Market Rule Amendment Proposal Form

Part 1 - Market Rule Information

Identification No.:	MR-00490-R00
Subject:	Adjustments to Real-Time Make-Whole Payments
Title:	Adjustments to Real-Time Make-Whole Payments
Nature of Proposal:	☒ Alteration ☐ Deletion ☒ Addition
Chapter:	Ch. 7 App.7.8, Ch. 9
Appendix:	Appendix 7.8
Sections:	App.7.8 s.4.4, Ch.9 s.3.5
Sub-sections proposed for amending:	Various
Current Market Rules Baseline:	54.1

Part 2 - Proposal History

Version	Reason for Issuing	Version Date
1.0	Draft for Stakeholder Review	December 4, 2025

Approved Amendment Publication Date:

Approved Amendment Effective Date:

Part 3 - Explanation for Proposed Amendment

Provide a brief description that includes some or all of the following points:

- The reason for the proposed amendment and the impact on the *IESO-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 *IESO-administered markets*.

Summary

Background

Discussion

Part 4 - Proposed Amendment

Chapter 7 Appendix 7.8- Economic Operating Point

Constraints for Operating Reserve Ramping

4.4.22 For a *dispatchable resource*, the upper bound of the RT LOC EOP for all classes of *operating reserve* shall be less than or equal to the ~~it~~ *operating reserve* ramp rates as follows:

4.4.22.1 For a *dispatchable generation resource,* for interval $i \in I$ and bus $b \in B^{DG}$:

$$\sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} + \sum_{k \in K_{i,b}^{10N}} ES10NDG_{i,b,k} + \sum_{k \in K_{i,b}^{30R}} ES30RDG_{i,b,k} \leq 30 \cdot ORRDG_b$$

$$\sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} + \sum_{k \in K_{i,b}^{10N}} ES10NDG_{i,b,k} \leq 10 \cdot ORRDG_b$$

4.4.22.2 For a *dispatchable load,* for interval $i \in I$ and bus $b \in B^{DL}$:

$$\sum_{j \in J_{i,b}^{10S}} ES10SDL_{i,b,j} + \sum_{j \in J_{i,b}^{10N}} ES10NDL_{i,b,j} + \sum_{j \in J_{i,b}^{30R}} ES30RDL_{i,b,j} \leq 30 \cdot ORRDL_b$$

$$\sum_{j \in J_{i,b}^{10S}} ES10SDL_{i,b,j} + \sum_{j \in J_{i,b}^{10N}} ES10NDL_{i,b,j} \leq 10 \cdot ORRDL_b$$

4.4.23 For a *dispatchable generation resource* with $RLP10S_{i,b} > 0$, the amount of *ten-minute operating reserve* that a *dispatchable generation resource* is scheduled to provide shall be less than or equal to its *reserve loading point* for *ten-minute operating reserve*:

$$\sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} \leq \left(\sum_{k \in K_{i,b}^{E}} ESDG_{i,b,k} \right) \cdot \left(\frac{1}{RLP10S_{i,b}} \right) \cdot \left(min \left\{ 10 \cdot ORRDG_b, \sum_{k \in K_{i,b}^{10S}} Q10SDG_{i,b,k} \right\} \right)$$

4.4.24 For all *dispatchable generation resources* with $RLP30R_{i,b} > 0$, the amount of *thirty-minute operating reserve* that a *dispatchable generation resource* is scheduled to provide shall be less than or equal to its *reserve loading point* for *thirty-minute operating reserve*:

$$\sum_{k \in K_{i,b}^{30R}} ES30RDG_{i,b,k} \leq \left(\sum_{k \in K_{i,b}^{E}} ESDG_{i,b,k} \right) \cdot \left(\frac{1}{RLP30R_{i,b}} \right) \cdot \left(min \left\{ 30 \cdot ORRDG_b, \sum_{k \in K_{i,b}^{30R}} Q30RDG_{i,b,k} \right\} \right)$$

4.4.25 Constraints shall be applied to recognize that interval to interval changes to a *dispatchable resource's* schedule for *energy* may modify the amount of *operating reserve* that the *resource* can provide.

