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Regulation Service Performance Measurement Framework Updates



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Territory Acknowledgement

The IESO acknowledges the land we are delivering today's webinar from is the traditional territory of many nations including the Mississaugas of the Credit, the Anishnaabeg, the Chippewa, 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 includes those of the Algonquin, Anishnaabeg, Ojibwe, Cree, Oji-Cree, Huron-Wendat, Haudenosaunee, Métis and Inuit peoples.

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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

Agenda

- Regulation Service Overview
- Previous Testing Framework
- Proposed New Testing Framework

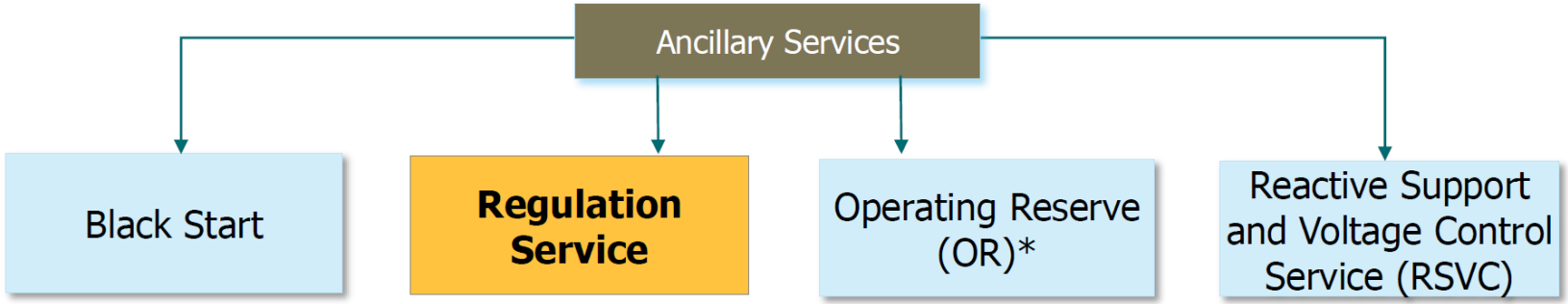
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What is Regulation Service?

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Regulation Service: An Ancillary Service

- Regulation service is one of four ancillary services that the IESO secures
- Ancillary Services are specialized services that support the reliable operation of Ontario's power system. While they account for a small share of the total power system costs, they play a critical role in maintaining grid reliability



**OR is obtained from the market in Ontario*

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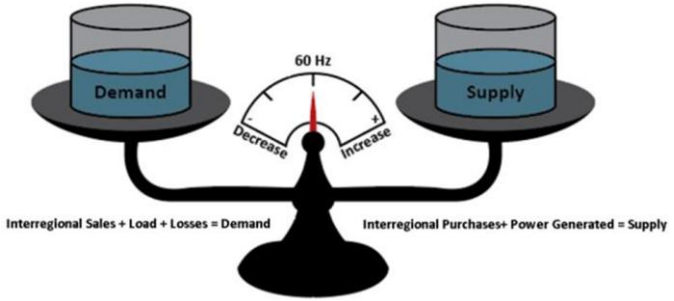
What is Regulation Service? (1)

- During normal operations, small mismatches between total demand and total supply occur
- The system is designed to automatically respond to these small mismatches by making continuous adjustments that maintain system balance
- Mismatches between supply and demand for different lengths of time require different services to respond

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What is Regulation Service? (2)

Mechanism	Inertial Response	Primary Frequency Response	Regulation	Operating Reserve	Ramping Capability
What is the response time?	Immediately following a system event	Within the first few seconds following a system event	Within less than 5-minutes of a mismatch between supply and demand	Within 10 minutes or 30 minutes of a system event	Five minutes to hours
How is balancing currently achieved?	Drawn from the stored kinetic energy of rotating equipment	Automatic adjustment of energy output by generators	Signal from IESO tools to a resource to adjust energy dispatch	Activated by the IESO	Scheduled by the IESO's dispatch scheduling engine



- For regulation service, instructions to begin ramping (up or down) are sent out as often as every four seconds
- Ramp rates are considered, and responses occur within the dispatch interval

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What is Regulation Service? (3)

Regulation service provides short-term balancing to ensure electricity supply matches demand and is provided by resources with Automatic Generation Control (AGC) capability, which permits them to vary their output in response to signals sent by the IESO

