the *dispatch hour(s)* that met the conditions in **MR Ch.7 s.22.15.15.1**.

   ii.   If the *resource* did not meet the conditions above in any of the *dispatch hours* reviewed, the *IESO* will select the *dispatch hour(s)* when the *resource* met the conditions in **MR Ch.7 s.22.15.15.2**.

  (2)   If two or more *dispatch hours* were selected following the review in (1), the *IESO* selects the *dispatch hour(s)* with the highest *LMP* in the *day-ahead market* for the *resource*, when assessing *physical withholding* in the *day-*

ahead market, or the hour-ahead run of the *pre-dispatch calculation engine*, when assessing *physical withholding* in the *real-time market*.

(3)   If two or more *dispatch hours* were selected pursuant to (2), the *IESO* selects the *dispatch hour(s)* with the highest hourly market *demand* based on the total *energy* data from the "Day-Ahead Totals Report", when assessing *physical withholding* in the *day-ahead market*, or based on the total *energy* data from hour-ahead version of the "Pre-Dispatch Totals Report", when assessing *physical withholding* in the *real-time market*.

(4)   If two or more *dispatch hours* were selected pursuant to (3), the *IESO* selects the *dispatch hour* that occurred first.

5.7. Determining the Settlement Charge

(MR Ch.9 s.5.4)

The *IESO* determines a *settlement* charge for *energy* and *operating reserve* for each dispatch day containing a *settlement hour* where the impact test was failed, as set out in **MR Ch.9 s.5.4.1**.

5.7.1.Persistence Multipliers

The persistence multiplier for *physical withholding* in **MR Ch.9 s.5.4.1.1(b)** (for *energy*) and **MR Ch.9 s.5.4.1.2(b)** (for *operating reserve*) is determined based on repeat failures of the impact test for *physical withholding* by a *market control entity for physical withholding*.

A persistence multiplier is used when determining a *settlement* charge in a first and second notice of *physical withholding* and also when determining the calculation of the *settlement amount*, as set out in **MR Ch.9 s.5.4.1**. The persistence multiplier starts at a value of one and increases by one for each second notice issued to any *resources* that share a *market control entity for physical withholding* in the 18-month period prior to the *instance of physical withholding* being assessed. The maximum value for the persistence multiplier is three. Calculation of the persistence multiplier excludes instances when an ex-post mitigation for *physical withholding settlement amount* is reversed as a result of a *notice of disagreement*, as of the time of the calculation of the persistence multiplier.

The following examples outline several scenarios.
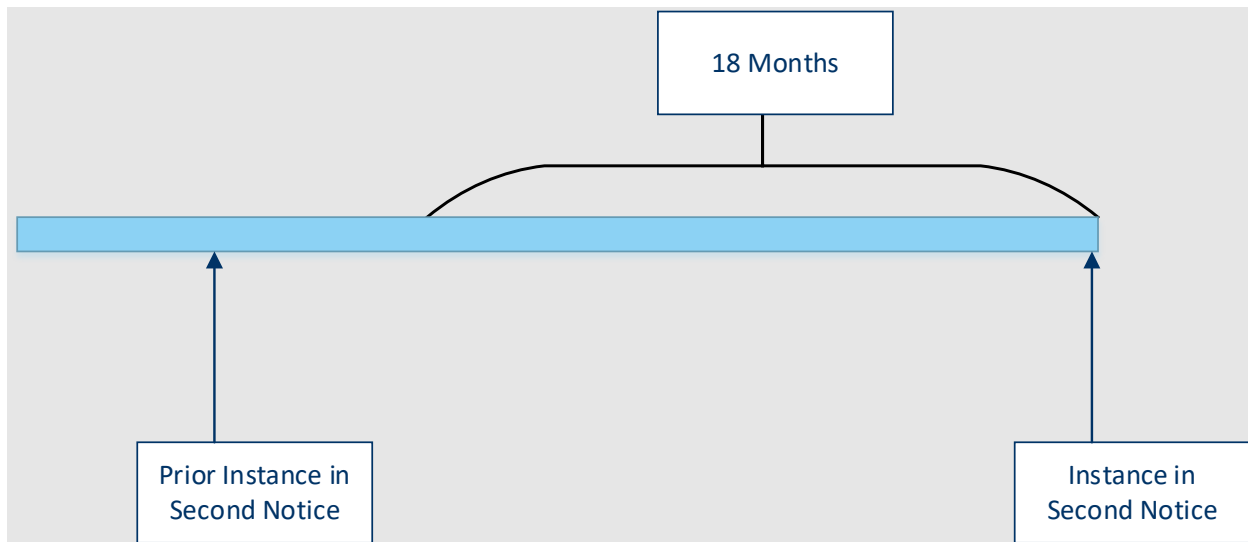
Scenario 1: One Instance

