Feedback Form

Long-Lead Time RFP – September 16, 2025

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To promote transparency, feedback submitted will be posted on the Long-Lead Time RFP engagement page unless otherwise requested by the sender.

- ☐ **There is confidential information, do not post**
- ☐ **Comfortable to publish to the IESO web page**

Following the September 16th Long-Lead Time RFP engagement webinar, the Independent Electricity System Operator (IESO) is seeking feedback from stakeholders on the items discussed. The presentation and recording can be accessed from the LLT engagement webpage.

Note: The IESO will accept additional materials where it may be required to support your rationale provided below. When sending additional materials please indicate if they are confidential.

Please submit feedback to engagement@ieso.ca by September 30th.

Foundational Design Elements

Do you have any feedback on the foundational design elements presented during the webinar?

ESC represents both commercially proven and emerging LDES technologies. While the IESO is proposing eligibility for some commercially proven LDES technologies, there is lack of commercial pathway for other commercially available technologies and many emerging technologies.

LDES Background

LDES systems are capacity resources that deliver reliable electricity to meet increasing system demands, often over 20+ year contract terms. LDES is also uniquely positioned to support the integration of higher renewable energy by providing sustained power output during extended periods of low renewable generation, such as winter peaks or lulls in solar and wind resources. Energy storage for 8+ hours can time-shift solar and wind generation to periods of higher demand. Ontario intends to rely heavily on solar (6,000 MW) and wind (17,600 MW), which is roughly a third of new installed capacity by 2050, from the Pathways to Decarbonization study from the IESO, so addressing the mismatch in supply and demand with 8+ hour storage could be critical. Another key benefit is the potential for deferred or avoided transmission system upgrades by installing storage downstream from high-capacity transmission nodes – in this case, storage capacity installed to mitigate this would not need to see significant discharge frequency since simply preventing overloading during a few peak events in a year could provide the benefit to the system of preventing costly transmission system upgrades. Mechanical LDES technologies, like pumped hydro and compressed air, have the potential to meet this need, as well as grid-scale thermal energy storage. These attributes make LDES systems a clear solution to meet Ontario's emerging system needs driving the IESO's Resource Adequacy Framework.

LDES in LLT

Despite LDES technology's ability to contribute to the system needs driving the IESO's Resource Adequacy Framework, there are not clear pathways to procure some LDES technologies through this Framework. ESC has feedback on two foundational design elements of the LLT Procurement.

1. Pathways for pilots and emerging technologies.

The IESO received 16 LLT RFI responses from pilot-scale or novel LDES technologies, and ESC adds that there are dozens of LDES technologies working toward commercial scale. Despite this signal, the IESO chose not to include pilot technologies in the LLT. If the pathway for emerging technologies is not the LLT procurement because the IESO is looking for projects that can deliver larger capacities than pilot- or demo-phased deployments, ESC suggests that the IESO articulate how they plan to create a market for emerging technologies ESC recommends the IESO utilize mechanisms like the grid innovation fund, unlock funding opportunities specifically for emerging storage technologies with a life-cycle duration of greater than 8 hours based on a need to identify and help scale promising nascent technologies.

Developing production pathways for these technologies and these projects will in the long term benefit the province by increasing competition and thereby lowering system costs. Developers of emerging LDES systems require a clear, stable, long-term contracting opportunity to move beyond the IESO grid innovation fund as the way to deploy these technologies within the grid.

2. Technology type eligibility framework

The IESO's current technology type eligibility framework – which thus far only identifies hydroelectric resources and commercially-proven long lead time LDES technologies as eligible in the LLT procurement, creates a few issues. First, it

creates significant market distortions by targeting specific resources absent a stated need for those resources relative to other resources that can provide the same grid services. This suppresses competition and the signal for LDES and other non-inverter technologies in Ontario. Second, the IESO does not define what it means by long lead time LDES, which makes it almost impossible to determine whether a resource is eligible – especially if it is the first time developing that resource in Ontario. To remedy these issues, ESC suggests that the IESO create clear criteria for participation in the LLT procurement that are driven by identified grid needs, and allow any technology that meets the criteria respond to the LLT RFP.

Resource Eligibility – Energy and Capacity Streams

Do you have any feedback or general comments to share with the IESO regarding defined eligibility for each stream of the LLT RFP?

- **Please see notes in general comments section**

Resource Eligibility – Hydro Redevelopments

Do you have any feedback or general comments to share with the IESO ahead of the upcoming repowering webinar regarding the participation of hydro redevelopments?

To help inform eligibility under the LLT RFP, the IESO is looking for project specific details from hydro resources that are looking to redevelop, including:

- existing nameplate and/or contract capacity, location, market participant status, original in-service date, remaining useful life and projected end of life;
- expected time required to redevelop the resource, a list of key milestones/activities, and projected operational lifetime post redevelopment; and
- information regarding whether the redevelopment will result in an increased capacity at the facility beyond what is currently registered with the IESO.

If required, please provide project specific information via a separate document.

