



OCTOBER 15, 2026

Enabling Resources Program (ERP) Storage and Co-located Hybrid Integration Project

Phase 2 Regulation Service Design

Independent Electricity System Operator (IESO)

Disclaimer

This presentation and the information contained herein is provided for informational purposes only.

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Territory Acknowledgement

The IESO acknowledges the land from where we are delivering today's webinar is the traditional territory of many nations including the Mississaugas of the Credit, the Anishnabeg, the Haudenosaunee and the Wendat peoples, and is now home to many diverse First Nations, Inuit and Métis peoples. We also acknowledge that Toronto is covered by Treaty 13 with the Mississaugas of the Credit First Nation.

As we have attendees from across Ontario, the IESO would also like to acknowledge all the traditional territories across the province, which include those of the Algonquin, Anishnabeg, Ojibwe, Cree, Oji-Cree, Huron-Wendat, Haudenosaunee, Métis, and Inuit peoples.

Engagement Principles

This engagement is conducted in accordance with the IESO's [External Engagement Framework](#), which includes the following principles:

- **Purposeful** – Initiate meaningful conversations that move the sector forward
- **Inclusive** – Invite many voices and diverse perspectives to the table
- **Timely** – Seek input and insight when it can have the most impact
- **Accessible** – Ensure we meet people where they are on their energy journey
- **Traceable** – Allow everyone to follow the path that is being taken
- **Transparent** – Show how engagement helped shape the final outcome

Shared Commitment to Respectful Participation

To support a focused and constructive discussion:

- We will take questions one at a time; please use the raise-hand feature to enter the speaking queue
- We encourage concise and focused comments to allow time for multiple perspectives
- Participants are encouraged to raise relevant points during the discussion and provide more detailed feedback through the written submission process
- We ask that all participants maintain a respectful and professional tone throughout the session
- Facilitators will guide the discussion and manage participation to stay aligned with today's focus and agenda
- Where necessary, we may disable a participant's microphone to manage participation

Information Session Recording and Webpage

- Today's session will be **recorded** and available for viewing online
- **Meeting materials** are posted on the Public Information Session webpage created for this topic
- Please visit the Public Information Session's webpage [here](#)

Agenda

1. Background
2. Eligibility Requirements
3. Participation Model
4. Performance Evaluation
5. Note on Settlement Design
6. Regulation Services Procurement
7. Next Steps

Enabling Resources Program Scope, 1 of 2

The Enabling Resources Program is a set of projects that will further enable key emerging resources, specifically electricity storage ("storage"), hybrid generation-storage pairings ("hybrids") and aggregations of Distributed Energy Resources ("DERs") into the IESO-administered markets, tools, and processes to provide required system services and contribute to the safe and reliable operation of the bulk power system in Ontario.

Enabling Resources Program Scope, 2 of 2

- The IESO will be implementing storage design through a phased approach.
- The intention of the Storage & Hybrid Integration Project Phase 2 (SHIP2) is to implement a design enabling storage participation in **regulation service** and implementing uplift exemptions.
- This presentation outlines the **proposed** design, and is subject to change.

Outcomes of Regulation Service Phase 2 Design:

- Participation in energy, OR, and regulation service
- State of Charge (SoC) coordination
- Performance evaluation

SHIP2 Timelines

- The planning and design phase is expected to be complete by Q2 2027.
- The implementation phase is expected to be complete by Q4 2028.
- This presentation focuses on the regulation service design.
- Uplift exemptions for storage resources work is planned to start in Q4 2026 and the design is planned to be discussed at an engagement in Q1 2027.



