



## Market Rule Amendment Proposal

### PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00245-R00		
Subject:	Market Evolution Program		
Title:	Multi-Interval Optimization – Permissions and Obligations		
Nature of Proposal:	<input type="checkbox"/> Alteration	<input type="checkbox"/> Deletion	<input checked="" type="checkbox"/> Addition
Chapter:	7	Appendix:	
Sections:	2.2		
Sub-sections proposed for amending:	2.2.6A (new)		

### PART 2 – PROPOSAL HISTORY

Version	Reason for Issuing	Version Date
1.0	Submitted for Technical Panel Review	January 28, 2004
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

### PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- The reason for the proposed amendment and the impact on the *IMO-administered markets* if the amendment is not made
- Alternative solutions considered
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IMO-administered markets*.

#### Summary

It is proposed to amend the market rules to incorporate the market participant and IMO permissions and obligations necessary to introduce multi-interval optimization and measures to address identified dispatch issues into the real-time constrained scheduling and dispatch sequences. These permissions and obligations relate to:

- the market participant submission of data regarding the operational characteristics of their facilities,
- the market participant's submission of offers and bids that respect those operational characteristics;
- the IMO respecting those operational characteristics in its determination of the real-time dispatch instructions and
- the IMO issuing dispatch advisories resulting from the multi-interval optimization.

#### Background

As part of the Market Evolution Program the IMO has been working with market participants to develop and implement multi-interval optimization (MIO). The MIO project proposes that the existing Real-Time Constrained Dispatch Scheduling Optimizer (RTC DSO) be enhanced such that it employs a formal multi-interval optimization technique rather than the current single interval optimization technique. MIO will determine security-constrained economic dispatch schedules for all dispatchable resources such that they are optimally utilized over a selected number of intervals.

MIO is intended to result in a lower overall cost dispatch within the market, enhance unit scheduling, and to reduce dispatch volatility.

As part of the MIO project, a number of other changes to the RTC DSO are being introduced to address facility dispatch and operational issues identified by market participant. These issues are related to facilities being dispatched currently in a manner that either increases equipment wear and tear and/or is not sustainable in the long term. These key issues are follows:

- Reflecting Unit Ramping Capability – The DSO causes a “stutter step” in non-quick start thermal facility loading when a facility starts to increase output from either a steady load or a loading rate that is less than the offered rate. This is a result of the snapshot that reflects the facility actual loading when calculating the next interval dispatch instruction. The DSO should account for the initial slow loading characteristic of non-quick start thermal facilities.
- Minimum Loading Point - Many facilities have a requirement to operate at or above a minimum loading point. These facilities cannot operate below those levels without ignition support unless they are either synchronizing or being shutdown. A minimum loading point could be defined in

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PLC by the market participants during the registration process. The RTC DSO should not schedule these units below this minimum output level unless the unit is synchronizing or shutting down.

- Dispatch Trajectory – Ensure that thermal units will not reverse direction without a minimum period (an adjustable variable from zero to two intervals) of steady operation. If facilities switch from ramping up to ramping down without this period of steady operation it increases the risk of equipment damage at the facility. After the minimum period of steady operation, the unit would be available to be normally dispatched.
- Forbidden Region – Hydro-electric generating station units have operating ranges, expressed in terms of a specific MW output range, where the units are unable to maintain steady operation without causing equipment damage. The RTC DSO should not schedule facilities in these predefined operating ranges. The forbidden range should be recorded in PLC for auditing purposes. Multiple forbidden ranges for aggregated facilities should be respected, up to a maximum of three. Market Participants have indicated to the IMO that this maximum number meets the need of generation facilities in Ontario.

For further information on MIO and the related dispatch and operational issue please refer to: [http://www.theimo.com/imoweb/consult/mep\\_mio.asp](http://www.theimo.com/imoweb/consult/mep_mio.asp).

**Discussion**

MR-00245-R00-02 proposes to specify the new obligations and permissions necessary to introduce MIO and the additional features that are being built into MIO to deal with specific operational issues noted above.

MR-00245-R00 proposes to insert a new section 2.2.6A into Chapter 7 of the market rules.

Section 2.2.6A would specify that a market participant **may** submit facility specific data such as minimum loading point, forbidden regions, and period of steady operation. It is also proposed that section 2.2.6A specify that if a market participant submits information regarding forbidden regions the market participant shall ensure such information is respected when submitting dispatch data for the real-time market in accordance with section 3.1 of Chapter 7. If the submitted dispatch data does not respect submitted forbidden regions the offer for the effected resource and the corresponding dispatch hour or hours would be rejected by the IMO. The facility specific data that a market participant may submit are: minimum loading point; forbidden regions, and period of steady operation.

Section 2.2.6A.1 would specify if no facility specific data is submitted to the IMO by a market participant pursuant to section 2.2.6A the IMO would assign default values of zero for the facility's minimum loading point, forbidden regions, and period of steady state operation. The assigning of default values for these parameters is necessary to ensure that the MIO Real Time Constrained sequence produces dispatch instructions because without the default values the DSO would not solve or schedule these units because the data was missing.

