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Improving Accessibility of Operating Reserve

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Agenda

- Recap of last webinar
- Today's objectives
  - Describe updates to the proposed solution for improving the accessibility of Operating Reserve (OR)
  - Present decision on unwarranted Congestion Management Settlement Credits (CMSC)
  - Present Operating Reserve (OR) settlement claw-back market rules
- Next steps

Reminder: Goals for this Initiative

- Improve reliability by enhancing the IESO's ability to access OR when it is activated;
- Compensate only for OR that can be accessed

March 30th, 2020 Webinar Recap

Recap: March 30th, 2020 Webinar

- Responded to stakeholder feedback from previous meeting
- Presented detailed design of the OR settlement claw-back mechanism developed with input from stakeholders
- Proposed to amend the Market Rules to establish new operating reserve activation (ORA) performance criteria (without any need for changes to IESO tools) based on:
  - incremental energy provided, and
  - meeting the ORA dispatch target the IESO sends
- Invited stakeholders to provide feedback on both proposals

Recap: March 30th, 2020 Webinar - Stakeholder Feedback

- Five stakeholder feedback submissions were received
- The IESO responded to these submissions on May 21, 2020
- Thank you to all stakeholders for your participation and input so far

Updates to the Proposed Solution for Improving the Accessibility of OR

Updates to the Proposed Solution

- Previous stakeholder feedback provided on the ORA performance criteria proposal indicated:
  - The IESO should consider implementing changes to its dispatch process to determine the amount of incremental energy required during ORAs and translate this to the ORA dispatch target
- Since the March 30, 2020 webinar, the IESO has undergone a cost-benefit assessment of implementing such a change to the dispatch tool and has determined this approach to be feasible
- The following slides present a high-level design of this change for stakeholder review and comment

High-level Design of Dispatch Tool Change for ORA Performance Improvement

Revised Proposal for OR Accessibility Improvement

- The IESO proposes to modify the dispatch tool to account for actual output/consumption in determining the ORA dispatch target
- This modification will improve the IESO's ability to access OR while also addressing the concerns raised by stakeholders
- In addition, a minor market rule amendment will clarify the IESO's existing ability to disqualify participants from future participation in the OR markets if they consistently fail to respond to ORA dispatches

Revised Proposal: ORA Dispatch Instructions

The ORA dispatch instruction for **dispatchable generators*** will be determined as follows:

- The maximum of either the resource's output at the time of the ORA **or** the energy dispatch for the end of the interval, **plus** the OR being activated up to the resource's high operating limit
- The ORA dispatch target will be capped at a resource's high operating limit. No supplier of OR will be dispatched to a value beyond its physical capability

*Examples can be found in the Appendix A

Revised Proposal: ORA Dispatch Instructions (cont'd)

The ORA dispatch instruction for **dispatchable loads*** will be determined as follows:

- The minimum of either the resource's consumption at the time of the ORA **or** the energy dispatch for the end of the interval **minus** the OR being activated

*Examples are provided in the Appendix A

Draft Dispatch Tool Change Market Rules

The following Market Rule clarifications are being proposed:

Proposed Amendment Description	Market Rule Chapter
Amendment to clarify the IESO's ability to dispatch all resource types that are participating in the OR market	Chapter 7, Sec. 7.4.3
Amendment to allow the IESO to calculate ORA dispatch based on resources' output/consumption at the time of ORA	Chapter 7, Sec. 7.4.3A
Amendment to clarify that the IESO may take action to disqualify registered facilities from future participation in the OR markets that consistently fail to produce energy or reduce energy withdrawals when called upon.	Chapter 7, Sec. 7.5.9

Draft Dispatch Tool Change Market Rules

- **Chapter 7, Section 7.4.3**

Where a *contingency event* has occurred or is occurring, the *IESO* may issue *dispatch instructions* within the *dispatch interval*, instructing a *registered facility*, other than a *boundary entity*, providing *operating reserve* to begin increasing *energy* production or reducing *energy* withdrawal as specified in its *offers* of *operating reserve*. *Dispatch instructions* issued in respect of a *registered facility* that is a *boundary entity* providing *operating reserve* shall be such as to ensure that the *energy* associated with each *offer* of *operating reserve* is scheduled by the *IESO* in a manner consistent with all relevant *reliability standards* for activation of *operating reserve* and as agreed upon by the entity scheduling the resulting *energy* transfer.