4.4.25.1 For a *dispatchable generation resource*, for all intervals $i \in I$ and all buses $b \in B^{DG}$:

$$\sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} + \sum_{k \in K_{i,b}^{10N}} ES10NDG_{i,b,k} + \sum_{k \in K_{i,b}^{30R}} ES30RDG_{i,b,k} \leq \sum_{k \in K_{i-1,b}^{E}} ESDG_{i-1,b,k} - \sum_{k \in K_{i,b}^{E}} ESDG_{i,b,k} + 30 \cdot ORRDG_b$$

and

$$\sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} + \sum_{k \in K_{i,b}^{10N}} ES10NDG_{i,b,k}$$

$$\leq \sum_{k \in K_{i-1,b}^{E}} ESDG_{i-1,b,k} - \sum_{k \in K_{i,b}^{E}} ESDG_{i,b,k} + 10 \cdot ORRDG_b$$

4.4.25.2 For a *dispatchable load,* for all intervals $i \in I$ and all buses $b \in B^{DL}$:

$$\sum_{j \in J_{i,b}^{10S}} ES10SDL_{i,b,j} + \sum_{j \in J_{i,b}^{10N}} ES10NDL_{i,b,j} + \sum_{j \in J_{i,b}^{30R}} ES30RDL_{i,b,j}$$

$$\leq - \sum_{j \in J_{i-1,b}^{E}} ESDL_{i-1,b,j} + \sum_{j \in J_{i,b}^{E}} ESDL_{i,b,j} + 30 \cdot ORRDL_b$$

and

$$\sum_{j \in J_{i,b}^{10S}} ES10SDL_{i,b,j} + \sum_{j \in J_{i,b}^{10N}} ES10NDL_{i,b,j}$$

$$\leq - \sum_{j \in J_{i-1,b}^{E}} ESDL_{i-1,b,j} + \sum_{j \in J_{i,b}^{E}} ESDL_{i,b,j} + 10 \cdot ORRDL_b$$

Constraints for Energy Ramping

4.4.265 With the exception of the first *interval* of each *dispatch day*, the RT LOC EOP shall use its RT LOC EOP for the prior interval as its initial starting point as follows:

4.4.265.1 For a *dispatchable generation resource,* its RT LOC EOP for *energy* cannot vary by more than five minutes of the *resource's energy* ramping capability for interval $i \in I$ and bus $b \in B^{DG}$:

$$ESDGInitSch_{i,b} - 5 \cdot DRRDG_{i,b,w} \leq \sum_{k \in K_{i,b}^{E}} ESDG_{i,b,k} \leq ESDGInitSch_{i,b} + 5 \cdot URRDG_{i,b,w}$$

4.4.265.2 For a *dispatchable load,* its RT LOC EOP for *energy* cannot vary by more than five minutes of the *resource's* energy ramping capability for interval $i \in I$ and bus $b \in B^{DL}$:

$$ESDLInitSch_{i,b} - 5 \cdot DRRDL_{i,b,w} \leq \sum_{j \in J_{i,b}^{E}} ESDL_{i,b,j} \leq ESDLInitSch_{i,b} + 5 \cdot URRDL_{i,b,w}$$

Constraints for Pseudo-Units

4.4.276 For a *pseudo-unit,* its RT LOC EOP for *energy* for the *dispatchable* region and duct firing region shall be less than or equal to the respective maximum capabilities for those regions for interval $i \in \mathrm{I}$ and bus $b \in B^{PSU}$:

$$\sum_{k \in K_{i,b}^{DR}} ESDG_{i,b,k} \leq MaxDR_{i,b}$$

$$\sum_{k \in K_{i,b}^{DF}} ESDG_{i,b,k} \leq MaxDF_{i,b}$$

4.4.287 For a *pseudo-unit,* the sum of its RT LOC EOP for *energy* and the RT LOC EOP s for all classes of *operating reserve* shall be less than or equal to the sum of the maximum capabilities for its *dispatchable* region and duct firing region for interval $i \in \mathrm{I}$ and bus $b \in B^{PSU}$

$$\sum_{k \in K_{i,b}^{DR}} ESDG_{i,b,k} + \sum_{k \in K_{i,b}^{DF}} ESDG_{i,b,k} + \sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} + \sum_{k \in K_{i,b}^{10N}} ES10NDG_{i,b,k} + \sum_{k \in K_{i,b}^{30R}} ES30RDG_{i,b,k} \leq MaxDR_{i,b} + MaxDF_{i,b}$$

4.4.298 For a *pseudo-unit* that cannot provide *ten-minute operating reserve* in from its duct firing region, the following constraint shall apply:

$$\sum_{k \in K_{i,b}^{E}} ESDG_{i,b,k} + \sum_{k \in K_{i,b}^{10S}} ES10SDG_{i,b,k} + \sum_{k \in K_{i,b}^{10N}} ES10NDG_{i,b,k} \leq MINQDG_b + QDR_{i,k}$$

Chapter 9

3.5.4 Notwithstanding this section 3.5, the following *resources* shall be ineligible for the following components of the real-time make-whole payment *settlement amount*:

3.5.4.1 The following *resources* shall be ineligible for ELC and ELOC:

a. *dispatchable loads* and *dispatchable electricity storage resources* that are registered to withdraw for any quantity of *energy* that they *bid* at the *maximum market clearing price* and which was scheduled in the *real-time market*;

b. combustion turbine *resources* or steam turbine *resources* that are registered as a *pseudo-unit* but not operating as a *pseudo-unit* for

metering intervals in which they have a minimum constraint applied for combined cycle operation consistent with combustion turbine commitment;

c. hydroelectric *generation resources:*

i. for any *settlement hour* for which the hydroelectric *generation resource* receives an *hourly must run* binding constraint;

ii. that are registered to the same *forebay* as one or more other hydroelectric *generation resources,* for a *trading day,* except for any *metering intervals* for which it receives a *reliability* constraint*,* if the sum of the quantity of *energy* scheduled in the *real-time market* for all *settlement hours* of the *trading day* for all *resources* that are registered to the same *forebay* is less than or equal to the *minimum daily energy limit* of such *forebay;* or

iii. that are not registered to the same *forebay* as one or more other hydroelectric *generation resources,* for a *trading day,* except for any *metering intervals* for which it receives a *reliability* constraint*,* if the sum of the quantity of *energy* scheduled in the *real-time market* for all *settlement hours* of the *trading day* for such *resources* is less than or equal to its *minimum daily energy limit;*

3.5.4.2 *energy traders* participating with *boundary entity resources* shall be ineligible for ELC, ELOC, and OLOC for import transactions;

3.5.4.3 *energy traders* participating with *boundary entity resources* shall be ineligible for ELOC and OLOC for export transactions;

3.5.4.4 *dispatchable load resources* and *dispatchable electricity storage resources* that are registered to withdraw shall be ineligible for ELOC where the *price-quantity pairs* contained in its *energy bid* for a *settlement hour* are not the same as the *price-quantity pairs* contained in its *energy bid* for the immediately preceding and next *settlement hour* and such change results in the ramping of the *resource* described in the applicable *market manual;*

3.5.4.5 *resources* shall be ineligible for positive ELC when its ~~it is injecting or withdrawing~~ *real-time schedule* for *energy* is less than~~below~~ it~~'~~s RT_LC_EOP;

3.5.4.6 *resources* shall be ineligible for positive ELOC when its *real-time schedule* for~~it is injecting or withdrawing~~ *energy* is greater than ~~above~~its RT_LOC_EOP;

3.5.4.7 *resources* shall be ineligible for positive OLC when its *real-time schedule* for *operating reserve* is less than its RT_OR_LC_EOP;

3.5.4.8 *resources* shall be ineligible for positive OLOC when its *real-time schedule* for *operating reserve* is greater than its RT_OR_LOC_EOP;

3.5.4.9 *non-quick start resources* shall be ineligible for ELOC and OLOC when its *real-time schedule* is less than its *minimum loading point*; and

3.5.4.10 Subject to section 3.5.4.10.1, *dispatchable loads* and *dispatchable electricity storage resources* that are registered to withdraw shall be ineligible for ELOC when (i) its RT_LOC_EOP is greater than its *real-time schedule;* (ii) its RT_LOC_EOP is greater than its actual quantity of *energy* withdrawn; and (iii) any of the following conditions exists:

Real-Time Make-Whole Payment for Dispatchable Generation Resources That Are Not Pseudo-Units and Dispatchable Electricity Storage Resources That Are Registered to Inject

3.5.6 For a *delivery point* 'm' associated with a *dispatchable electricity storage resource* that is registered to inject or a *dispatchable generation resource* that is not a *pseudo-unit*, the real-time make-whole payment *settlement amount* is calculated as follows:

$$RT\_MWP_{k,h}^{m} = \sum^{T} Max\left(0, RT\_ELC_{k,h}^{m,t} + RT\_OLC_{k,h}^{m,t}\right) + Max\left(0, RT\_ELOC_{k,h}^{m,t} + RT\_OLOC_{k,h}^{m,t}\right)$$