Figure 5-2: Scenario 1 with One Instance of Physical Withholding

Because there were no previously issued second notices in the 18 months prior to the current second notice, the persistence multiplier is equal to one.
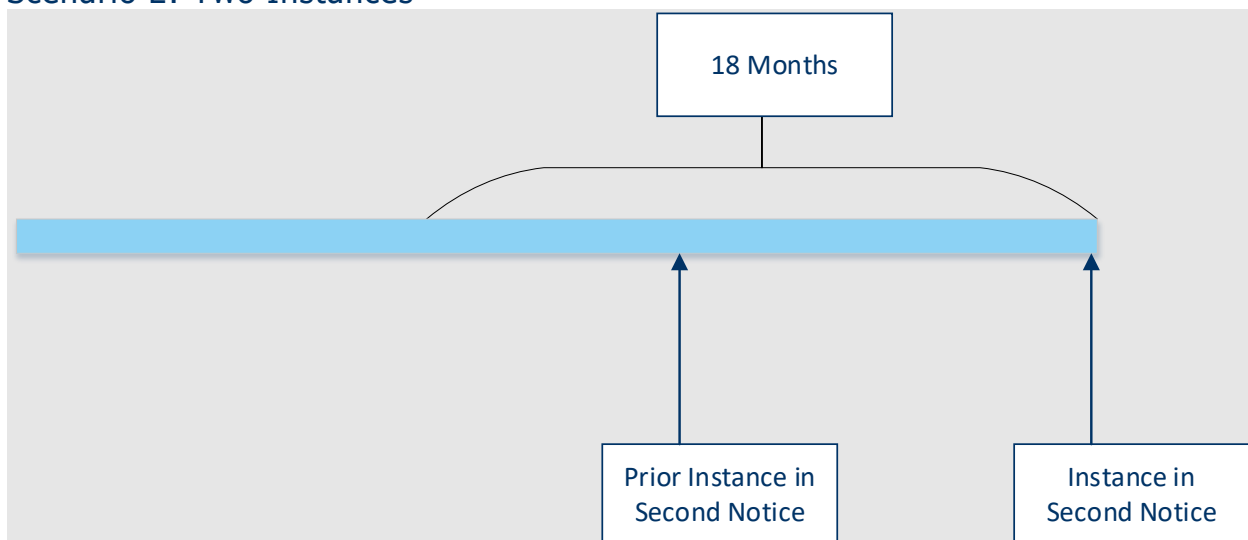
Scenario 2: Two Instances

Figure 5-3: Scenario 2 with Two Instances of Physical Withholding

Because there was a second notice issued in the 18-month period prior to the current second notice, the persistence multiplier is equal to two.
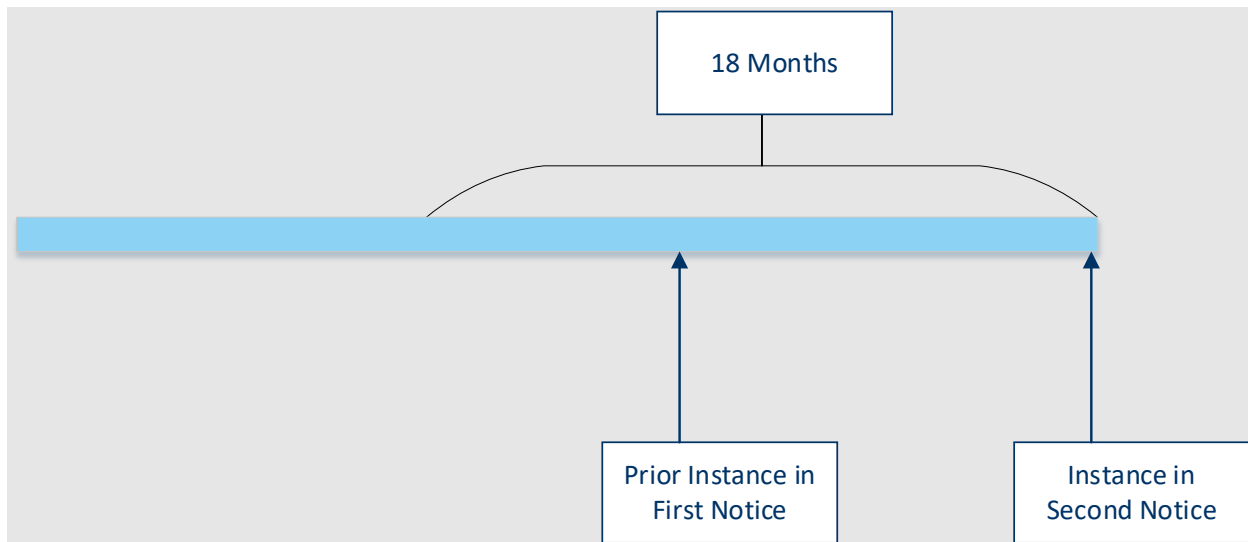
Scenario 3: One Instance

Figure 5-4: Scenario 3 with One Instance of Physical Withholding

There was no previously issued second notice within the 18-month period, though there was a prior instance that had only progressed as far as the issuance of a first notice. The persistence multiplier is, therefore, equal to one.