Draft Dispatch Tool Change Market Rules

- **Chapter 7 , Section 7.4.3A**

Where a *registered facility* is injecting or withdrawing more or less *energy* in a *dispatch interval* than specified in its *dispatch instruction* and where a *contingency event* has occurred the *IESO* may issue *dispatch instructions* instructing a *registered facility*, other than a *boundary entity*, providing *operating reserve* to begin increasing *energy* production or reducing *energy* withdrawal for an amount up to the maximum quantity of MW of *operating reserve* which it is scheduled, notwithstanding the maximum quantity of the *operating reserve offer* as provided in accordance with Appendix 7.3

Draft Dispatch Tool Change Market Rules

- **Chapter 7, Section 7.5.9**

In addition to any other sanction or consequence provided for in these *market rules*, the *IESO* may disqualify from future participation in the *operating reserve market* any *registered facilities* that consistently fail to produce *energy* or reduce *energy* withdrawal when called upon in accordance with Chapter 7.

Unwarranted CMSC

Updates to the Issue of Unwarranted CMSC

- Prior to this webinar, stakeholders recommended the IESO consider the costs and benefits of developing and implementing a solution to the issue of unwarranted **OR** CMSC related to inaccessible OR prior to MRP implementation
- Due to the revised proposal to implement a dispatch tool change to improve OR accessibility during ORAs, there is now also a potential for unwarranted **energy** CMSC. This CMSC is considered to be self-induced as it is created when a participant is off-dispatch
- Since the March 30th, 2020 webinar, the IESO has undertaken an assessment of how to most cost-effectively implement a solution to address the issue of unwarranted **OR** and **energy** CMSC

Unwarranted OR CMSC - Description

- Unwarranted OR CMSC arises when a resource's accessible OR is different from the constrained OR schedule
- Unwarranted OR CMSC = the difference between the OR CMSC calculated based on constrained OR schedule (OR CMSC paid) and the OR CMSC calculated based on accessible OR (warranted OR CMSC)
    - Accessible OR for generators = the difference between a resource's output and its maximum capability
    - Accessible OR for dispatchable loads = actual consumption

Unwarranted Energy CMSC - Description

- Arises when the ORA dispatch signal is revised to account for actual output/consumption of a resource at the time of the ORA
  - This can occur as a result of the revised ORA dispatch solution:
    - Current ORA target = Last sent energy schedule + OR activated
    - Proposed ORA target = Energy output at the time of OR activation + OR activated

Unwarranted Energy CMSC – Generator Example*

- Generator max capacity =160 MW, market clearing price (MCP) =$10, Energy offer =$20, OR activated =50 MW,
- Energy unconstrained schedule = 0 MW
- Energy constrained schedule = 100 MW
- Actual Output at the time of the ORA =110 MW

Constrained energy schedule for the ORA interval (current)	Constrained energy schedule for the ORA interval (proposed)	CMSC (current)	CMSC (proposed)	Unwarranted CMSC
150 MW	160 MW	$1500	$1600	$100

*A more detailed calculation can be found in Appendix B

Unwarranted CMSC - Materiality

- Quantitative analysis showed that the unwarranted OR and energy CMSC were estimated to be relatively immaterial (<$150K/year)
- Given the complexity of an automatic solution to this issue, the IESO will not proceed with implementing an automatic unwarranted CMSC claw-back in the current market
- The IESO is proposing to instead amend the market rules to allow the IESO to manually claw back the CMSC that is deemed unwarranted when a resource failed to maintain unused generation (or load reduction) capacity equal to or greater than their total amount of scheduled operating reserve.