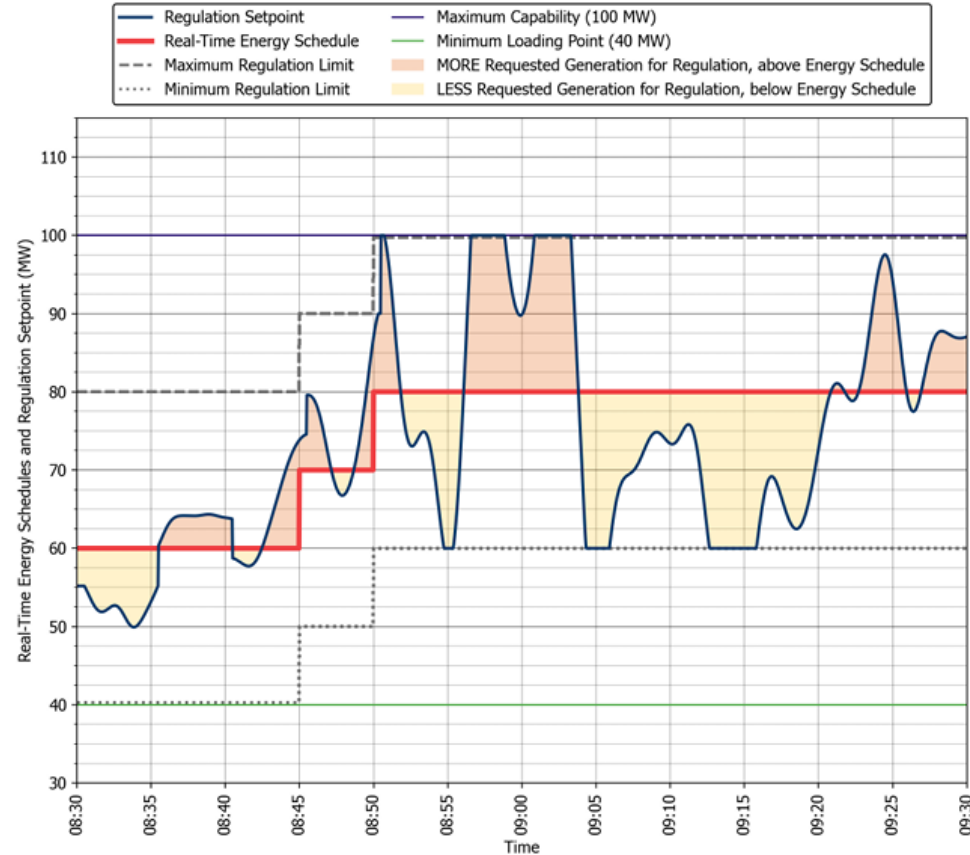
1. Background

Regulation Service

- Ancillary service that helps balance supply and demand within strict tolerances to keep system frequency as close to 60 Hz and Area Control Error (ACE) as close to zero as possible.
- ACE is a metric for measuring system balance that indicates whether the right amount of power is being generated to meet demand while supporting scheduled net-intertie flows and frequency in the Eastern Interconnection. Minimizing and maintaining ACE within acceptable bounds is essential for reliable operations.
- The IESO schedules regulation as required by the market rules, and to maintain compliance with the NERC standard, BAL-001-2.

AGC Setpoints

- IESO's Energy Management System (EMS) sends Automatic Generation Control (AGC) signals to regulation resources through telemetry in the form of setpoints.
- Resources vary their output to deviate either up or down from their economic dispatch instruction within the 5-minute dispatch interval in response to the 4-second regulation setpoints.



Drivers for Phase 2 Regulation Service

- The minimum regulation requirement is forecast to double to approximately 200 MW by 2030 driven by electrification, load growth, and variable generation growth.
- ~3,000 MW of contracted storage resources are scheduled to be in service by 2028.
- Alignment with neighbouring jurisdictions who already benefit from the operational characteristics of battery storage in their regulation service markets.

Regulation Service Current State

- The IESO does not have a regulation service market; regulation service is an ancillary service that the IESO contracts to help ensure the reliable operation of the power system.
- Although regulation service is typically procured through bilateral negotiations, there may be future procurements for this service.
- Regulation service is not currently co-optimized with Energy and OR, and co-optimizing Energy, OR, and Regulation is not in the scope of ERP.
- Regulation is scheduled day-ahead before the DAM submissions are due.

