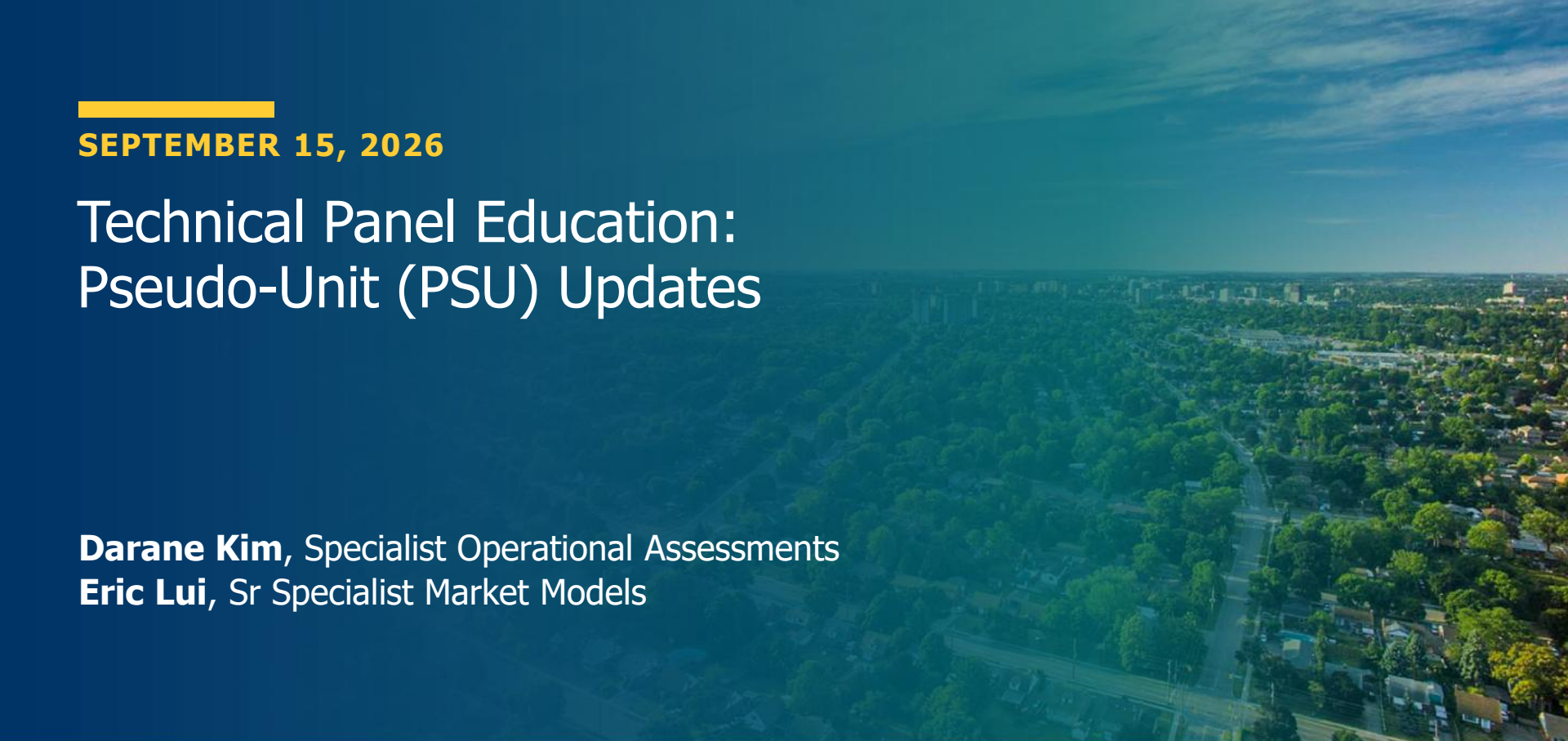




SEPTEMBER 15, 2026

Technical Panel Education: Pseudo-Unit (PSU) Updates

Darane Kim, Specialist Operational Assessments
Eric Lui, Sr Specialist Market Models