Draft Unwarranted CMSC Market Rules

Proposed Amendment Description	Market Rule Chapter
Amendment to allow the IESO to claw-back unwarranted CMSC when a resource fails to maintain unused generation (or load reduction) capacity equal to or greater than their total amount of scheduled operating reserve.	Chapter 7, Sec. 7.4.6

Draft Unwarranted CMSC Market Rules

- **Chapter 7 Section 7.4.6**
- A *registered facility* that is dispatched pursuant to section 7.4.3A or failed to maintain unused *generation* (or load reduction) *capacity* equal to or greater than their total amount of scheduled *operating reserve* is not entitled to any inappropriate congestion management *settlement* credit determined in accordance with section 3.5.2 of Chapter 9. The *IESO* may withhold or recover such congestion management *settlement* credits and shall redistribute any recovered payments in accordance with section 4.8.2 of Chapter 9.

Draft OR Settlement Claw-back Market Rules

Proposed OR Settlement Claw-back

- OR settlement claw-back is intended to claw-back stand-by payments for OR that is not accessible
- For each OR class, the claw-back will be calculated as the difference between the OR standby payment for each OR class (10s, 10n, 30r) received and the OR standby payment calculated based on accessible OR for each class

OR Settlement Claw-back Implementation

- Forward-looking claw-back
  - The proposed OR settlement claw-back is a forward-looking claw-back charge with no retroactive charges
- Three new charge types and three modified charge types (uplift charge types) detailed in the draft amendments to Market Rule Chapter 9
- Settled on interval basis
- Targeted go-live timing expected in Q4 2022 coincident with the Replacement of the Settlement System (RSS) project

Proposed OR Settlement Claw-back Market Rules

- Chapter 9, Section 3.8 of the Market Rules provides the IESO the ability to recover compensation paid to market participants for services they cannot provide
- Amendments to Chapter 7, section 7.4 will enable the automation of this existing ability
- The IESO will claw-back a portion of OR payments from a resource that did not maintain unused generation or load curtailment capacity that would have been required to meet their OR schedules had they been activated. The claw-back is for the portion of unused capacity they failed to maintain

Draft OR Settlement Claw-back Market Rules

- The following Market Rule amendments are being proposed:

Proposed Amendment Description	Market Rule Chapter
Market Rules are to be amended to allow the IESO to automate the OR settlement claw-back	Chapter 7, Various sections
New OR claw-back formulas and OR claw-back charge types are added	Chapter 9, Various sections

The draft market rules can be found in Appendix C

Recap and Next Steps

Summary of Draft Market Rule Amendments

- Proposed Rule Amendments for Dispatch Tool Change

Proposed Amendment Description	Market Rule Chapter
Amendment to clarify the IESO's ability to dispatch all resource types that are participating in the OR market	Chapter 7, Sec. 7.4.3
Amendment to allow the IESO to calculate ORA dispatch based on resources' output/consumption at the time of ORA	Chapter 7, Sec. 7.4.3A
Amendment to clarify that the IESO may take action to disqualify registered facilities from future participation in the OR markets that consistently fail to produce energy or reduce energy withdrawals when called upon.	Chapter 7, Sec. 7.5.9

Summary of Draft Market Rule Amendments (cont'd)

- Proposed Rule Amendments for Unwarranted CMSC Clawback

Proposed Amendment Description	Market Rule Chapter
Amendment to allow the IESO to claw-back unwarranted CMSC when a resource fails to maintain unused generation (or load reduction) capacity equal to or greater than their total amount of scheduled operating reserve.	Chapter 7, Sec. 7.4.6

Summary of Draft Market Rule Amendments (cont'd)

- Proposed Rule Amendments for OR Settlement Claw-back

Proposed Amendment Description	**Market Rule Chapter**
Market Rules are to be amended to allow the IESO to automate the OR settlement claw-back	Chapter 7, Various sections
New OR claw-back formulas and OR claw-back charge types are added	Chapter 9, Various sections

Stakeholder Feedback Requests

Proposed Dispatch Tool Change

- Do stakeholders foresee any challenges with the proposed dispatch tool change in terms of market participant implementability?
- From a stakeholder perspective, will the proposed design enable resources' to effectively respond to ORA dispatches?