Regulation Service Timeline

Pre-DAM

- Regulation requirement determined
- Market Participants submit offers by 9 AM EPT
- Day-Ahead Market Operator evaluates offers and schedules resources before 10 AM EPT

DAM Submission

- Dispatch data submitted
- Energy & OR offers and ramp rates
- Review pre-DAM reports and regulation schedule

DAM Execution

- DAM runs from 10-13:30 EPT
- Regulation-providing resources have energy and OR capabilities modified

Post-DAM

- DAM produces financially binding schedules for energy & OR
- Review DAM reports

PD Execution

- PD starts at 20 EST and looks out 27 h, runs hourly reducing look-ahead by 1h
- Unrestricted changes to market bids/offers allowed before mandatory window
- Telemetered SoC used

Post-PD/Pre-RTM

- Review PD advisory schedules, prices, reports
- Control-Room Operator reviews and potentially constrains resources

RTM Execution

- Telemetered SoC provided for initialization
- RTM schedules for 5min dispatch
- Telemetered AGC setpoints calculated every 4 seconds



2. Eligibility Requirements

Eligibility Requirements

- Storage resources providing regulation will participate as a dispatchable Single Model Storage Resource (SMSR).
- Future procurements may require a minimum of ± 10 MW of regulation service from each facility.
- Changes contemplated as part of ERP will enable transmission-connected batteries to provide regulation service. It is anticipated that additional changes to internal processes along with additional coordination with distributors would be required to enable distribution-connected resources to provide regulation service, and these changes are not in SHIP2's scope.

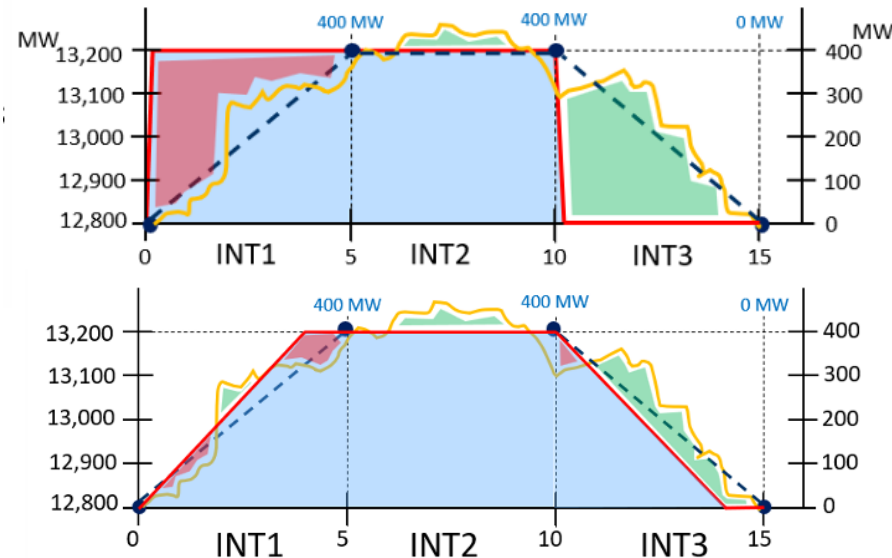


3. Participation Model

A Note on the Electricity Storage Facility Ramp Limit

- The IESO currently enforces a facility ramp rate limit on Electricity Storage Facilities to manage system imbalances ([Engagement](#))
- In SHIP2, the IESO is proposing **removing** this limit while a facility is following AGC setpoints to utilize the full ramp capability to manage ACE
- The basepoint used in the AGC setpoint calculation would transition linearly between energy dispatches*, alleviating the need for the ramp rate limit while following the AGC setpoint.