Agenda

- Proposed PSU Dispatch Scheduling Optimization (DSO) Enhancement with Red-Line Documents
 - **Item 1:** Combustion Turbine (CT) outages and allocation of Steam Turbine (ST) derates
 - **Item 2:** Derates and constraints below PSU Minimum Loading Point (MLP)
 - **Item 3:** Ramp rates when CT and ST come online at different times.
- Next Steps and Timelines

Background

- Following the launch of the renewed Market in May 2025, specific discrepancies were identified in how PSU resources were being scheduled, which resulted in infeasible schedules under certain situations.
- Workarounds for these discrepancies were implemented in June 2025 to minimize the impact (see [PSU Resources Interim Workarounds](#))
- The proposed enhancements to the DSO scheduling of PSU resources will eliminate some of those interim workarounds
- These enhancements will require amendments to the Market Rules



Enhancement 1: CT outages and allocation of ST derates

Enhancement 1: Issue

- **Issue:** Derates on the ST gets allocated pro-rata amongst all PSUs at a station including ones that are unavailable from an outage slip

Description: the DSO applies any derate or maximum constraint submitted for a ST across all associated PSUs that have offers. This is an issue if a Market Participant (MP) submits only an outage slip and does not remove offers. Furthermore, if the derate or constraint brings the PSU below its calculated MLP, the PSU gets dispatched to 0 MW.

Enhancement 1: Solution

- **Proposed change:** Incorporate additional logic to ensure submitted outages on CTs are considered when determining how to split the ST's derated MWs.
 - The fix will also have a conforming change to the implementation of the economic operating point (EOP) calculation.
- **Change applies to:** Day-Ahead, Pre-Dispatch, Real-Time

Enhancement 1: Market Rule Amendment Summary

Proposed Market Rule Amendments	Description
Added Sections: 22.2.2A (Appendix 7.5), 15.2.2A (Appendix 7.5A), 10.2.2A (Appendix 7.6), 22.3.5.2A (Appendix 7.5), 15.3.5.2A (Appendix 7.5A), 10.3.5.1A (Appendix 7.6)	These new sections have been incorporated to clarify the treatment of derates and constraints of ST in Day-Ahead Market (DAM), Predispatch (PD), and Real-Time (RT). Specifically, they establish the eligibility criteria that a PSU must meet, so that the prorating of the most limiting ST maximum constraint or ST derate across associated PSUs and CTs is applied.
Modified Sections: 22.2.3.1.2 (Appendix 7.5), 22.3.5.3 (Appendix 7.5), 15.2.3.1.2 (Appendix 7.5A), 15.3.5.3 (Appendix 7.5A), 10.2.3.1.2 (Appendix 7.6), 10.2.3.1.6 (Appendix 7.6), 10.3.5.2 (Appendix 7.6)	These sections have been adjusted so that the prorating logic only applies when conditions set out in the newly added sections are met.

Note: Appendix 7.5 is the DAM timeframe, 7.5A is the PD timeframe and, 7.6 is the RT timeframe

Enhancement 1: Market Rule Amendment Summary cont'd

Proposed Market Rule Amendments	Description
Modified Section: 10.2.3.1.5 (Appendix 7.6)	This section was modified to apply CT derates for the associated PSU, when the derate or constraint is below the MLP and the PSU is not operating in single cycle mode.
Added Section: 10.2.3.1.5A (Appendix 7.6)	The added section was introduced to capture the scenario where the PSU is operating in single cycle mode or the associated ST is offline.
Modified Section: 22.2.3.1.1 (Appendix 7.5), 15.2.3.1.1 (Appendix 7.5A), 10.2.3.1.1 (Appendix 7.6)	These sections have been modified to incorporate logic for calculating the amount of offered energy attributed to the ST portion. Specially, when a PSU is flagged to operate in single cycle mode, it will now affect the offered energy attributed to the steam turbine portion.
Modified Section: 10.2.3.1.3 (Appendix 7.6)	This section was modified such that a PSU is no longer deemed unavailable when either: The CT capacity is below its MLP; or the ST capacity associated with the PSU is below its MLP.