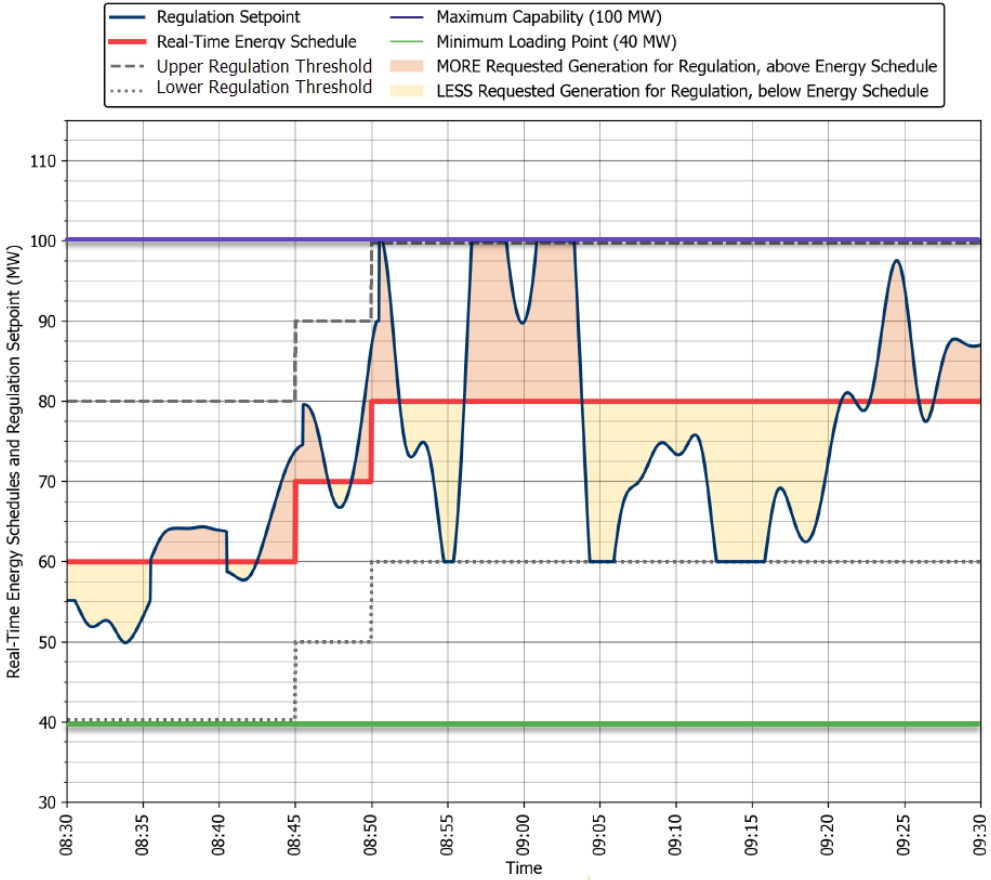
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What is Automatic Generation Control (AGC)?

- "Regulation" and "AGC" are often used interchangeably, but they do not mean the same thing
- Regulation means the service required to control power system frequency and maintain the balance between load and generation
- Automatic Generation Control (AGC) means the process that automatically adjusts the output from a generation or electricity storage resource that is providing regulation
- The AGC function checks system frequency and actual power flows into and out of Ontario every two seconds and then recalculates and sends regulation setpoints to resources up to every four seconds
- Signals are smoothed to minimize unnecessary cycling of regulation resources caused by small, short-term temporary fluctuations in supply and demand

How do resources provide regulation?

- **Real-Time Energy Schedule (Basepoint)** means the economic dispatch of the resource
- **Regulation Setpoint** means the expected output of the resource as sent by the AGC tool
- **Lower Regulation Threshold** means the lower MW setpoint of the resource, based on the Regulation Capacity
- **Upper Regulation Threshold** means the upper MW setpoint of the resource, based on the Regulation Capacity