Where:

a. $RT\_ELC_{k,h}^{m,t}$ is calculated in accordance with section 3.5.6.1;

b. $RT\_OLC_{k,h}^{m,t} = \sum_{R}\{-1 \times \left[OP\left(RT\_PROR_{r,h}^{m,t}, Max(DAM\_QSOR_{r,k,h}^{m}, RT\_QSOR_{r,k,h}^{m,t}), BOR_{r,k,h}^{m,t}\right) - OP\left(RT\_PROR_{r,h}^{m,t}, Max(RT\_OR\_LC\_EOP_{r,k,h}^{m,t}, DAM\_QSOR_{r,k,h}^{m}), BOR_{r,k,h}^{m,t}\right)\right]/12\}$

c. $RT\_ELOC_{k,h}^{m,t}$ is calculated in accordance with section 3.5.6.2;

d. $RT\_OLOC_{k,h}^{m,t} = \sum_{R}\left[\{\text{Max}[0, OP\left(RT\_PROR_{r,h}^{m,t}, RT\_OR\_LOC\_EOP_{r,k,h}^{m,t}, BOR_{r,k,h}^{m,t}\right)] - Max\left[0, OP\left(RT\_PROR_{r,h}^{m,t}, RT\_QSOR_{r,k,h}^{m,t}, BOR_{r,k,h}^{m,t}\right)\right] - RT\_OR\_\text{FROP}\_LOC_{r,k,h}^{m,t}\}/12\right]$

Where:

i. if the *offer* price of $BOR_{r,k,h}^{m,t}$ is greater than $RT\_PROR_{r,h}^{m,t}$, the *IESO* shall revise the *offer* price of $BOR_{r,k,h}^{m,t}$ to be equal to $RT\_PROR_{r,h}^{m,t}$; and

ii. $RT\_OR\_\text{FROP}\_LOC_{r,k,h}^{m,t}$ is calculated in accordance with section 3.5.6.3.

3.5.6.1 The *IESO* shall calculate $RT\_ELC_{k,h}^{m,t}$ as follows:

$$RT\_ELC_{k,h}^{m,t} = -1\ x\ \left[\left[OP\left(RT\_LMP_{h}^{m,t}, Max(DAM\_QSI_{k,h}^{m}, Min(RT\_QSI_{k,h}^{m,t}, AQEI_{k,h}^{m,t})), BE_{k,h}^{m,t}\right) - OP\left(RT\_LMP_{h}^{m,t}, Max(RT\_LC\_EOP_{k,h}^{m,t}, DAM\_QSI_{k,h}^{m}), BE_{k,h}^{m,t}\right)\right] - RT\_FROP\_LC_{k,h}^{m,t}\right]/12$$

Where:

a. the *dispatchable generation resource* is registered as a hydroelectric *generation resource,* $RT\_QSI_{k,h}^{m,t}$ is greater than $FR\_LL_{k}^{m,f}$, and $RT\_QSI_{k,h}^{m,t}$ is less than or equal to $FR\_UL_{k}^{m,f}$, then:

$$RT\_FROP\_LC_{k,h}^{m,t} = Max\,[0, OP\left(RT\_LMP_{h}^{m,t}, Max(DAM\_QSI_{k,h}^{m}, Min(RT\_QSI_{k,h}^{m,t}, AQEI_{k,h}^{m,t})), BE_{k,h}^{m,t}\right)] - OP\left(RT\_LMP_{h}^{m,t}, Max(FR\_LL_{k,h}^{m,t,f}, DAM\_QSI_{k,h}^{m}, RT\_LC\_EOP_{k,h}^{m,t}), BE_{k,h}^{m,t}\right)$$

Where:

i. '$FR\_UL_{k}^{m,f}$' is the *forbidden region* upper limit from *forbidden region* set 'f' where $RT\_QSI_{k,h}^{m,t} <= FR\_UL_{k}^{m,f}$, as submitted by *market participant* 'k' for *delivery point* 'm' as daily *dispatch data*.

ii. '$FR\_LL_{k}^{m,f}$' is the *forbidden region* lower limit from *forbidden region* set 'f' where $RT\_QSI_{k,h}^{m,t} > FR\_LL_{k}^{m,f}$, as submitted by *market participant* 'k' for *delivery point* 'm' as daily *dispatch data*.

iii. 'f' = (1…N) of the *forbidden region* set $\{FR\_UL_{k}^{m,f}, FR\_LL_{k}^{m,f}\}$ and 'N' is the maximum number of *forbidden regions* submitted by *market participant* 'k' for *delivery point* 'm' as daily *dispatch data*.

b. Otherwise $RT\_FROP\_LC_{k,h}^{m,t}$ shall equal zero.