5.8. Supporting Documentation for Alternative Reference Quantity Value Requests

(MR Ch.7 s.22.15.20.1)

Market participants submitting requests that the *IESO* use an *alternative reference quantity value* pursuant to **MR Ch.7 s.22.15.20** must include documentation with their request to support any *resource*-specific considerations that were not accounted for in the *resource's reference quantities* in use during the *instance of physical withholding*. This supporting documentation may include, but is not limited to, data regarding:

- ambient temperature;
- relative humidity;
- water conditions (water flow, water level etc.);
- actions taken to ensure the safety of any person, prevent the damage of equipment, prevent the violation of any *applicable law*, or to maintain the *reliability* of the *IESO-controlled grid*;

- *energy offers* submitted by other *resources* located at the same *facility*, if the available supply of the *facility* is less than the sum of the registered maximum *generator* active power capability of all *resources* at that *facility;*

- other *resource*-specific considerations that were not accounted for in the registered *energy* or *operating reserve reference quantity* formula;

- *IESO* staff requesting that a *resource* reduces *offer* quantities or removes *offers*;

- *planned outages* and equipment de-ratings; and

- *forced outages* and equipment de-ratings.

5.9. Second Notice of Physical Withholding

(MR Ch.7 ss.22.15.23-22.15.25)

If the conduct test and impact test are failed using an *alternative reference quantity value*, then the *IESO* will send a second notice of *physical withholding* that will contain updates to the information that was provided in the first notice.

5.10. Settlement Charges

(MR Ch.7 s.22.15.25.1)

Settlement charges related to *physical withholding* are applied after the *IESO* issues the second notice of *physical withholding* to the *market participant.*

5.11. Reporting on Physical Withholding

The *IESO publishes* a report each month with the following information:

- monthly total and number of *settlement amounts* issued for *physical withholding* of *energy* and *operating reserve*;

- timestamp of the report creation; and

- the relevant month.

– End of Section –

6. Ex-Post Mitigation for Intertie Economic Withholding on an Uncompetitive Intertie Zone

(MR Ch.7 ss.22.17-22.19)

This section provides details on the process for assessing *intertie economic withholding* on uncompetitive *intertie zones* using the relevant conduct tests and impact tests in **MR Ch.7 ss.22.17-22.19**.

The *IESO* may assess *intertie economic withholding* by a *boundary entity resource* in both or either of the *day-ahead market* and the *real-time market* for a *dispatch day.* If the *IESO* selects a single market, the *IESO* will deem the MWhs withheld in the other market to be 0 for all relevant *dispatch hours* when calculating the *intertie economic withholding* settlement amount.

6.1. Sample Intertie Economic Withholding Timeline

Figure 6-1 illustrates the activities associated with *intertie economic withholding* on uncompetitive *intertie* zones:
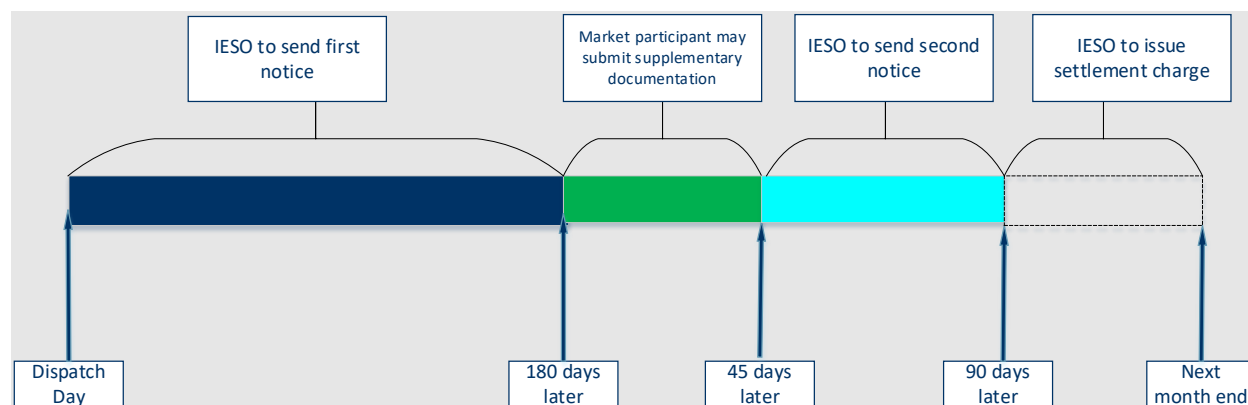