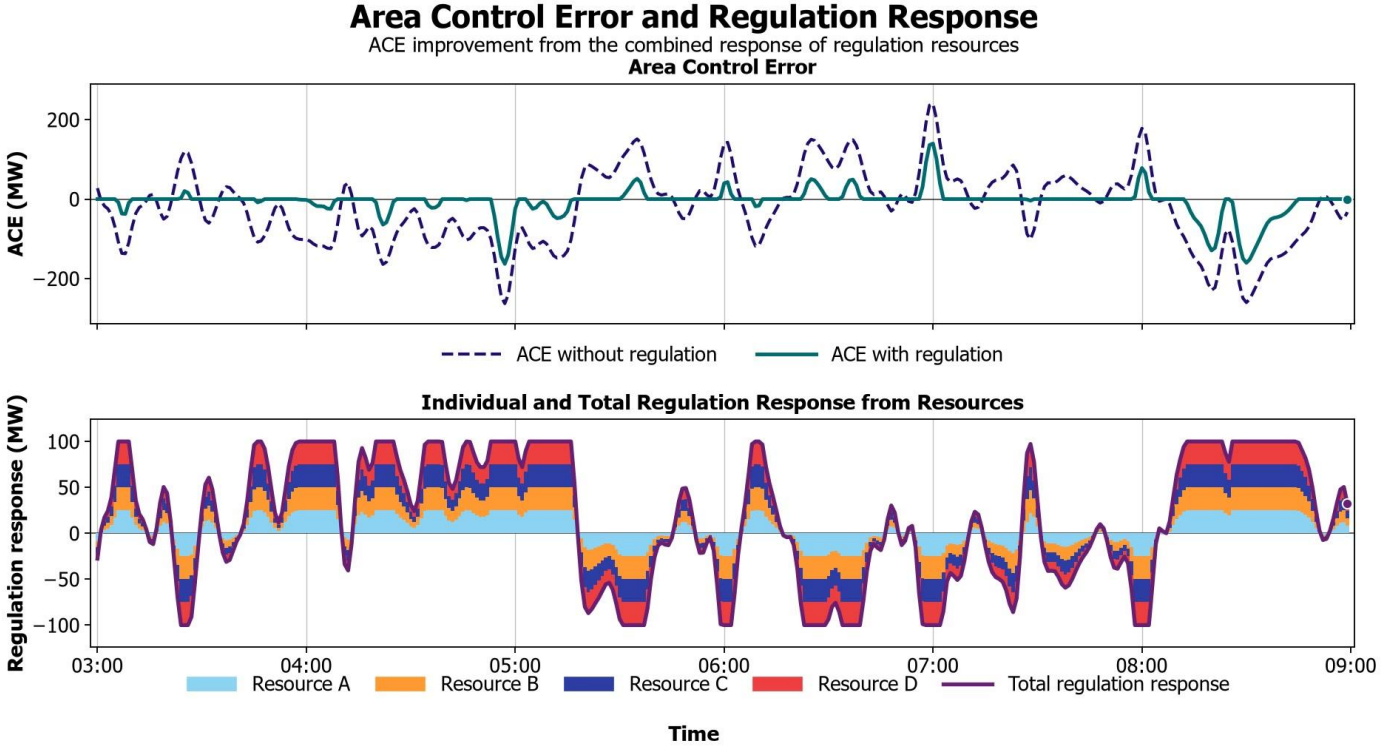


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Why is Regulation Service needed?

Reliability	Changing System Needs
• To minimize large or sustained mismatches between supply and demand, and keep frequency and interchange close to schedules • To maintain compliance with the relevant reliability standard, as established by the North American Electric Reliability Corporation (NERC)	• To support the integration of more renewable resources such as wind and solar, which generate intermittently • To manage the forecasted load growth, including loads with highly fluctuating profiles, electrification of industrial loads and public transit electrification and expansion

How do resources respond to regulation?



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Previous Testing Framework

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Previous Framework (1)

- Market Rules, Chapter 5, Section 4.9.2.6:
  - The *IESO* shall at least **annually** test a *resource* providing *regulation* for **compliance with the performance standards referred to in sections 1.1.3 and 1.1.4 of Appendix 5.1** in accordance with the testing procedures specified in the applicable *contracted ancillary services* contract.
- Market Rules, Chapter 5, Section 4.10, Consequences of Failure to Pass a Test
  - Failure of a test **obligates the IESO to not schedule ancillary services** from that resource