Section 2.2.6A.2 would specify that if facility specific data is submitted to the IMO in accordance with section 2.2.6A the IMO shall respect the submitted information in its determination of the real-time schedule.

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2.2.6A A registered market participant for a generation facility may submit the following facility specific information: minimum loading point; forbidden regions; and period of steady operation. If the information regarding forbidden regions is submitted, the market participant shall respect such information when submitting dispatch data for the real-time market. If the dispatch data submitted does not respect such information the IMO shall reject the dispatch data submission for the effected resource and for the corresponding dispatch hour or dispatch hours and shall provide to the submitting registered market participant the reasons for such rejection.

2.2.6A.1 If no facility specific data is submitted to the IMO in accordance with section 2.2.6A the IMO shall assign default values of zero for the facility's minimum loading point, forbidden regions, and period of steady operation.

2.2.6A.2 If facility specific data is submitted to the IMO in accordance with section 2.2.6A the IMO shall respect the data as submitted in its determination of the real-time schedule in accordance with section 4.0.

**PART 5 – IMO BOARD COMMENTS**



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Identification No.:	MR-00245-R01		
Subject:	Market Evolution Program		
Title:	Multi-Interval Optimization – Permissions and Obligations		
Nature of Proposal:	Alteration	<input type="checkbox"/> Deletion	<input checked="" type="checkbox"/> Addition
Chapter:	7	Appendix:	
Sections:	7.1.6 (new)		
Sub-sections proposed for amending:			

### PART 2 – PROPOSAL HISTORY – PLEASE REFER TO MR-00245-R00

Version	Reason for Issuing	Version Date
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

### PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

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- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IMO-administered markets*.

Refer to MR-00245-R00.

An integral part of MIO is the issuance of dispatch advisories to all registered dispatchable market participants by the IMO. A feature of optimizing over a number of future intervals is that additional information can now be made available to market participants regarding anticipated operation for those future intervals. For each dispatch interval, a dispatch instruction would be issued as is currently done, plus the addition of up to 4 dispatch advisories for future intervals. Dispatch advisories are to be provided to dispatchable market participants even though no dispatch instruction may be sent (e.g., no change in the dispatch of the facility). Optimization under MIO would be performed for 5 “critical” intervals within a forward looking study horizon of the next 11 intervals. These “critical” intervals are selected every 5 minutes based on a set of defined selection criteria that considers both the most efficient optimization and the most beneficial information for facility operators.

The dispatch interval is always selected as a critical interval and the resulting schedule is issued to the respective market participants in the form of dispatch instructions using the same mechanisms that are currently used. The energy and Operating Reserve schedules for the remaining critical intervals are communicated to the respective market participants in the form of dispatch advisories and are issued every 5 minutes. The market participant specific dispatch advisories indicate anticipated future dispatch targets for energy and all classes of Operating Reserve and will be provided to the market participant for information purposes only. This will assist the market participant by providing an indication of expected future operation for the facility. The market participant will continue to be obligated to follow only its dispatch instruction for the next dispatch interval. There is no obligation for the market participant to follow the dispatch advisories.

MR-00245-R01 therefore proposes to obligate the IMO, on a best efforts basis, to issue dispatch advisories to all registered dispatchable market participants. There is no obligation for the market participants to follow these advisories. There is a possibility that it may not be possible for the IMO to produce and issue dispatch advisories due to a market systems problem. Because of this possibility and the fact that dispatch advisories are only provided for information purposes only, it is proposed that the obligation on the IMO to provide dispatch advisories only on a “best efforts basis” rather than on an “absolute basis”.

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- 7.1.6 The IMO shall, on a best efforts basis, determine and issue dispatch advisories for each registered dispatchable facility, for information purposes only.- Dispatch advisories are determined and issued every 5

minutes to each registered dispatchable facility to provide an indication of potential future dispatch instructions and operating reserve schedules.

**PART 5 – IMO BOARD COMMENTS**

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## Market Rule Amendment Proposal

### PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00245-R02		
Subject:	Market Evolution Program		
Title:	Multi-Interval Optimization – Permissions and Obligations		
Nature of Proposal:	<input checked="" type="checkbox"/> Alteration	<input type="checkbox"/> Deletion	<input type="checkbox"/> Addition
Chapter:	7	Appendix:	7.1
Sections:			
Sub-sections proposed for amending:	1.1.5		

### PART 2 – PROPOSAL HISTORY – PLEASE REFER TO MR-00245-R00

Version	Reason for Issuing	Version Date
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**PART 3 – EXPLANATION FOR PROPOSED AMENDMENT**