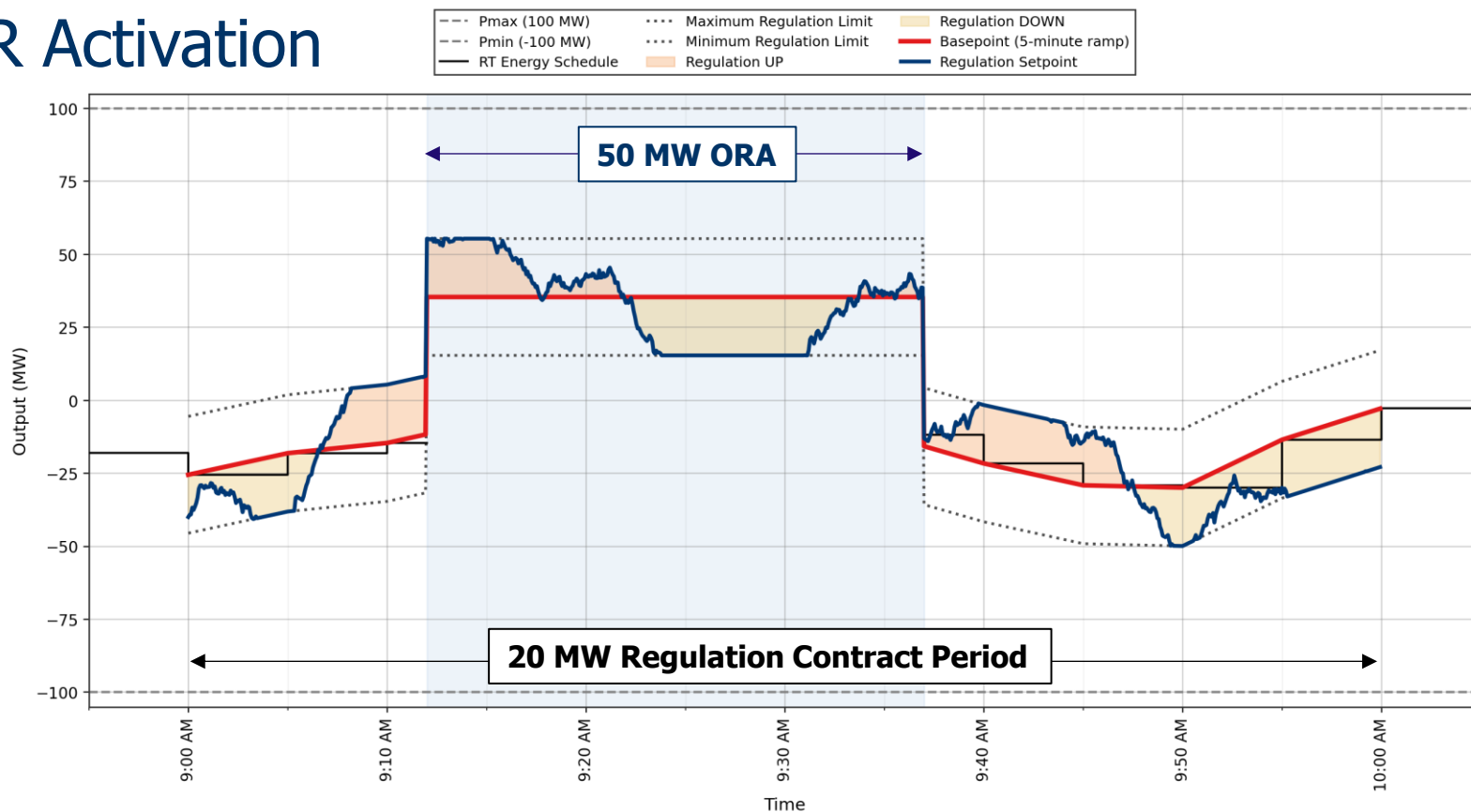
Figure: Example of system imbalance with and without a 100MW/min facility ramp limit applied



OR and Regulation

- Currently, the IESO disallows resources to simultaneously participate in regulation service and OR.
- The IESO is proposing changes to its rules and systems to remove this restriction for resources of all types, and for all classes of operating reserve.
- The following slide illustrates an example of a resource providing energy, OR, and regulation simultaneously. The resource would follow the issued setpoint throughout the whole regulation service period – including during the OR activation (ORA).