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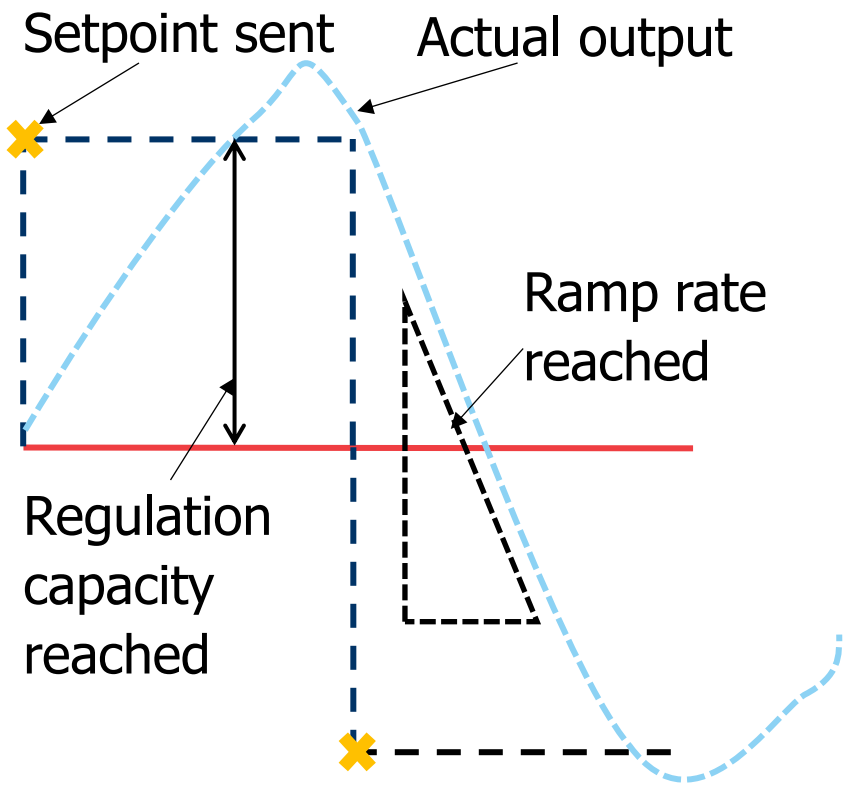
Previous Framework (2)

- Market Rules, Appendix 5.1, Sections 1.1.3 and 1.1.4:
  - A *resource* providing *regulation* must achieve at least the ramp rate specified in its *contracted ancillary services* contract for the full amount of ***regulation* capacity** offered in such contract.
  - A *resource* providing *regulation* must be able to adjust its output or consumption at least at the **ramp rate** specified in its *contracted ancillary services* contract to the maximum and minimum values specified in such contract.

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Previous Framework (3)

- Constrain on resources that have not provided regulation in the year
- Place manual basepoints and manual setpoints
- Compare the output against setpoints to confirm regulation capacity and ramp rate
- Good for **certification**, not **performance**



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Limitations of Previous Framework

- Does not test day-to-day performance of the provision of regulation
- Requires the IESO to constrain on resources that have not provided regulation in the past year, adding to unnecessary market costs
- Obligates the IESO to not schedule regulation if regulation capacity and ramp rate is not achieved, even marginally.
- Actual test requires manual setpoints to be sent, during which the resource is not providing actual regulation, which could cause further imbalances on the system

Proposed New Testing Framework

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Proposed New Testing Framework (1)

- Market Rules, Chapter 5, Section 4.9.2.6:
- 4.9.2.6 the IESO ~~shall at least annually~~ may test a *resource* or *facility* providing *regulation* for compliance with the performance standards referred to in sections 1.1.3 and 1.1.4 of Appendix 5.1 in accordance with the testing procedures specified in the applicable *contracted ancillary services contract*~~.~~; and
- 4.9.2.7 the *IESO* may evaluate a *resource* or *facility* providing *regulation* for compliance with the performance standards specified in section 1.1.4A of Appendix 5.1.

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Proposed New Testing Framework (2)

- Market Rules, Chapter 5, Section 4.10.1.1:
- 4.10.1 If an *ancillary service provider's facility* or *resource* fails a test performed pursuant to section 4.9.1 or 4.9.2 in respect of an *ancillary service*, the *IESO* shall not schedule such *ancillary service* from such *facility* or *resource* until the *ancillary service provider* demonstrates that it can provide the relevant *ancillary service*.
- 4.10.1.1 Nothwithstanding section 4.10.1, the *IESO* may schedule a *resource* or *facility* providing *regulation* that fails a test performed pursuant to sections 4.9.1 or 4.9.2, if such scheduling is necessary to maintain the *reliable* operation of the *IESO-controlled grid.*

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Proposed New Testing Framework (3)

- Market Rules, Chapter 5, Appendix 5.1, Sections 1.1.3, 1.1.4:
- 1.1.3 A *resource* providing *regulation* must achieve at least the ramp rate specified in its *contracted ancillary services* contract for the full amount of *regulation* capacity offered in such contract.
- 1.1.4 A *resource* providing *regulation* must be able to adjust its output or consumption at least at the ramp rate specified in its *contracted ancillary services* contract to the maximum and minimum values specified in such contract.
- 1.1.4A. A *resource* or *facility* providing *regulation* must achieve a monthly mean absolute error of less than 50%, as calculated in accordance with the applicable *market manual*.