- Please provide written feedback by **June 18** to engagement@ieso.ca using the feedback form on the engagement webpage

Stakeholder Feedback Requests

Draft Market Rule Amendments for Dispatch Tool Change, Claw-back of Unwarranted CMSC and OR Settlement Claw-back

- Please provide written feedback on the proposed market rule amendments by **June 18** to engagement@ieso.ca using the feedback form on the engagement webpage
- Please use the feedback form provided to ensure stakeholder feedback is compliant with the Accessibility for Ontarians with Disabilities Act (AODA). If you choose not use the IESO feedback form, please provide an AODA compliant pdf document

Next Steps

- IESO will review and provide a response to stakeholder feedback in a document posted to the engagement webpage following the feedback deadline
- Pending stakeholder feedback, an additional webinar may be scheduled to review the proposals prior to proceeding through the Technical Panel
- The IESO is aiming to present these proposed market rule amendments as an education item to the Technical Panel at the June 29, 2021 meeting

Appendix A: Revised ORA Dispatch Instructions Examples

Revised ORA Dispatch Instructions Examples
Scenario 1: Generation Resource with Headroom

- OR schedule =50 MW, 50 MW of OR is activated at 10:07, Max capability of the resource is 200 MW

A	B	C	D	E	F	G	H	I
	Max Capability		Energy Schedule 10:05	Output at 10:07 (OR activation)	Energy Schedule 10:10	Exsiting ORA Target	Proposed ORA Target	DIFF
GEN 1	200	Ramping Up	90	95	100	150	150	0
		Under Generating	100	95	100	150	150	0
		Ramping Down	100	90	80	130	140	10
		Over Generating	100	110	100	150	160	10

Revised ORA Dispatch Instructions Examples
Scenario 2: Generator Resource Without Headroom

- OR schedule = 50 MW, 50 MW of OR is activated at 10:07, Max Gen capability of the resource is 150 MW

A	B	C	D	E	F	G	H	I
	Max Capability		Energy Schedule 10:05	Output at 10:07 (OR activation)	Energy Schedule 10:10	Exsiting ORA Target	Proposed ORA Target	DIFF
GEN 2	150	Ramping Up	90	95	100	150	150	0
		Under Generating	100	85	100	150	150	0
		Ramping Down	100	90	80	130	140	10
		Over Generating	100	110	100	150	150	0

Revised ORA Dispatch Instructions Examples
Scenario 3: Dispatchable Loads

- OR schedule = 30 MW, 30 MW of OR is activated at 10:07

A	Max Capability	B	C	D	E	F	G	H
			Energy Schedule 10:05	Consumption at 10:07 (OR activation)	Energy Schedule at 10:10	Existing ORA Target	Proposed ORA Target	DIFF
DL	100	Shutting Down	70	60	50	20	20	0
		Over Consuming	50	60	50	20	20	0
		Increasing Consumption	50	60	70	40	30	10
		Under Consuming #1	70	60	70	40	30	10
		Under Consuming#2	30	0	30	0	0	0

Appendix B: Unwarranted Energy CMSC Example Calculation

Unwarranted Energy CMSC- Example

- Energy CMSC for ORA target calculated based on schedule =(MCP-Offer Price) x (Unconstrained Schedule – MAX(Current ORA Target, AQEI*) =($10 - $20) x (0-150) = $1500
- Energy CMSC for ORA target calculated based on output=(MCP-Offer Price) x (Unconstrained Schedule – MAX(Proposed ORA Target, AQEI*) =($10 - $20) x (0-160) = $1600
- Unwarranted Energy CMSC = $100 ($1600-$1500)
  - This energy CMSC is considered to be self-induced because it is the result of the unit's actual energy output being off dispatch.