Note: Appendix 7.5 is the DAM timeframe, 7.5A is the PD timeframe and, 7.6 is the RT timeframe



Enhancement 2: Derates and constraints on CT or ST below DSO's calculated PSU MLP

Enhancement 2: Issue

- **Issue:** Derates or constraints applied on CT or ST below DSO calculated MLP results in PSU dispatched to 0 MW (applies to NQS resources as well)

Description: The DSO calculates the ST's MLP by multiplying the 1x1 ST MLP by the number of offered CTs. If any derate or constraint brings the value to below this calculated MLP, the DSO will dispatch the PSU to 0 MW.

This issue is amplified if issue 1 (ST derate split incorrectly) is present.

Enhancement 2: Solution

- **Proposed change:** Derates and constraints will be respected even when the PSU is operating below its MLP. This applies to all NQS resources.
 - The fix will also have a conforming change to the implementation of the economic operating point (EOP) calculation.
- **Change applies to:** Real-Time DSO only

Enhancement 2: Market Rule Amendment Summary

Proposed Market Rule Amendments	Description
Added Section: 10.3.3.2 (Appendix 7.6)	This section was added to define the logic for when a PSU is not operating in single cycle mode and either the maximum constraint or maximum offered quantity is below the MLP. In these circumstances, the real-time calculation engine will adjust the maximum constraints of the associated CT (CTMax) and ST (PRSTMax) accordingly.
Added Section: 10.3.3.2.1 (Appendix 7.6)	Building upon Section 10.3.3.2, this section was added to define the conditions and corresponding logic when the associated CT is online while the ST is offline.
Added Section: 10.3.3.2.2 (Appendix 7.6)	Building upon Section 10.3.3.2, this section was added to define the conditions and corresponding logic when both the associated CT and ST are online.
Added Section: 10.3.3.2.3 (Appendix 7.6)	Building upon Section 10.3.3.2, this section was added to define the conditions under which the associated CT and/or ST is not yet online but have a confirmed future startup time. Specifically, this section outlines how the calculated maximums shall be applied in the advisory intervals.



Enhancement 3: Ramp rates when CT and ST come online at different times.

Enhancement 3: Issue

- **Issue:** Delayed ST ramp causes ramp rate discrepancies

Description: When the ST synchronizes later than the CT, RT DSO uses the ST's own physical unit initialization MW to determine its ramp rate. By doing so, the PSU is being ramped up quicker than expected.

This issue is amplified if issue 2 (derates/constraints are not considered during ramp up to MLP) is present.

Enhancement 3: Solution

- **Proposed change:** The PSU output is used to determine the ramp rates for the ramp trajectory. For the first PSU coming online (i.e. the ST is offline), the CT output level is considered in the ST ramp rate when it comes online. For subsequent PSUs, when the ST is already online, the additional CTs that synchronize shall use the appropriate PSU ramp rates (starting at 0MW) because the CT and ST will ramp together from the start.
 - The fix will also have a conforming change to the implementation of the economic operating point (EOP) calculation.
- **Change applies to:** RT DSO only