3.5.6.2 The *IESO* shall calculate $RT\_ELOC_{k,h}^{m,t}$ as follows:

$$RT\_ELOC_{k,h}^{m,t} = \{Max[0, OP\left(RT\_LMP_{h}^{m,t}, RT\_LOC\_EOP_{k,h}^{m,t}, BE_{k,h}^{m,t}\right)] - Max\left[0, OP\left(RT\_LMP_{h}^{m,t}, Max(RT\_QSI_{k,h}^{m,t}, AQEI_{k,h}^{m,t}), BE_{k,h}^{m,t}\right)\right] - RT\_FROP\_LOC_{k,h}^{m,t}\} /12$$

Where:

a. if the *offer* price of $BE_{k,h}^{m,t}$ is greater than $RT\_LMP_{h}^{m,t}$, the *IESO* shall revise the *offer* price of $BE_{k,h}^{m,t}$ to be equal to $RT\_LMP_{h}^{m,t}$

b. if the *dispatchable generation resource* is registered as a hydroelectric *generation resource,* $RT\_QSI_{k,h}^{m,t}$ is greater than or equal to $FR\_LL_{k}^{m,f}$ and $RT\_QSI_{k,h}^{m,t}$ is less than $FR\_UL_{k}^{m,f}$, then:

$$RT\_FROP\_LOC_{k,h}^{m,t} = Max\,[0, OP\left(RT\_LMP_{h}^{m,t}, Min(FR\_UL_{k,h}^{m,f}, RT\_LOC\_EOP_{k,h}^{m,t}), BE_{k,h}^{m,t}\right)] - Max\left[0, OP\left(RT\_LMP_{h}^{m,t}, Max(RT\_QSI_{k,h}^{m,t,f}, AQEI_{k,h}^{m,t}), BE_{k,h}^{m,t}\right)\right]$$

Where:

i. '$FR\_UL_k^{m,f}$' is the *forbidden region* upper limit from *forbidden region* set 'f' where $RT\_QSI_{k,h}^{m,t} < FR\_UL_k^{m,f}$, as submitted by *market participant* 'k' for *delivery point* 'm' as daily *dispatch data*.

ii. '$FR\_LL_k^{m,f}$' is the *forbidden region* lower limit from *forbidden region* set 'f' where $RT\_QSI_{k,h}^{m,t} >= FR\_LL_k^{m,f}$, as submitted by *market participant* 'k' for *delivery point* 'm' as daily *dispatch data*.

iii. 'f' = (1…N) of the *forbidden region* set {$FR\_UL_k^{m,f}$, $FR\_LL_k^{m,f}$} and 'N' is the maximum number of *forbidden regions* submitted by *market participant* 'k' for *delivery point* 'm' as daily *dispatch data*.

c. Otherwise $RT\_FROP\_LOC_{k,h}^{m,t}$ shall equal zero.

3.5.6.3 The *IESO* shall calculate $RT\_OR\_\text{FROP}\_LOC_{r,k,h}^{m,t}$ as follows:

$$RT\_OR\_FROP\_LOC_{r,k,h}^{m,t} = Max[0, OP(RT\_PROR_{r,h}^{m,t}, (RT\_OR\_LOC\_EOP_{r,k,h}^{m,t} - QTY\_ADJ_{r,k,h}^{m,t}), BOR_{r,k,h}^{m,t})] - Max\left(0, OP(RT\_PROR_{r,h}^{m,t}, RT\_QSOR_{r,k,h}^{m,t}, BOR_{r,k,h}^{m,t})\right)$$

Where:

a. $QTY\_ADJ_{r,k,h}^{m,t} = \text{Max}(0, QTY\_DIFF_{r,k,h}^{m,t} - FR\_QTY\_AVAIL_{r,k,h}^{m,t})$

b. $QTY\_DIFF_{r,k,h}^{m,t} = RT\_OR\_LOC\_EOP_{r,k,h}^{m,t} - RT\_QSOR_{r,k,h}^{m,t}$

c. For synchronized *ten-minute operating reserve*:

$$FR\_QTY\_AVAIL_{r1,k,h}^{m,t} = Max\left[0, Max\left(DAM\_QSI_{k,h}^{m}, Min(RT\_QSI_{k,h}^{m,t}, AQEI_{k,h}^{m,t})\right) - Max(FR\_LL_{k,h}^{m,t}, DAM\_QSI_{k,h}^{m}, RT\_LC\_EOP_{k,h}^{m,t})\right]$$

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

$$FR\_QTY\_AVAIL_{r2,k,h}^{m,t} = FR\_QTY\_AVAIL_{r1,k,h}^{m,t} - (RT\_OR\_LOC\_EOP_{r1,k,h}^{m,t} - QTY\_ADJ_{r1,k,h}^{m,t} - RT\_QSOR_{r1,k,h}^{m,t})$$

e. For thirty-minute *operating reserve*:

$$FR\_QTY\_AVAIL_{r3,k,h}^{m,t} = FR\_QTY\_AVAIL_{r2,k,h}^{m,t} - (RT\_OR\_LOC\_EOP_{r2,k,h}^{m,t} - QTY\_ADJ_{r2,k,h}^{m,t} - RT\_QSOR_{r2,k,h}^{m,t})$$