- NA

Policy Based Rated Criteria: Prime Agricultural Areas (PAAs)

Do you have any information to share with the IESO to inform decisions related to rated criteria for projects locating in PAAs?

Specifically, the IESO is seeking further information, including but not limited to:

- whether proponents are intending to locate their project in a PAA;
- approximate project footprint (in acres), including distinction of surface level and subsurface components;
- land/soil impacts during construction and operation; and
- portion of the land that will remain available for agricultural use post COD.

Energy Storage Canada (ESC) is committed to fostering stronger collaboration between the Independent Electricity System Operator (IESO) and its members by creating clear channels for transparency and alignment on planned projects.

As Ontario advances its energy transition, it is critical that developers, operators, and policymakers share a common understanding of project timelines, system needs, and procurement objectives.

ESC seeks to act as a bridge, ensuring that its members have access to accurate and timely information while providing the IESO with valuable industry insights. This collaborative approach will build trust, reduce uncertainty, and support efficient project development.

Team Member Experience Requirements - Capacity

Do you have any feedback regarding the information presented during the webinar?

ESC appreciates that the IESO has recognized that LDES technologies are new to Ontario and proposes to expand Qualifying Projects (under the capacity stream) to include those that have reached commercial operation in Europe and Australia. ESC believes this will yield more robust competition and will not introduce additional risk.

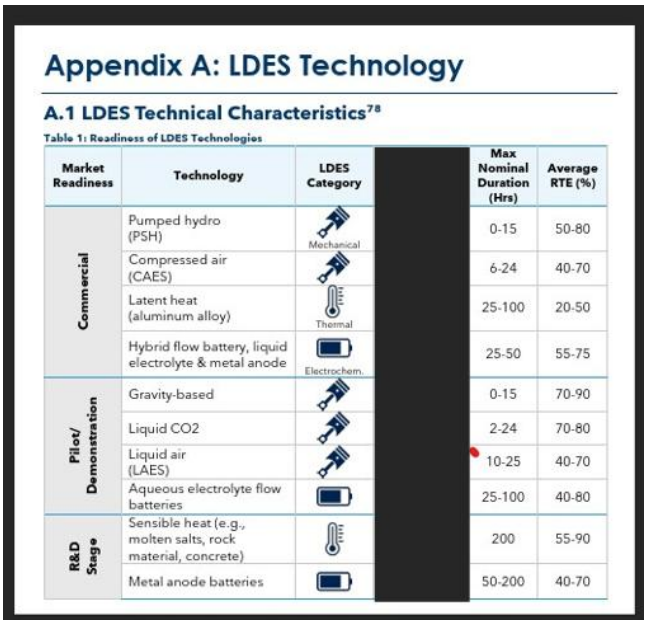
Round Trip Efficiency (RTE) – Capacity

Do you have feedback to help inform the minimum RTE requirement and development of the associated rated criteria.

- As it relates specifically to LLT and LDES technologies ESC would encourage the IESO to consider a few changes as it relates to round trip efficiency, Technology Readiness, and adjustments to RFP design considerations.

Round Trip Efficiencies

- IESO should consider softening the availability window for LDES technologies to maximize the capital value of these investments without penalizing certain technologies due to their roundtrip efficiencies.
- The LT2 proposed threshold of 80% this fails to account for other technology types and therefore ESC recommends lowering this to 50% to allow maximum storage technology participation. Additionally, this roundtrip efficiency of different technology types as presently set out would create problematic contract defaults for certain technologies.
- This is beneficial as mechanical storage technologies while lower round trip efficiencies they offer a 40-year design life, nearly double that of other technologies.



Appendix A: LDES Technology

A.1 LDES Technical Characteristics[78]

Table 1: Readiness of LDES Technologies

Market Readiness	Technology	LDES Category	Max Nominal Duration (Hrs)	Average RTE (%)
Commercial	Pumped hydro (PSH)	Mechanical	0-15	50-80
	Compressed air (CAES)		6-24	40-70
	Latent heat (aluminum alloy)	Thermal	25-100	20-50
	Hybrid flow battery, liquid electrolyte & metal anode	Electrochem.	25-50	55-75
Pilot/ Demonstration	Gravity-based		0-15	70-90
	Liquid CO2		2-24	70-80
	Liquid air (LAES)		10-25	40-70
	Aqueous electrolyte flow batteries		25-100	40-80
R&D Stage	Sensible heat (e.g., molten salts, rock material, concrete)		200	55-90
	Metal anode batteries		50-200	40-70

Contract Provisions: Long Term Outages

Do you have any feedback regarding the IESO's proposal related to long-term outages?

Based on feedback from members ESC offers the following information.

Technology-specific considerations:

- **Pumped hydro: :** Large mechanical assets (turbines, gates, penstocks)could require replacement or major maintenance in 30 to 40 years. Some electronic components could need replacement in 25 years.
- **Compressed air / thermal systems:** Pressure vessels and thermal storage media often demand inspections on a **5–7 year cycle**, with shorter downtime if modular systems are deployed.
- **Flow batteries:** Routine stack and pump servicing can be done on shorter intervals (annual to 3-year cycles), with electrolyte and membrane upgrades typically after 7–10 years.