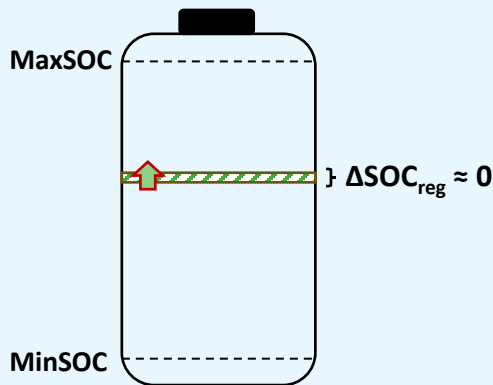
OR Activation



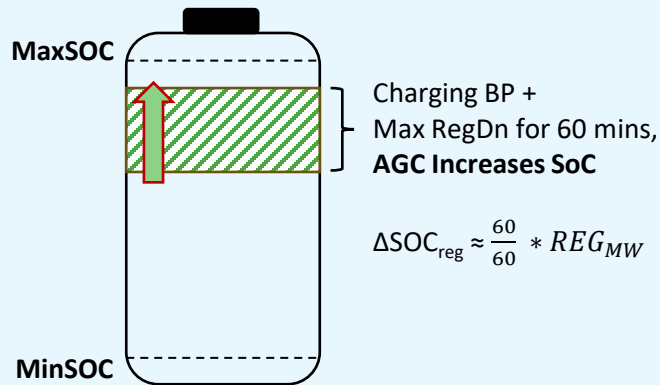
Energy Reservation, 1 of 3

- Currently, the DSO reserves headroom and footroom on a resource's power operating limits (MW) to ensure it can provide the full regulating range while on AGC. This alone is not sufficient for storage resources, which are also energy limited. *Providing regulation has an impact on SoC:*

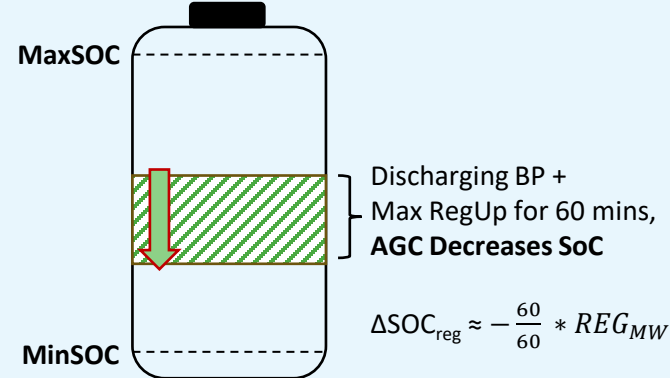
a) Neutral AGC signal



b) Worst-case negative AGC bias



c) Worst-case positive AGC bias



Energy Reservation, 2 of 3

- The proposed design therefore also reserves energy for regulation by adjusting SoC limits and constraints within the DSO
- In DAM and PD: energy to support a full hour of scheduled regulation will be reserved.
- In Real-Time (RT): energy to support 10 minutes of scheduled regulation will be reserved in the current interval. The 10-minute buffer is intended to insure against telemetering issues (e.g., synchronization, SoC behavior changing near limits, etc.) and account for basepoint adjustment and response time.

Energy Reservation, 3 of 3

- With the SoC reservations in place and assuming sufficient SoC headroom/footroom is available, the battery will be able to provide regulation up or regulation down at the full regulation capacity regardless of whether its basepoint is requiring energy injections or withdrawals.

Resource Selection

- Currently, the IESO schedules resources for regulation on an as-offered basis with validations for outages, de-rates, and manual constraints.
- A new regulation resource selection procedure will select resources for scheduling based on reliability when more regulation resources are available beyond the regulation requirement
- The IESO is proposing a reliability-based resource selection process for all resources in the pre-DAM timeframe.
- Cost-based selection was considered and will continue to be investigated.

Resource Selection Process

Requirement

- Regulation requirement determined by the IESO for capacity (MW) and ramp rate (MW/Min).

Offer Submission

- MPs submit offers by 9:00 AM EPT.
- Must include resource availability and resource capacity offered.