Real-Time Make-Whole Payment for Dispatchable Loads and Dispatchable Electricity Storage Resources That Are Registered to Withdraw

3.5.7 For a *delivery point* 'm' associated with a *dispatchable load* or *dispatchable electricity storage resource* that is registered to withdraw, the real-time make-whole payment *settlement amount* is calculated as follows:

$$RT\_MWP_{k,h}^{m} = \sum^{T} Max\left(0, RT\_ELC_{k,h}^{m,t} + RT\_OLC_{k,h}^{m,t}\right) + Max(0, RT\_ELOC_{k,h}^{m,t} + RT\_OLOC_{k,h}^{m,t})$$

Where:

a. $RT\_ELC_{k,h}^{m,t} = \left[OP\left(RT\_LMP_{h}^{m,t}, Max(DAM\_QSW_{k,h}^{m}, Min(RT\_QSW_{k,h}^{m,t}, AQEW_{k,h}^{m,t})), BL_{k,h}^{m,t}\right) - OP\left(RT\_LMP_{h}^{m,t}, Max(RT\_LC\_EOP_{k,h}^{m,t}, DAM\_QSW_{k,h}^{m}), BL_{k,h}^{m,t}\right)\right]/12$

b. $RT\_OLC_{k,h}^{m,t} = \sum_{R}\{-1 \times \left[OP\left(RT\_PROR_{r,h}^{m,t}, Max(DAM\_QSOR_{r,k,h}^{m}, RT\_QSOR_{r,k,h}^{m,t}), BOR_{r,k,h}^{m,t}\right) - OP\left(RT\_PROR_{r,h}^{m,t}, Max(RT\_OR\_LC\_EOP_{r,k,h}^{m,t}, DAM\_QSOR_{r,k,h}^{m}), BOR_{r,k,h}^{m,t}\right)\right]/12\}$

c. $RT\_ELOC_{k,h}^{m,t} = -1 \times \{Max\,[0, OP\left(RT\_LMP_{h}^{m,t}, RT\_LOC\_EOP_{k,h}^{m,t}, BL_{k,h}^{m,t}\right)] - OP\left(RT\_LMP_{h}^{m,t}, Max(RT\_QSW_{k,h}^{m,t}, AQEW_{k,h}^{m,t}), BL_{k,h}^{m,t}\right)\}/12$

And where:

i. if the *bid* price of $BL^{m,t}_{k,h}$ is less than $RT\_LMP_{h}^{m,t}$, the *IESO* shall revise the *bid* price of $BL^{m,t}_{k,h}$ to be equal to $RT\_LMP_{h}^{m,t}$

d. $RT\_OLOC_{k,h}^{m,t} = \sum_{R}\left[Max[0, \{OP\left(RT\_PROR_{r,h}^{m,t}, RT\_OR\_LOC\_EOP_{r,k,h}^{m,t}, BOR_{r,k,h}^{m,t}\right)] - Max\left[0, OP\left(RT\_PROR_{r,h}^{m,t}, RT\_QSOR_{r,k,h}^{m,t}, BOR_{r,k,h}^{m,t}\right)\right]\}/12\right]$

And where:

i. if the *offer* price of $BOR^{m,t}_{r,k,h}$ is greater than $RT\_PROR^{m,t}_{r,h}$, the *IESO* shall revise the *offer* price of $BOR^{m,t}_{r,k,h}$ to be equal to $RT\_PROR^{m,t}_{r,h}$

Real-Time Make-Whole Payment for Dispatchable Generation Resources That Are Pseudo-Units

Combustion turbine

3.5.9 For a *delivery point* 'c' for a combustion turbine *resource* associated with a *pseudo-unit*, the real-time make-whole payment *settlement amount* is calculated as follows:

$$RT\_MWP^{c}_{k,h} = \sum^{T} Max\left(0, RT\_ELC^{c,t}_{k,h} + RT\_OLC^{c,t}_{k,h}\right) + Max\left(0, RT\_ELOC^{c,t}_{k,h} + RT\_OLOC^{c,t}_{k,h}\right)$$