Appendix C: Draft OR Settlement Claw-back Market Rules

Draft OR Settlement Claw-back Market Rules

- **Chapter 7, Section 7.4.2.1**

A *market participant* shall be subject to non-accessibility charges if it fails to maintain unused *generation* (or load reduction) *capacity* equal to or greater than its total amount of scheduled *operating reserve* during any *interval* in which it is scheduled to provide *operating reserve* but is not *dispatched* to increase *energy generation* (or load reduction) pursuant to section 7.4.3 or 7.4.3A. The *market participant* may also be subject to compliance actions in accordance with section 6 of Chapter 3.

Draft OR Settlement Claw-back Market Rules (2)

- **Chapter 9, Section 3.4.2**

The *IESO* shall apply the non-accessibility charge specified in section 7.4.2.1 of Chapter 7, and a *market participant* shall be subject to such non-accessibility charge, for every *dispatch interval* where the *market participant* is scheduled to provide *operative reserve* but was not dispatched to increase *energy generation* (reduce load) pursuant to section 7.4.3 of Chapter 7, and where the total scheduled *operating reserve* is greater than the total accessible *operating reserve* as determined by:

Draft OR Settlement Claw-back Market Rules (3)

- **Formula for Chapter 9, Section 3.4.2**

$\sum_{R}^{\square} AQOR_{rn,k,h}^{m,t} > TAOR_{k,h}^{m,t}$ and $\sum_{R}^{\square} AQOR_{rn,k,h}^{m,t} > 0$

Where:

R: is the set of all classes of *operating reserve*

For *operating reserve* provided by a *dispatchable load*:

$$TAOR_{k,h}^{m,t} = Max\left(0, AQEW_{k,h}^{m,t} - MC_{m}^{h,t}\right)$$

$MC_{m}^{h,t}$ = minimum consumption level and is equal to the quantity in the *price-quantity pair* where the *bid* price is *MMCP*

For *operating reserve* provided by a *generator* other than aggregated *facilities*:

$$TAOR_{k,h}^{m,t} = Max\left(0, MAX\_CAP_{k,h}^{m,t} - AQEI_{k,h}^{m,t}\right)$$

$MAX\_CAP_{k,h}^{m,t}$ = Maximum capability based on the maximum *energy offer* quantity adjusted for de-rated generation capacity

Draft OR Settlement Claw-back Market Rules (4)

- **Chapter 9, Section 3.4.2.1**

Where *operating reserve* is scheduled to be provided by aggregated *facilities,* a *market participant* shall be subject to a non-accessibility charge for every *dispatch interval* where the *market participant* is scheduled to provide *operative reserve* but was not dispatched to increase *energy generation* (or reduce load), and where the total scheduled *operating reserve* is greater than the total accessible *operating reserve* as determined by:

Draft OR Settlement Claw-back Market Rules (5)

- **Formula for Chapter 9, Section 3.4.2.1**

$$\sum_R^M AQOR_{rn,k,h}^{m,t} > TAOR\_CA_{k,h}^{M,t}, \text{ and } \sum_R^M AQOR_{rn,k,h}^{m,t} > 0$$

Where:

R: is the set of all class of *operating reserve*

M: is set of all *delivery points* 'm' that are compliance aggregated

Total accessible *operating reserve* (TAOR) for aggregated *generators:*

$$TAOR\_CA_{k,h}^{M,t} = Max\left(0, \sum_{\square}^{M}\left(MAX\_CAP_{k,h}^{m,t} - AQEI_{k,h}^{m,t}\right)\right)$$

