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# The Enabling Resources Program Work Plan

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# Introduction

- The purpose of this presentation is to present the IESO's work plan for enabling emerging technologies in the wholesale electricity market
- The plan captures work related to:
  - Energy storage
  - Hybrid generation-energy storage
  - Distributed Energy Resources (DER)<sup>1</sup> including aggregations of DERs and flexible loads with/without behind-the-meter DER

<sup>1</sup> DER is a resource that is directly connected to the distribution system, or indirectly connected to the distribution system behind a customer's meter; and generates energy, stores energy, or controls load

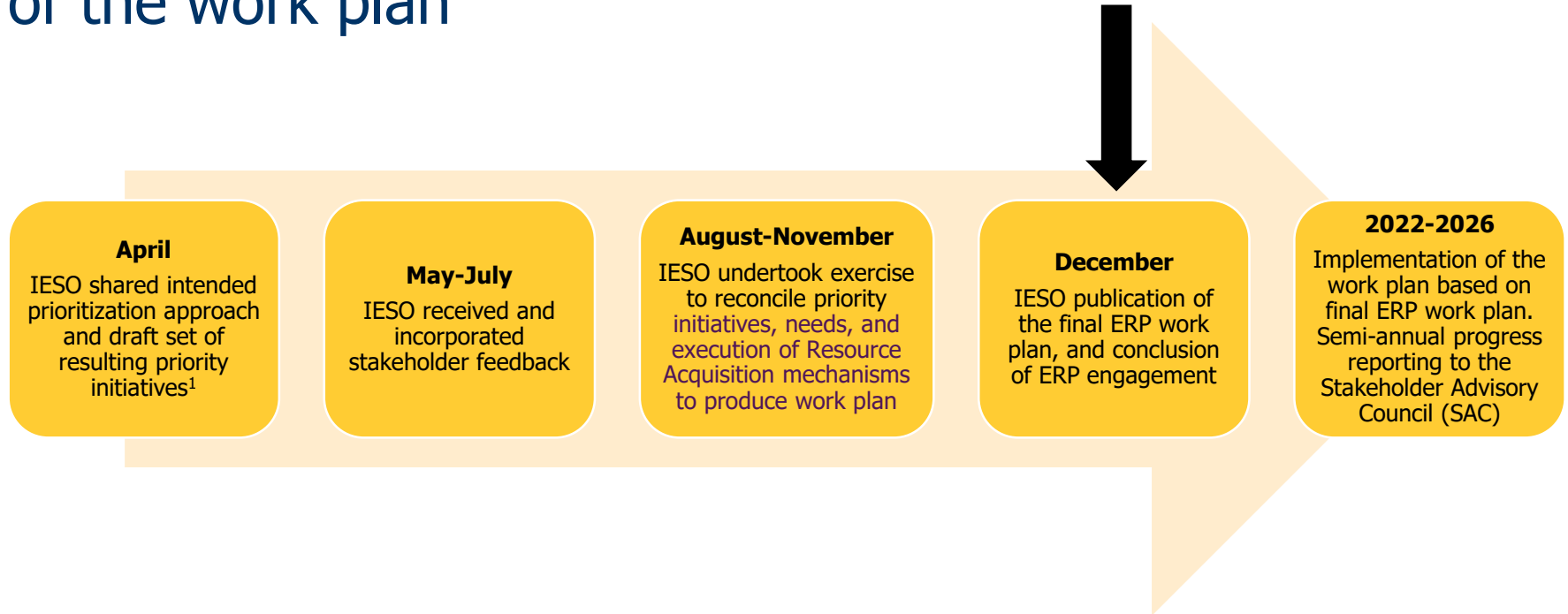
# The Enabling Resources Program (ERP) purpose

To produce and implement an integrated work plan that will outline the sequencing, timing and scope of activities to be undertaken by the IESO to enable existing electricity resources to provide electricity system services in the **post-Market Renewal market** that they cannot, or cannot fully, provide under current market design

The work plan will provide stakeholders greater certainty regarding resource enablement timing to facilitate investment planning and support participation in IESO's resource acquisition mechanisms



# Where we are in the development and implementation of the work plan



<sup>1</sup>Presentation available at <https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/enabling-resources/er-20210421-presentation.ashx>

# Stakeholder feedback on April presentation

## Theme

## IESO Response

If resourcing is a significant constraint impacting when IESO will pursue high-priority opportunities, the IESO should seek additional resources to expedite the program to align with other major markets

The IESO is seeking additional resources in its most recent Business Plan and is exploring opportunities to secure federal funding to advance the program.