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Proposed New Testing Framework (4)

- MM 7.3, Section 5.3.3 Testing and Evaluation of Ancillary Services

Monthly Mean Absolute Error for Regulation Service: The monthly mean absolute error, expressed as a percentage of provided *regulation* capacity, indicates how far, on average, the actual output of the *regulation resource* or *facility* was from the requested setpoint relative to the *regulation* capacity provided during all *dispatch intervals* during month "m". A smaller monthly mean absolute error is better, with 50% considered the minimum acceptable level of performance.

For the purpose of **MR Ch.5 App.5.1 s. 1.1.4A**, the average monthly mean absolute error shall be measured as follows:

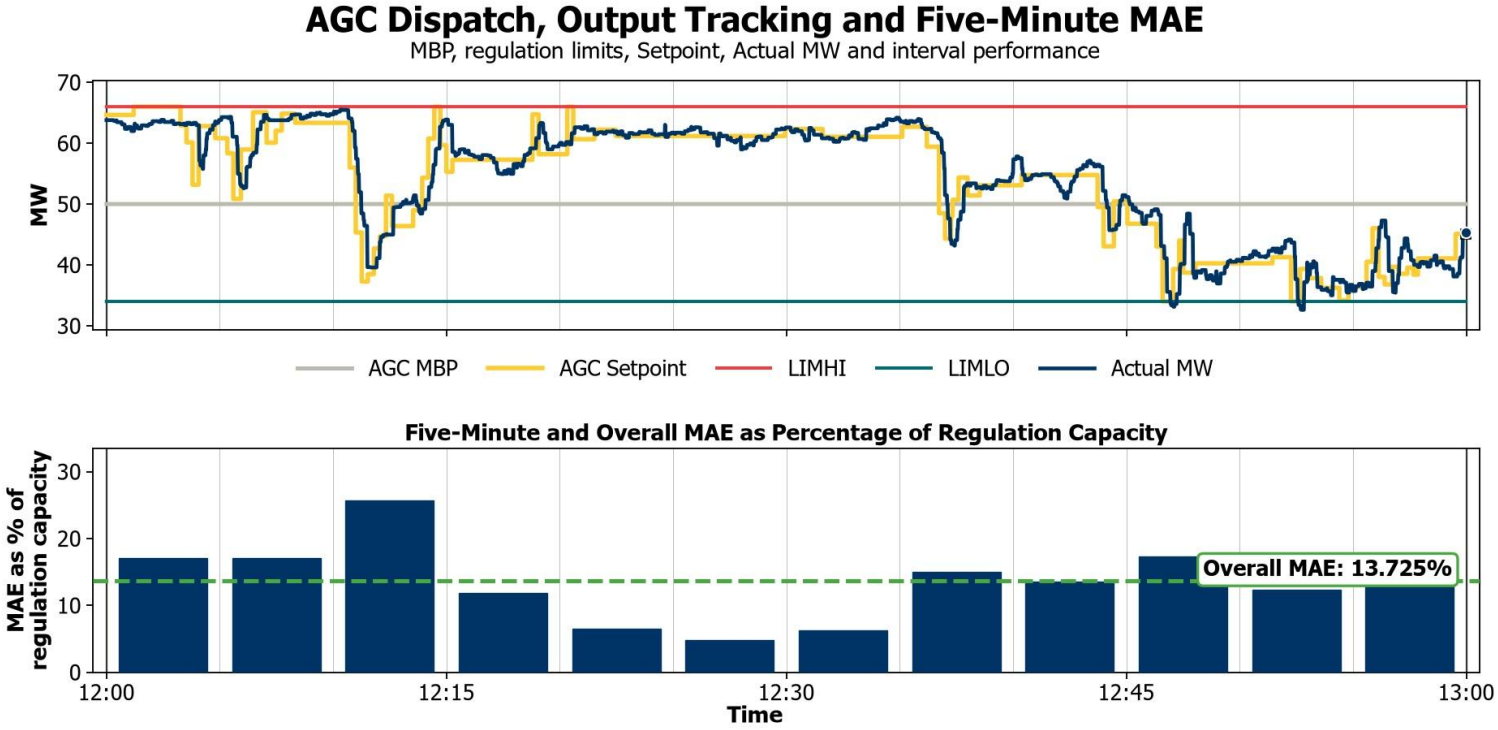
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Proposed New Testing Framework (5)

$$MAE_{\%m} = \frac{100}{H_m} \sum_{h=1}^{H_m} \frac{1}{RC_h} \left[\frac{1}{N_h} \sum_{t=1}^{N_h} |MW_t - SP_t| \right]$$