$MAX\_CAP_{k,h}^{m,t}$: Maximum capability based on the maximum *energy offer* quantity adjusted for de-rated generation capacity

Draft OR Settlement Claw-back Market Rules (6)

- **Chapter 9, Section 3.4.3**

Where it is determined that a non-accessibility charge is to be applied to a market participant pursuant to section 3.4.2, the non-accessibility charge shall be calculated for each class of operating reserve as follows:

Draft OR Settlement Claw-back Market Rules (7)

- **Formula for Chapter 9, Section 3.4.3**

For synchronized *ten-minute operating reserve*:

$$ORSCB_{r1,k,h}^{m,t} = Min\left(0, \left(TAOR_{k,h}^{m,t} - AQOR_{r1,k,h}^{m,t}\right) \times PROR_{r1,h}^{m,t}\right)$$

For non-synchronized *ten-minute operating reserve*:

$$ORSCB_{r2,k,h}^{m,t} = Min\left(0, \left(Max\left(0, TAOR_{k,h}^{m,t} - AQOR_{r1,k,h}^{m,t}\right) - AQOR_{r2,k,h}^{m,t}\right) \times PROR_{r2,h}^{m,t}\right)$$

For *thirty-minute operating reserve*:

$$ORSCB_{r3,k,h}^{m,t} = Min\left(0, \left(Max\left(0, TAOR_{k,h}^{m,t} - AQOR_{r1,k,h}^{m,t} - AQOR_{r2,k,h}^{m,t}\right) - AQOR_{r3,k,h}^{m,t}\right) \times PROR_{r3,h}^{m,t}\right)$$

Draft OR Settlement Claw-back Market Rules (8)

- **Continued formula for Chapter 9, Section 3.4.3**

Where:

$AQOR^{m,t}_{rn,k,h}$: Allocated quantity in MW of *class r reserve* for *market participant* 'k' at *RWM* 'm' in *metering interval* 't' of *settlement hour* 'h';

$PROR^{m,t}_{rn,h}$: *Market price* in $/MW of *class r reserve* in *metering interval* 't' of *settlement hour* 'h' at *RWM* 'm';

r1 denotes the *ten-minute operating reserve* that is synchronized with the *IESO-controlled grid*;

r2 denotes *ten-minute operating reserve* that is not synchronized with the *IESO-controlled grid*; and

r3 denotes *thirty-minute operating reserve*.

Draft OR Settlement Claw-back Market Rules (9)

- **Chapter 9, Section 3.4.3.1**

Where it is determined that a non-accessibility charge is to be applied to a *market participant* pursuant to section 3.4.2.1, the amount of non-accessible *operating reserve* shall be determined for each class of *operating reserve* as follows:

Draft OR Settlement Claw-back Market Rules (10)

- **Formula Chapter 9, Section 3.4.3.1**

For aggregated *generators* scheduled to provide synchronized *ten-minute operating reserve*:

$$ORIA\_CA_{r1,k,h}^{M,t} = Min\left(0, TAOR\_CA_{k,h}^{M,t} - \sum\nolimits_{\square}^{M} AQOR_{r1,k,h}^{m,t}\right)$$

For aggregated *generators* scheduled to provide non-synchronized *ten-minute operating reserve*:

$$ORIA\_CA_{r2,k,h}^{M,t} = Min\left(0, Max\left(0, TAOR\_CA_{k,h}^{M,t} - \sum\nolimits_{\square}^{M} AQOR_{r1,k,h}^{m,t}\right) - \sum\nolimits_{\square}^{M} AQOR_{r2,k,h}^{m,t}\right)$$

For aggregated *generators* scheduled to provide *thirty-minute operating reserve*:

$$ORIA\_CA_{r3,k,h}^{M,t} = Min\left(0, Max\left(0, TAOR\_CA_{k,h}^{M,t} - \sum\nolimits_{\square}^{M} AQOR_{r1,k,h}^{m,t} - \sum\nolimits_{\square}^{M} AQOR_{r2,k,h}^{m,t}\right) - \sum\nolimits_{\square}^{M} AQOR_{r3,k,h}^{m,t}\right)$$