Where:

a. $RT\_ELC^{c,t}_{k,h} = (-1) \times \left[OP\left(RT\_LMP^{c,t}_{h}, Max\left(DAM\_QSI^{c}_{k,h}, Min\left(RT\_QSI^{c,t}_{k,h}, AQEI^{c,t}_{k,h}\right)\right), RT\_DIPC^{c,t}_{k,h}\right) - OP\left(RT\_LMP^{c,t}_{h}, Max\left(RT\_LC\_EOP^{c,t}_{k,h}, DAM\_QSI^{c}_{k,h}\right), RT\_DIPC^{c,t}_{k,h}\right)\right]/12$

b. $RT\_OLC^{c,t}_{k,h} = \sum_{R}\left[(-1) \times \left\{OP\left(RT\_PROR^{c,t}_{r,h}, Max\left(DAM\_QSOR^{c}_{r,k,h}, RT\_QSOR^{c,t}_{r,k,h}\right), RT\_OR\_DIPC^{c,t}_{r,k,h}\right) - OP\left(RT\_PROR^{c,t}_{r,h}, MAX\left(RT\_OR\_LC\_EOP^{c,t}_{r,k,h}, DAM\_QSOR^{c}_{r,k,h}\right), RT\_OR\_DIPC^{c,t}_{r,k,h}\right)\right\}/12\right]$

And where:

i. If the *offer* price in the $RT\_OR\_DIPC^{c,t}_{r,k,h}$ *offer* curve is greater than $RT\_PROR^{c,t}_{r,h}$ for the same *class r reserve*, the *IESO* shall revise the *offer* price of $RT\_OR\_DIPC^{c,t}_{r,k,h}$ to be equal to $RT\_PROR^{c,t}_{r,h}$.

c. $RT\_ELOC^{c,t}_{k,h} = \left\{Max[0, OP\left(RT\_LMP^{c,t}_{h}, RT\_LOC\_EOP^{c,t}_{k,h}, RT\_DIPC^{c,t}_{k,h}\right)] - Max\left[0, OP\left(RT\_LMP^{c,t}_{h}, Max\left(RT\_QSI^{c,t}_{k,h}, AQEI^{c,t}_{k,h}\right), RT\_DIPC^{c,t}_{k,h}\right)\right]\right\}/12$

And where:

i. If the *offer* price in the $RT\_DIPC^{c,t}_{k,h}$ *offer* curve is greater than $RT\_LMP^{c,t}_{h}$, the *IESO* shall revise the *offer* price of $RT\_DIPC^{c,t}_{k,h}$ to be equal to $RT\_LMP^{c,t}_{h}$

d. $RT\_OLOC^{c,t}_{k,h} = \sum_{R}\left[Max[0, OP\left(RT\_PROR^{c,t}_{r,h}, RT\_OR\_LOC\_EOP^{c,t}_{r,k,h}, RT\_OR\_DIPC^{c,t}_{r,k,h}\right)] - Max\left[0, OP\left(RT\_PROR^{c,t}_{r,h}, RT\_QSOR^{c,t}_{r,k,h}, RT\_OR\_DIPC^{c,t}_{r,k,h}\right)\right]\right]/12$

And where:

i. If the *offer* price in the $RT\_OR\_DIPC^{c,t}_{r,k,h}$ *offer* curve is greater than $RT\_PROR^{c,t}_{r,h}$ for the same *class r reserve*, the *IESO* shall revise the *offer* price of $RT\_OR\_DIPC^{c,t}_{r,k,h}$ to be equal to $RT\_PROR^{c,t}_{r,h}$.

Steam turbine

3.5.10 For a *delivery point* 's' for a steam turbine *resource* associated with a *pseudo-unit* where at least one of the combustion turbine *resources* associated with the *pseudo-unit* has a *real-time schedule* greater than or equal to its *minimum loading point* during the applicable *settlement hour*, the real-time make-whole payment *settlement amount* is calculated as follows:

$$RT\_MWP^{s}_{k,h} = \sum^{T} Max\left(0, RT\_ELC^{s,t}_{k,h} + RT\_OLC^{s,t}_{k,h}\right) + Max\left(0, RT\_ELOC^{s,t}_{k,h} + RT\_OLOC^{s,t}_{k,h}\right)$$