- Where :
- $\boldsymbol{MAE_{\%m}}$ = Monthly Mean Absolute Error, expressed as a percentage of provided *regulation* capacity
- $\boldsymbol{H_m}$ = Total number of hours "h" during month "m" in which *regulation* service was provided. The *IESO* may exclude hours where *regulation* was not provided for the full hour due to reasons outside of the control of the *market participant*
- $\boldsymbol{RC_h}$ = The scheduled *regulation* capacity during hour "h"
- $\boldsymbol{N_h}$ = The number of time intervals (seconds) within hour "h" during which *regulation* service was provided
- $\boldsymbol{MW_t}$ = The actual output of the *regulation resource* or *facility* at time interval "t" (second)
- $\boldsymbol{SP_t}$ = The requested *regulation* setpoint at time interval "t" (second)

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$$\text{Overall MAE\%} = \frac{100}{16}\left[\frac{1}{3,600}\sum_{t=1}^{3,600}|MW_t - SP_t|\right] = 13.725\%$$

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Benefits of Proposed Framework: Summary

The proposed framework provides a more accurate and operationally relevant view of regulation performance. It measures actual setpoint tracking during service delivery, supports earlier identification of performance concerns, and reduces the need for artificial annual testing and unnecessary market costs. It also establishes a consistent performance measure that could support future contracts, where an incentive mechanism could easily be linked to performance under the Proposed Framework.

Appendix: Benefits of Previous Proposed Framework and Other Relevant Materials

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What are the Benefits of the Proposed Framework? (1)

- **Measures actual service delivery:** MAE measures how closely a resource's actual output follows the IESO regulation setpoint during real operating conditions.
- **Replaces a test with ongoing evidence:** The previous framework relied on a scheduled annual test using manual setpoints. The proposed framework evaluates performance whenever the resource provides regulation.
- **Tests performance, not only capability:** The previous test demonstrated ramp capability and regulation capacity. MAE shows if the resource consistently delivers the requested service.

What are the Benefits of the Proposed Framework? (2)

- **Prevents errors from being masked:** Absolute error means over-delivery in one interval cannot cancel under-delivery in another.
- **Reduces unnecessary testing and market costs:** The IESO would no longer need to constrain resources that have not recently provided regulation solely to conduct an annual test, reducing market impacts.
- **Encourages right-sized participation:** Resources are encouraged to provide regulation capacity that is meaningful relative to their ability to respond to setpoints.

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What are the Benefits of the Proposed Framework? (3)

- **Protects fleet-level performance:** Small tracking errors can accumulate across the regulation fleet. Holding each resource accountable helps reduce the aggregate balancing burden on the system.
- **Improves transparency for participants:** Regular performance results give resources clearer information about how effectively the service is being delivered and where improvement may be required.
- **Enables earlier intervention:** Ongoing measurement allows persistent performance concerns to be identified and addressed without waiting for the next annual test.

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What are the Benefits of the Proposed Framework? (4)

- **Creates a durable foundation for future contracting:** The standardised MAE calculation could be referenced in future contracts, and any incentive mechanism design could be linked to the standardised MAE calculation, incentivising better performance.

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Materials and Other Relevant Links

- IESO Ancillary Services
- Quick Take on Regulation Service – What is It?
- Quick Take on Technical Requirements for Regulation Service
- IESO Regulation Service Request for Proposal (RFP)
- IESO Enabling Resources Program

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Next Steps:

- Using the feedback form provided, stakeholders can submit feedback on the proposed Market Rule amendments by December 1, 2026.
- The IESO will consider feedback before finalizing the Market Rule and Manual amendments and presenting to the Technical Panel in Q1 2027.
- The IESO is proposing an effective date for the proposed Market Rule and Manual amendments in Q3 2027.
- For any additional questions, you can contact engagement@ieso.ca

Thank You

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