

An aerial photograph of a city, likely Chicago, showing a dense urban landscape with many trees and buildings. The image is overlaid with a semi-transparent blue gradient that covers the top and left portions of the frame, creating a professional and modern look.

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Adding De-Rates to the Real-Time Lost Cost EOP

Independent Electricity System Operator (IESO)

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Background:

- Ongoing monitoring and review of the renewed market has identified a specific Real-Time Make-Whole Payment (RT MWP) scenario under which inappropriate RT MWP are paid out.
- The scenario is related to the interaction between de-rates and RT lost cost Economic Operating Point (RT LC EOP) for PSUs.
- The dispatch scheduling optimizer (DSO) calculations, scheduling and pricing are correct; however, adjustments are needed to LC EOP calculations.
- The IESO is proposing a correction to the formulas in EOP Market Rules and related tools to ensure continued accuracy and consistency.

Make-Whole Payments in the Renewed Market:

- Dispatch schedules may not align to prices because of:
 - Manual out-of-market actions taken for reliability; and
 - Scheduling pass/pricing pass differences

Principles for calculating Real-Time Make-Whole Payments:

1. It must represent what is physically achievable for the resource; and
2. It must be calculated considering co-optimization of energy and operating reserve consistent with the real-time DSO engine

Rationale for the fix:

- The DSO is modelling the de-rates submitted on the physical resources associated with a PSU to drive the correct schedules for the combustion turbine and steam turbine (CT/ST).
- There is an inconsistency whereby the RT lost cost EOP does not account for de-rates in the EOP calculation engine. This inconsistency can result in understating RT lost cost EOPs, leading to overpayments in RT LC MWP.

Impact:

- De-rates are modelled in the day-ahead lost cost EOP and the real-time lost opportunity cost EOP; therefore, those MWP calculations are correct.
- The RT lost cost EOP is missing the modelling of de-rates for all resources and the impact to the RT MWP is only on the CT/ST associated with PSU resources. This is due to the interaction between the PSU EOP and the physical resource EOPs.

Example of real-time lost cost:

Example: A de-rate has been applied to 2 of the combustion turbines associated with PSU1 and PSU2. No de-rate is applied to the steam turbine.

Energy Schedules & EOP prior to de-rates:

G1 = 196

G2 = 196

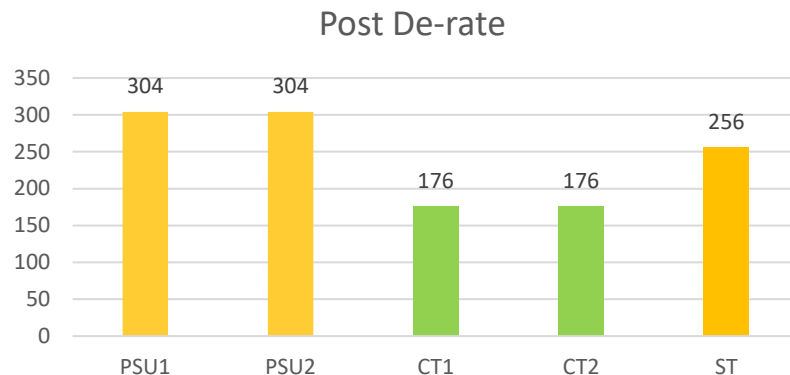
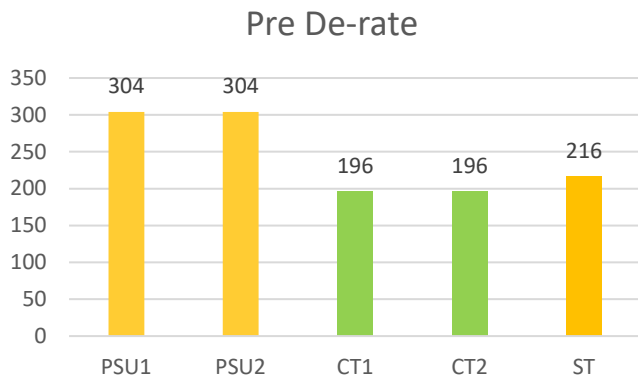
G3 (ST) = 216

PSU1 = 304, PSU2 = 304

**Since there is no difference between schedules and EOPs prior to the de-rates,
MWP = \$0**

Example of real-time lost cost:

The market participant submits de-rates on CT 1 and CT2 for 20MW each. In this example, when the de-rate is being applied only on the physical units, the DSO will not dynamically updating the schedules of the associated PSU resource, therefore the ST resource schedule is increasing by 40MW.