Where:

a. $RT\_ELC^{s,t}_{k,h} = (-1) \times \left[OP\left(RT\_LMP^{s,t}_{h}, Max\left(DAM\_DIGQ^{s}_{k,h}, Min\left(RT\_QSI\_DIGQ^{s,t}_{k,h}, AQEI^{s,t}_{k,h}\right)\right), RT\_DIPC^{s,t}_{k,h}\right) - OP\left(RT\_LMP^{s,t}_{h}, Max\left(RT\_LC\_EOP\_DIGQ^{s,t}_{k,h}, DAM\_DIGQ^{s}_{k,h}\right), RT\_DIPC^{s,t}_{k,h}\right)\right]/12$

b. $RT\_OLC^{s,t}_{k,h} = \sum_{R}\left[(-1) \times \left\{ OP\left(RT\_PROR^{s,t}_{r,h}, Max\left(DAM\_QSOR^{s}_{r,k,h}, RT\_QSOR^{s,t}_{r,k,h}\right), RT\_OR\_DIPC^{s,t}_{r,k,h}\right) - OP\left(RT\_PROR^{s,t}_{r,h}, Max\left(RT\_OR\_LC\_EOP^{s,t}_{r,k,h}, DAM\_QSOR^{s}_{r,k,h}\right), RT\_OR\_DIPC^{s,t}_{r,k,h}\right)\right\}/12\right]$

And where:

i. If the *offer* price in the $RT\_OR\_DIPC^{s,t}_{r,k,h}$ *offer* curve is greater than $RT\_PROR^{s,t}_{r,h}$ for the same *class r reserve*, the *IESO* shall revise the *offer* price of $RT\_OR\_DIPC^{s,t}_{r,k,h}$ to be equal to $RT\_PROR^{s,t}_{r,h}$.

c. $RT\_ELOC^{s,t}_{k,h} = \left\{Max[0, OP\left(RT\_LMP^{s,t0}_{h}, RT\_LOC\_EOP\_DIGQ^{s,t0}_{k,h}, RT\_DIPC^{s,t0}_{k,h}\right)] - Max\left[0, OP\left(RT\_LMP^{s,t0}_{h}, Max\left(RT\_QSI\_DIGQ^{s,t0}_{k,h}, AQEI^{s,t0}_{k,h}\right), RT\_DIPC^{s,t0}_{k,h}\right)\right]\right\}/12 + \left\{OP\left(RT\_LMP^{s,t1}_{h}, RT\_LOC\_EOP\_DIGQ^{s,t1}_{k,h}, RT\_DIPC^{s,t1}_{k,h}\right) - Max\left[0, OP\left(RT\_LMP^{s,t1}_{h}, RT\_QSI\_DIGQ^{s,t1}_{k,h}, RT\_DIPC^{s,t1}_{k,h}\right)\right]\right\}/12$

And where:

i. 't_0' is *metering interval* 't' in *settlement hour* 'h' when none of the combustion turbine *resources* associated with the steam turbine *resource* have a *real-time schedule* that is less than its respective *minimum loading*

point. For greater certainty, 't_1' and 't_0' *metering intervals* are mutually exclusive, and the calculation will be conducted using either the 't_1' or 't_0' variables, depending on whether the relevant *metering interval* meets the criteria of 't_1' or 't_0', respectively*;*

ii. 't_1' is *metering interval* 't' in *settlement hour* 'h' when (1) at least one combustion turbine *resource* associated with the steam turbine *resource* has a *real-time schedule* greater than or equal to its *minimum loading point*; and (2) at least one of the combustion turbine *resources* associated with the steam turbine *resource* has a *real-time schedule* that is less than its respective *minimum loading point.* For greater certainty, 't_1' and 't_0' *metering intervals* are mutually exclusive, and the calculation will be conducted using either the 't_1' or 't_0' variables, depending on whether the relevant *metering interval* meets the criteria of 't_1' or 't_0', respectively*;* and

iii. If the *offer* price in the $RT\_DIPC_{k,h}^{s,t}$ *offer* curve is greater than $RT\_LMP_{h}^{s,t}$, the *IESO* shall revise the *offer* price of $RT\_DIPC_{k,h}^{s,t}$ to be equal to $RT\_LMP_{h}^{s,t}$.

d. $$RT\_OLOC_{k,h}^{s,t} = \sum_R \left[\left\{Max\left[0, OP\left(RT\_PROR_{r,h}^{s,t}, RT\_OR\_LOC\_EOP_{r,k,h}^{s,t}, RT\_OR\_DIPC_{r,k,h}^{s,t}\right)\right] - Max\left[0, OP\left(RT\_PROR_{r,h}^{s,t}, RT\_QSOR_{r,k,h}^{s,t}, RT\_OR\_DIPC_{r,k,h}^{s,t}\right)\right]\right\}/12\right]$$

And where:

i. If the *offer* price in the $RT\_OR\_DIPC_{r,k,h}^{s,t}$ *offer* curve is greater than $RT\_PROR_{r,h}^{s,t}$ for the same *class r reserve*, the *IESO* shall revise the *offer* price of $RT\_OR\_DIPC_{r,k,h}^{s,t}$ to be equal to $RT\_PROR_{r,h}^{s,t}$.