Figure 6-1: Timeline of Ex-Post Mitigation for Intertie Economic Withholding on Uncompetitive Intertie Zones

6.2. Impact Test Simulation Methodology

(MR Ch.7 ss.22.17.8 and 22.17.14)

6.2.1. Inputs for Simulated Intertie Reference Level Locational Marginal Price

The *simulated intertie reference level energy locational marginal price* calculated pursuant to **MR Ch.7 s.22.17.8** or **22.17.14** will be determined using a combined *offer/bid-intertie reference level* curve for a *boundary entity resource* that failed the conduct test. The *IESO* determines the combined *offer/bid-intertie reference level* by replacing all price components of each *offer* lamination that failed the conduct test with the *intertie reference level* and then reordering the laminations to respect price monotonicity.

6.2.2. Determining the Simulated Intertie Reference Level Locational Marginal Price Based on Uncompetitive Intertie Zones

All submitted *boundary entity resource* import *offer* and export *bid* curves that failed the conduct test for the same *dispatch hour* of the same *dispatch day* for a *market participant* at an uncompetitive *intertie zone* for a given *dispatch hour* will be replaced by their combined *offer/bid-intertie reference level* curves simultaneously to determine the *simulated intertie reference level locational marginal price*. For a *market participant* that has *boundary entity resource offer* or *bid* curves at multiple uncompetitive *intertie zones* for a given *dispatch hour* that have failed the conduct test, the *offers* or *bids* on each uncompetitive *intertie zone* will be replaced by their applicable combined *offer/bid-intertie reference level* curves simultaneously to determine the *simulated intertie reference level locational marginal price*.

6.3. Determining the Settlement Charge

(MR Ch.7 ss.22.19.7, 22.19.8 and MR Ch.9 s.5.5)

The *IESO* determines an ex-post mitigation for *economic withholding* on uncompetitive interties *settlement amount* for each *dispatch day* that contains a *settlement hour* where the impact test was failed, as set out in **MR Ch.9 s.5.5**.

6.4. Supporting Documentation for Requests for Alternative Intertie Reference Level Value

(MR Ch.7 s.22.19.3)

The *IESO* evaluates the supporting documentation provided to determine whether it is consistent with the *alternative intertie reference level value* requested.

Alternative intertie reference level values are based on *short-run marginal costs* for importers and *short-run marginal benefits* for exporters.

With respect to importers, the *short-run marginal cost* is the cost of the power purchased or produced to serve Ontario taking into account the transaction costs. With respect to exporters, the *short-run marginal benefit* is the price the exporter received or would have received on the sale of the power purchased from Ontario, taking into account the transaction costs. The *IESO* only considers actual after-the-fact costs.

The *IESO* will not consider fixed costs, sunk costs or operational expenses that are not directly incurred to undertake any specific transaction nor benefits that are not a direct result of undertaking any specific transaction.

If the *IESO* determines an *alternative intertie reference level value*, the *IESO* shall perform the conduct test and impact test using the *alternative intertie reference level value*. If the conduct test and impact test still fail using the *alternative intertie reference level value*, the *IESO* will issue a second notice of *intertie economic withholding*. If the conduct and impact tests do not fail when using the *alternative intertie reference level value*, the assessment concludes and no ex-post mitigation for *economic withholding* on uncompetitive interties *settlement amount* is issued.

6.5. Applying Settlement Charge
(MR Ch.7 ss.22.19.6-22.19.8)

Settlement charges related to *intertie economic withholding* are applied after the *IESO* issues the second notice of *intertie economic withholding* to the *market participant* in accordance with **MR Ch.7 s.22.19.6** or **22.19.7**.

6.6. Reporting on Intertie Economic Withholding

The *IESO publishes* a report each month with the following information:

- monthly total and number of *settlement amounts* issued for *intertie economic withholding*;

- timestamp of the report creation; and

- the relevant month.

– End of Section –

List of Acronyms

Acronym	Term
DCA	Dynamic constrained area
GOG	Generator Offer Guarantee
GSF	Generation shift factor
LMP	Locational marginal price
MR	Market rules
NCA	Narrow constrained area
NQS	Non-quick start
OSL	Operating security limit
QS	Quick-start
OR	Operating Reserve
DAM	Day-ahead market
RTM	Real-time market

– End of Section –

References

Document ID & Link	Document Title
MDP_RUL_0002	Market Rules
IMP_GDE_0088	Market Manual 1.3: Identity Management Operations Guide
MDP_PRO_0033	Market Manual 5.5: Physical Markets Settlement Statements

- **– End of Document –**