Enhancement 3: Market Rule Amendment Summary

Proposed Market Rule Amendments	Description
Modified Section: 10.3.4.1 (Appendix 7.6)	This section was modified to include the condition that the steam turbine resource is online.
Modified Section: 10.3.4.2 (Appendix 7.6)	This section was modified to include the condition that the steam turbine resource is offline.
Modified Section: 10.3.4.3 (Appendix 7.6)	This section was modified to include the condition where the steam turbine resource is online -- the logic where the PSU is deemed unavailable if the CT's maximum constraint is below it's MLP no longer applies. Instead, the real-time engine will calculate a PSUMax based on the CT and ST respective high operating limits below MLP.
Modified Section: 10.3.4.4 (Appendix 7.6)	This section was modified to include the condition when the ST is offline.
Added Section: 5.6.1.6 (Appendix 7.6)	This section was added to incorporate logic which determines the initial energy schedule based on the latest dispatch instruction when operator intervention has caused deviations from the original dispatch schedule.
Added Section: 8.6.2.3 (Appendix 7.6)	This section was added to incorporate logic for if a NQS's minimum constraint, maximum constraint, or derate is below the MLP. The RT calculation engine will respect that constraint and ramp rates in the dispatch and advisory intervals until that constraint or derate is removed or has ended.



Summary of Stakeholder Feedback

Summary of Stakeholder Feedback

- The IESO presented the proposed market rule amendments to stakeholders at the July 21, 2026 stakeholder engagement day.
- No written comments or feedback was received by the submission deadline.
- Stakeholders were generally supportive of the change and did not raise any material concerns.



Next Steps

Next Steps & Timelines

Timing	Engagement Activity
May 21, 2026 ✓	Public Engagement Session
June 5, 2026 ✓	Request for Feedback
July 21, 2026 ✓	Public Engagement Session
August 7, 2026 ✓	Request for Feedback
September 15, 2026	Technical Panel (TP) Education
October 13, 2026	TP Vote to Post
November 10, 2026	TP Vote to Recommend
December 1, 2026	IESO Board Consideration
February 2027	Target Implementation

Thank You

ieso.ca

1.888.448.7777

customer.relations@ieso.ca

engagement@ieso.ca



[@IESO Tweets](https://twitter.com/IESO)



facebook.com/OntarioIESO



linkedin.com/company/IESO



Appendix: Examples

Enhancement 1: Example

Given a 3x1 PSU plant (200MW per CT, 450MW ST) and the percentage share of ST is equal across all PSUs.

Scenario: One CT is forced out of service with an outage slip and the ST total capacity is derated to 300MW. All three CTs kept offers in.

- **Current outcome:** The derated ST 300MW capacity is split amongst all CTs with offers present – i.e. does not consider outage slips. The available two PSUs would have a capacity of $200\text{MW} + (300\text{MW}/3) = 300\text{MW}$ each
- **Proposed change:** the available two PSUs would have a capacity of $200\text{MW} + (300\text{MW}/2) = 350\text{MW}$ each

Enhancement 2: Example

Given a 3x1 PSU plant (200MW per CT, 450MW ST, 110MW 1x1 ST MLP) and the percentage share of ST is equal across all PSUs.

Scenario: One CT is forced out of service with an outage slip and the ST total capacity is derated to 200MW. All three CTs kept offers in.

- **Current outcome:** The derated ST 200MW capacity is split amongst all CTs with offers present - i.e. does not consider outage slips. PSU's ST allotment is $200\text{MW}/3 = \sim 66\text{MW}$. This is below its 1x1 ST MLP, causing the PSU to be dispatched to 0MW.
- **Proposed change:** ST derated capacity is split only for CTs online. Thereby, PSU's ST allotment is $200\text{MW}/2 = 100\text{MW}$. This is still below the 1x1 ST MLP however DSO will respect it. The two available PSU capacity will be $200\text{MW} + 100\text{MW} = 300\text{MW}$

Enhancement 3 Example

Given PSU1 ramp up rates:

5MW/min @ 50MW breakpoint, 0.2MW/min @ 75MW breakpoint

Scenario: PSU1 CT (G1) syncs using the first ramp rate breakpoint of 5MW/min until it reaches the 50MW. Once CT reaches 50MW, ST syncs.

- **Current outcome:** ST ramp rate applied is based on ST output (i.e. '0'MW). Hence ST ramp of 5MW/min is applied.
- **Proposed change:** ST ramp rate is based on total PSU output (i.e. 50MW). Hence ST ramp of 0.2MW/min is applied.