The IESO has practical limits on the ability to undertake additional initiatives while Market Renewal Program (MRP) is in flight due to the limited availability of highly-specialized internal and external staff and consultants, limited availability of vendors supporting highly specialized tools, and MRP design dependencies. Care must be taken to avoid compromising successful delivery of the MRP.

IESO should place a higher priority on the opportunity to further enable aggregations of demand response resources/behind-the-meter resources

This opportunity will be pursued as part of the high-priority DER Market Vision and Design Project.

The IESO is seeking to test the capabilities of aggregations of DER, including demand response, to provide operating reserves through the Grid Innovation Fund pilot call in collaboration with the Ontario Energy Board's Innovation Sandbox (the "IESO-OEB Joint Targeted Call"). Findings from the pilot will inform the DER Market Vision and Design Project.

# Stakeholder feedback on April presentation (cont'd)

Theme	IESO Response
Questions about why capability to provide Operating Reserve and other Ancillary Services was not a greater consideration in opportunity prioritization	The IESO determined that enablement opportunities should be prioritized based on ability to retain/increase available capacity since this is the most pressing forecasted system need whereas there is not a pressing forecasted need for additional Ancillary Services capability at this time.
Questions about how IESO quantified resource capabilities, particularly demand response/behind-the-meter resources	The resource capabilities were primarily based on confidential inputs into the 2020 APO for contracted resources. The IESO has less visibility into existing demand response/behind-the-resources so leveraged results of the 2020 Industrial Conservation Initiative DER survey. The IESO is also currently undertaking a DER Potential Study to better understand the type and magnitude of DER capacity expected in the future.
The IESO will need to coordinate carefully with Local Distribution Companies (and allocate time for coordination) for program success, particularly regarding DER enablement	The IESO will engage extensively with the LDC community through the DER Roadmap engagement, the Transmission-Distribution Coordination Working Group, the OEB's Framework for Energy Innovation Working Group, and other forums. Through the Grid Innovation Fund, IESO is also currently funding DER integration pilots being undertaken by multiple LDCs to understand issues related to LDC/IESO coordination for DERs.

# Priority enablement opportunities

- The list on the following slide identifies the IESO's priority enablement opportunities (based on the April engagement session and subsequent stakeholder feedback) and clarifies the pathway through which they will be addressed
- The low-priority enablement opportunities presented in April will not be included in the scope of ERP work plan
  - Low-priority opportunities include enabling the provision of Operating Reserve from existing Regulation Service providers, Not-So-Quick-Start natural gas, and variable generation

# Priority enablement opportunities (cont'd)

Resource Type	Opportunity	Enablement pathway
Hybrid generation-storage	Capacity, energy, operating reserves (OR)	<a href="#">Hybrid Integration Project</a> to establish a market participation model for hybrids
Distributed Energy Resources (DER)	Capacity, energy, operating reserves (OR)	<a href="#">DER Market Vision and Design Project</a> to establish additional market participation models for DER, including aggregations of DERs
Storage	Enhancements to provision of energy, OR, and Regulation Service	Operational enhancements to be implemented through standalone projects Incremental market efficiency enhancements to be considered after the hybrid participation model design work is complete
Demand Response	OR	<a href="#">IESO-OEB Joint Targeted Call</a> , potential establishment of market participation model for fast-responding load aggregations through DER Market Vision and Design Project
Resource-Backed Imports	Capacity	Capacity Auction evolution outside of Enabling Resources Program
Variable Generation	Capacity	Capacity Auction evolution outside of Enabling Resources Program