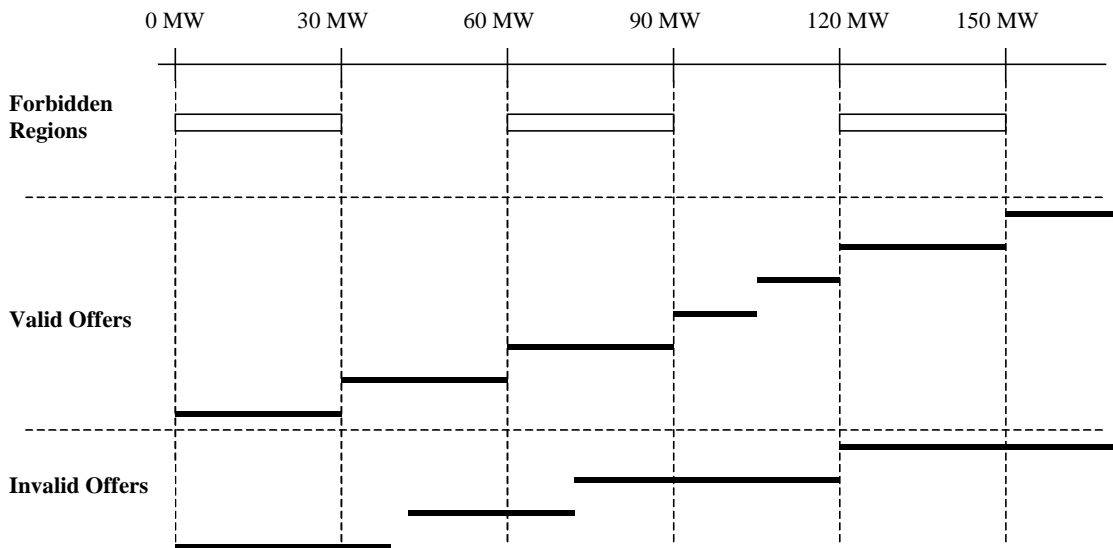
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For further information please refer to MR-00245-R00.

Consequential to the changes proposed by MR-00245-R00 there is a need to amend section 1.1.5 of Appendix 7.1. This Appendix of the market rules relates to the provision of energy offer information by registered dispatchable market participants. If a market participant has submitted information to the IMO regarding a forbidden region pursuant to the proposed section 2.2.6A of Chapter 7 then the submitted offer price-quantity pairs must include a quantity equal in value to each of the lower and upper limit of each forbidden region. If the submitted offer price-quantity pairs do not include these quantity values the energy offer will be rejected in accordance with section 2.2.6A.

A graphic illustration of what is and is not allowed is as follows:



MR-00245-R02 proposes to amend the market rules in section 1.1.5 of Appendix 7.1 to specify that if a generator has specified forbidden regions to the IMO then the energy laminations represented by the facility’s price-quantity pairs should not contain both forbidden and non-forbidden regions. If invalid offers are submitted they will be rejected by the IMO for the effected resource and for the corresponding dispatch hour or dispatch hours in accordance with section 2.2.6A of chapter 7.

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## Appendix 7.1 – Energy Offer Information

### 1.1 Within the IMO Control Area

- 1.1.5 Two to twenty *price-quantity pairs* for each *dispatch hour*, the final of which represents the maximum quantity of the *offer*. If the generator has specified forbidden regions, the submitted offer price-quantity pairs must include a quantity equal to each of the lower and upper limits of each forbidden region.

## PART 5 – IMO BOARD COMMENTS

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## Market Rule Amendment Proposal

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### PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00245-R03		
Subject:	Market Evolution Program		
Title:	Multi-Interval Optimization – Permissions and Obligations		
Nature of Proposal:	<input checked="" type="checkbox"/> Alteration	<input type="checkbox"/> Deletion	<input type="checkbox"/> Addition
Chapter:	11	Appendix:	
Sections:			
Sub-sections proposed for amending:			

### PART 2 – PROPOSAL HISTORY – PLEASE REFER TO MR-00245-R00

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**PART 3 – EXPLANATION FOR PROPOSED AMENDMENT**

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Consequential to the changes proposed by MR-00245-R00 there is a need to insert two new definitions into Chapter 11 of the market rules. These new definitions are “forbidden regions” and “period of steady operation”. A definition for minimum loading point already exists as it was introduced as part of MR-00235 (Market Pricing Initiatives – Spare generation on line).

For further information please refer to MR-00245-R00.

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*forbidden region* means a predefined operating range within which a hydroelectric *generation facility* cannot maintain steady operation without causing equipment damage. A hydroelectric *generation facility* may have more than one *forbidden region*;

*period of steady operation* means a predefined number of intervals (0, 1, or 2) for which a non *quick-start* *generation facility* must maintain steady operation before changing direction of its *energy* output (either increasing or decreasing). Such a *facility* is considered to be in steady operation if the magnitude of change between *dispatch instructions* for the last two intervals is less than 0.1 multiplied by the unit’s *offer* ramp rate;

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