Selection Validation

- Ensures resource can reliably provide regulation.
- Validations will consider registration parameters, resource constraints, and contract parameters.

Selection Execution

- Reliability-based objective based on ramp rate and offered capacity.
- Constraints will ensure regulation requirement is met while preserving energy and OR capability.
- Applied to all resource types.

Schedules Determined

- The IESO informs MPs before 10:00 AM EPT.
- Includes hours and capacity for provision.
- Constraints on available Energy and OR capacity applied.

Note on Regulation Signal Design

- The existing bidirectional regulation signal will be retained.
- Separate Regulation Up and Regulation Down products could provide more flexibility to the system by allowing different amounts of Regulation Up and Regulation Down to be scheduled, but require broader changes to procurement, scheduling, settlements, operational processes, and tools.

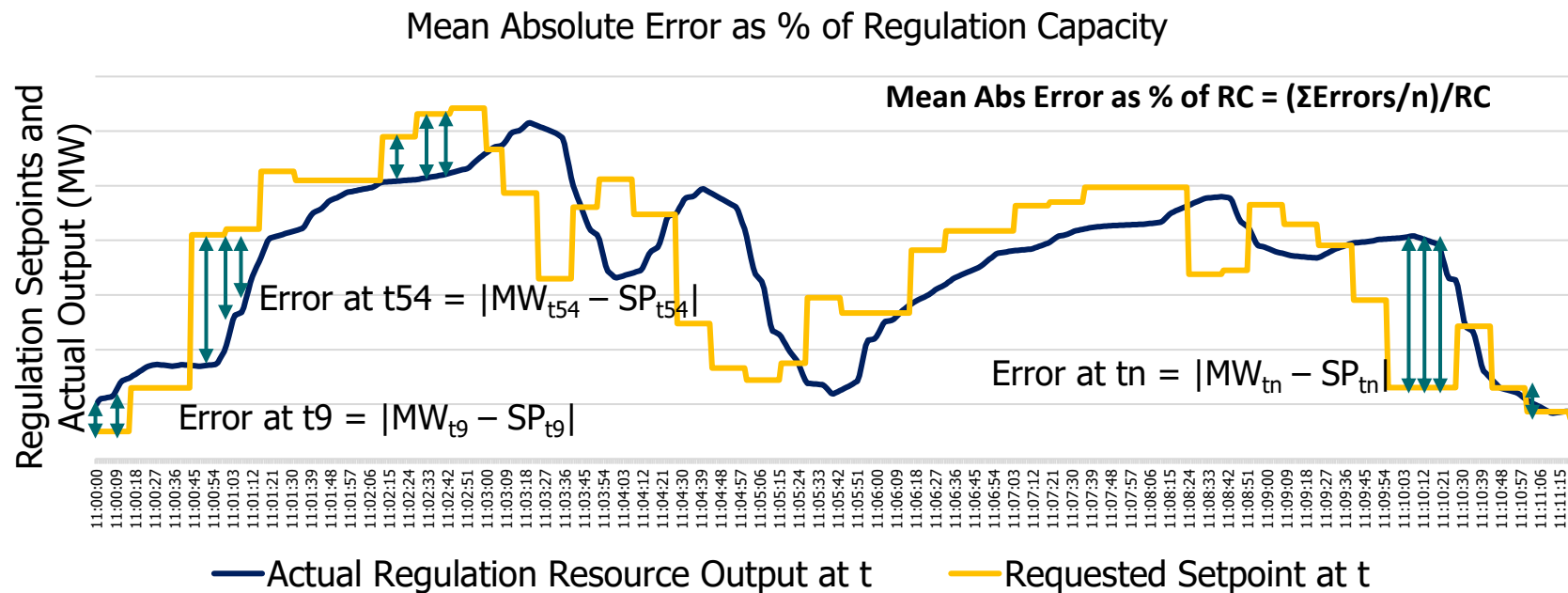


4. Performance Evaluation

Performance Evaluation

- To ensure accuracy and efficiency, a performance evaluation is proposed for resources providing regulation.
- Performance may be evaluated monthly and used in the auditing and testing of regulation resources, per the IESO Market Rules (Chapter 5, Section 4.9).
- Performance may be evaluated by calculating the mean absolute error between the actual output and the requested regulation setpoint.