Example of real-time lost cost:

Energy schedules post de-rates:

G1 = 176, G2 = 176, G3 = 256

EOP are not impacted by the de-rates and remain the same:

$$\text{ST EOP} = (\text{PSU EOP} - \text{CT EOP}) = (304 - 196) \times 2 = 216$$

$$\text{EOP G1} = 196, \text{EOP G2} = 196, \text{EOP G3} = 216$$

The discrepancy between the schedules and the EOP is the source of the issue causing the RT MWP.

Example of real-time lost cost:

Outcomes:

CT:

RT schedule (176MW) < EOP (196MW)

No lost cost MWP for the CT resources

ST:

RT schedule (256MW) > EOP (216MW)

The ST resource is showing a lost cost

**This lost cost
represents
an inappropriate RT
MWP.**

Inputs to Simplified Settlement Example:

For the ST:

RT LMP = \$40

RT schedule = 256 MW

RT EOP = 216 MW

	PSU 1	PSU 2	PSU 3
PSU operating ranges	160	140	80
Steam turbine portion	0.3	0.4	1

PSU offer	price 1	Qty 1	price 2	Qty 2	price 3	Qty 3
PSU 1	30	0	30	304	90	380
PSU 2	30	0	30	304	90	380
Translated offers	price 1	Qty 1	price 2	Qty 2	price 3	Qty 3
CT 1	30	0	30	196	0	0
CT 2	30	0	30	196	0	0
ST	30	0	30	208	90	8

Simplified Settlement Example:

A RT MWP is calculated because of the difference between the RT schedule and the RT EOP of the ST.

RT Lost Cost Calculation		
	OP (Min(RT_QSI, AQEI))	OP (RT_LC_EOP)
Revenue	256MW X \$40 =	216MW X \$40 =
	\$ 10,240	\$ 8,640
Costs	208MW X \$30 + 48MW X \$90 =	208MW X \$30 + 8MW X \$90 =
	\$ 10,560	\$ 6,960
Total	\$10240 - \$10560 =	\$8640 - \$6960 =
	-\$ 320	\$ 1,680
RT COMP1	-1 X (-\$320 - \$1680) =	
Hour	\$2,000	
Interval	\$167	

Conclusion:

Before the market rule change:

ST RT schedule (256MW) > EOP (216MW)

The ST resource is showing a lost cost.

After the market rule change, schedule and EOP align during de-rates:

ST RT schedule (256MW) = EOP (256MW)

The ST resource is not showing a lost cost.

This is the correct outcome given that economic operating point should be consistent with the DSO in reflecting the de-rate and capabilities of the resource.

Changes to Market Rules Chapter 7 Appendix:

Addition required: In the Market Rules, update the calculation for real time lost cost EOP to add in a constraint for modeling de-rates, Chapter 7, Appendix 7.8 Economic Operating Point, in a new section

For a *dispatchable generation resource*, its RT LC EOP shall not exceed the maximum available capacity for the *resource* for interval $i \in I$ and bus $b \in B^{DG}$:

$$AdjMaxDG_{i,b} = \left\{ \begin{array}{ll} \min \left(\sum_{k \in K_{i,b}^E} QDG_{i,b,k}, Derate_{i,b}, \right) & \text{if } b \in B^{VG} \\ \min \left(\sum_{k \in K_{i,b}^E} QDG_{i,b,k}, Derate_{i,b} \right) & \text{otherwise} \end{array} \right\}$$

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

Next Steps

Timing	Engagement Activity
August 19, 2026	Public Engagement Session
September 1, 2026	Request for Feedback
September 15, 2026	TP Education
October 13, 2026	TP Vote to Post
November 10, 2026	TP Vote to Recommend
December 10, 2026	IESO Board Consideration
February 2027	Target Implementation