Draft OR Settlement Claw-back Market Rules (11)

- **Continued formula for Chapter 9, Section 3.4.3.1**

Where:

$AQOR_{rn,k,h}^{m,t}$: Allocated quantity in MW of *class r reserve* for *market participant* 'k' at *RWM* 'm' in *metering interval* 't' of *settlement hour* 'h';

r1 denotes the *ten-minute operating reserve* that is synchronized with the *IESO-controlled grid*;

r2 denotes *ten-minute operating reserve* that is not synchronized with the *IESO-controlled grid*; and

r3 denotes *thirty-minute operating reserve*.

Draft OR Settlement Claw-back Market Rules (12)

- **Chapter 9, Section 3.4.3.2**

The non-accessibility charge calculated pursuant to section 3.4.2.1 will be divided among individual aggregate *facilities* on a pro-rated based on the percentage of total inaccessible *operating reserve* attributed to it as determined as follows:

$$ORCF_{rn,k,h}^{m,t} = \frac{ORIA_{rn,k,h}^{m,t}}{\sum_{}^{M1} ORIA_{rn,k,h}^{m,t}}$$

Draft OR Settlement Claw-back Market Rules (13)

- **Formula for Chapter 9, Section 3.4.3.2**

Where:

M1: is the set of delivery point 'm' where resource has *operating reserve* scheduled in class 'rn'.

Total inaccessible *operating reserve* for *generators:*

$$ORIA_{rn,k,h}^{m,t} = Min\left(0, TAOR_{k,h}^{m,t} - \sum_{R}^{\square} AQOR_{rn,k,h}^{m,t}\right)$$

Total accessible *operating reserve* for *generators*:

$$TAOR_{k,h}^{m,t} = Max\left(0, MAX\_CAP_{k,h}^{m,t} - AQEI_{k,h}^{m,t}\right)$$

Draft OR Settlement Claw-back Market Rules (14)

- **Chapter 9, Section 3.4.3.3**

The non-accessibility charge calculated pursuant to section 3.4.3.2 will be calculated for an individual aggregate *facility* as follows:

$$ORSCB_{rn,k,h}^{m,t} = ORIA\_CA_{rn,k,h}^{M,t} \times ORCF_{rn,k,h}^{m,t} \times PROR_{rn,h}^{m,t}$$

Where:

$PROR_{rn,h}^{m,t}$: *Market price* in $/MW of *class r reserve* in *metering interval* 't' of *settlement hour* 'h' at *RWM* 'm'.

Draft OR Settlement Claw-back Market Rules (15)

- **Chapter 9, Section 3.9.1**

The hourly *settlement amounts* defined by the preceding provisions of this section 3 will result in an hourly *settlement* deficit that shall be recovered from *market participants* as a whole through the *hourly uplift*. The *hour* 'h' ("HUSAh") shall be determined according to the following equation:

Draft OR Settlement Claw-back Market Rules (16)

- **Formula for Chapter 9, Section 3.9.1**

$$HUSA_h = \sum_K \left(NEMSC_{k,h} + ORSC_{k,h} + CMSC_{k,h} + RDSA_{k,h} + TRSC_{k,h} + IOG_{k,h}\right) + TCRF_{k,h} - \sum_K \left(\sum_R ORSSD_{k,r,h} + \sum_R ORSCB_{r,k,h} + DA\_IFC_{k,h} + RT\_IFC_{k,h} + DA\_EFC_{k,h} + RT\_EFC_{k,h} + DA\_LWFC_{k,h}\right)$$

ORSCBr,k,h = *operating reserve* non-accessibility charge for the *market participant* 'k' in *settlement hour* 'h'

Thank You

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