Mean Absolute Error as a Percentage of Regulation Capacity



Performance Calculation

- Performance may be evaluated by calculating a Performance Factor (PF) based on the average mean absolute error (MAE) as a percentage of regulation capacity achieved over the settlement month "m".

$$PF_m = 100\% - MAE\%_m$$

- If regulation resources underperform in the monthly evaluations or do not pass the annual test, the contracted regulation capacity and the ramp rates could be adjusted to align with observed performance.



5. Note on Settlement Design

Note on Settlement Design

The settlement design will follow in a subsequent version of the Phase 2 Regulation Service design work planned to be discussed at a stakeholder engagement session in Q1 2027.

This includes, but is not limited to, further details on:

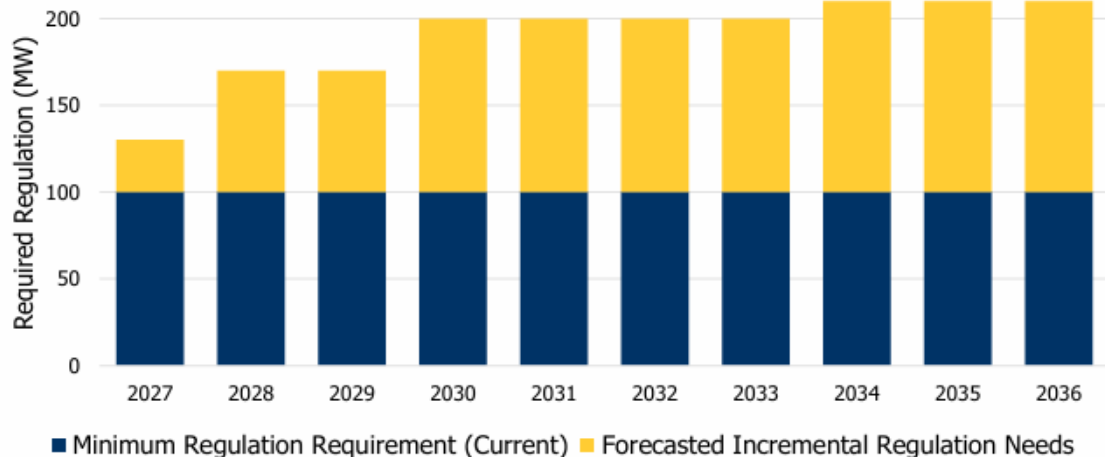
- Make Whole Payment (MWP) design
- Economic Operating Point (EOP) design
- Settlement considerations



6. Regulation Services Procurement

Incremental Regulation Needs

- The 2026 [APO](#) identified incremental regulation needs of 30 MW beginning in 2027 that continue to grow to up to 110 MW by 2034



Competitive Procurement for Regulation Services

- The IESO is currently engaged in bilateral negotiations to meet near term regulation service needs
- To meet future needs that emerge as early as 2030, the IESO is planning to engage on the introduction of a competitive procurement to acquire incremental regulation services
- Stakeholder engagement is expected to begin later this fall to prepare for a procurement launch in late 2027; activities will be closely aligned with participation model for BESS being explored through ERP Phase II
- Interested parties can [subscribe to updates](#) on the "Regulation Services RFP" to receive further details once the engagement commences



7. Next Steps

Next Steps

- Additional engagements on Settlements and Uplift Exemptions are being scheduled.
 - These engagements will commence in Q1 2027.
- Regulation Procurement engagement being scheduled for November.

Feedback

- For any feedback on today's session, please submit using the feedback form on the [ERP Storage Project engagement webpage](#) by **October 30, 2026**, to IESO Engagement at engagement@ieso.ca

Thank You

ieso.ca

1.888.448.7777

customer.relations@ieso.ca

engagement@ieso.ca



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