Optimal scheduling: Outages should be coordinated with **seasonal demand patterns** (e.g., avoiding peak summer or winter periods in Ontario), and ideally staggered across projects to minimize system-level reliability impacts.

In short, optimal outage timelines for LDES balance long intervals (5–10 years) between major overhauls with short, strategically timed downtime, ensuring assets remain reliable while aligning with market and system needs.

Contract Provisions: Environmental Attributes

Do you have any feedback regarding the information shared during the webinar?

- ESC believes that the environmental attributes of a project should be held by the developer over the full life cycle of the resource to ensure the integrity, accountability, and value of the investment.
- When a developer undertakes the significant financial, technical, and regulatory risk of designing, financing, and building a clean energy or storage project, they do so with the expectation that both the direct revenues and the associated environmental benefits will flow back to support their business model.
- Allowing developers to retain these attributes creates certainty in project economics, underpins the financing structures that make large capital-intensive projects possible, and prevents double counting or dilution of environmental claims across multiple parties. It also ensures that the attributes are tracked consistently with the actual operation of the resource, avoiding situations where environmental value is separated from physical performance, which can undermine trust in environmental markets.
- From a policy perspective, tying the attributes to the developer over the full project life cycle creates transparency and accountability, as regulators, investors, and communities can reliably verify that the promised emissions reductions or renewable contributions are being delivered by the party directly responsible for the project.
- This ownership structure also aligns incentives by rewarding developers for maintaining optimal environmental performance and extending the useful life of assets, rather than treating attributes as short-term tradable commodities divorced from long-term operational outcomes.
- Finally, consistent developer ownership provides a stable foundation for future market development, encouraging ongoing innovation and reinvestment in cleaner technologies. In sum, holding environmental attributes with the developer for the entire project life cycle reinforces financial stability, environmental integrity, and long-term climate policy objectives, making it a critical principle for effective clean energy deployment.

General Comments/Feedback

- If the IESO does not intend to move from a technology type eligibility framework, ESC also believes that Compressed Gas Energy Storage should be an eligible resource for the procurement. With Compressed Air already on the list, this just broadens the category to contain other types of gases in addition to air. These other types of compressed gas projects can be contracted for 40 years.
- Compressed gas refers to any gas that is stored under pressure in a cylinder, tank, or other container at a pressure higher than atmospheric levels. When gas is compressed, its molecules are forced closer together, which reduces its volume and allows a much larger quantity of gas to be stored in a relatively small space. This property makes compressed gases highly useful for a wide range of applications, from industrial processes and medical oxygen delivery to welding, transportation, and energy storage. Because the gas is under pressure, it can be released in a controlled manner for immediate use or converted into other forms of energy.
- Compressed air is a specific type of compressed gas, where ordinary atmospheric air is pressurized and stored for later use. Like other compressed gases, compressed air serves as a portable and storable energy carrier. Both compressed air and other gases share similar principles: energy is used to compress them, they can be stored safely under pressure, and that stored energy can be released on demand. The main difference lies in composition—compressed air is simply nitrogen, oxygen, and trace gases from the atmosphere, whereas compressed gases may include pure elements or compounds such as oxygen, hydrogen, carbon dioxide, or natural gas.
- As a principle, we believe this broader definition should apply to this and future IESO procurement events, including the Long Lead Time (LLT) procurement.
- The IESO needs to consider expanding the procurement target size for LDES to 1,000 MW or more. Energy Storage Canada recently commissioned a market outlook report[1] that suggested by 2050 Ontario could need as much as nearly 5 GW of Long duration storage by 2050. Ontario can set the market for commercial production of LDES by leading the way in its upcoming LLT procurement, bolstering our domestic supply chain.
- Additionally, this would send an appropriate signal to ESC members about the commitment Ontario and the IESO have toward long-duration energy storage.
- Furthermore, a larger procurement will help the province meet its supply needs in the 2030s as nuclear refurbs across the province continue and allow the province to conduct a more competitively priced procurement. An expanded procurement will also increase optionality for the IESO and protect against attrition from contract award to commercial operation.
- LDES are specifically important as they provide considerable economic benefits relative to some other technologies.
- This is true for Hydrostor's proposed advanced Compressed Air Energy (A-CAES) storage facility under development in Lennox and Addington County. In terms of economic benefits the project is estimated to provide 40 full-time permanent local jobs during operation, estimated peak workforce of 670 jobs during the construction period, and over $1.1 billion of direct and indirect economic impacts across Ontario.
- This is a made in Ontario investments. Procuring LDES technologies locally fosters the development of a domestic industry. This not only strengthens the resilience of the energy supply chain but also promotes technological

[1] Energy Storage Canadian Market Outlook. https://www.energystoragecanada.org/energy-storage-canadian-market-outlook

innovation and expertise within the province. The growth of the LDES sector has a multiplier effect on the economy. Beyond direct employment, it stimulates related industries and services, increasing economic activity, higher GDP, and a more robust and diversified economy.

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