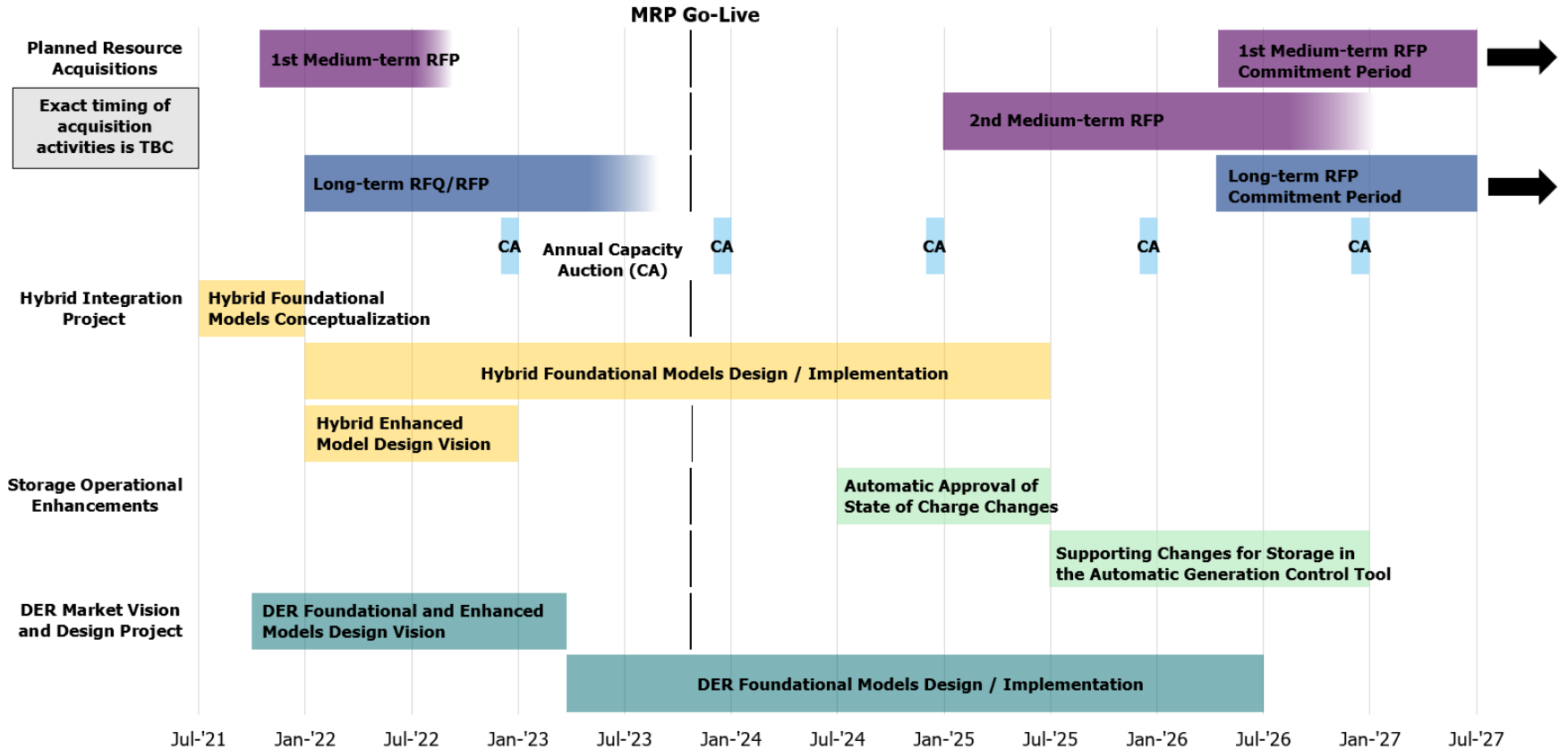
# ERP work plan approach

- The following slide presents a work plan for implementing the priority enablement opportunities
- The work plan is designed to:
  - 1) Facilitate greater competition in future acquisitions
  - 2) Proactively provide resource owners/developers with the information to identify opportunities for participation in future acquisitions
  - 3) Respect IESO constraints (e.g. staff/consultant availability, budget availability, specialized vendor availability) to ensure successful ERP program delivery

## ERP work plan approach (cont'd)

- While the work plan is intended to provide reasonable guidance to stakeholders, it may be revised should underlying objectives and constraints change (see previous slide) or other circumstances dictate, to ensure that IESO can continue to fulfil its core operational and planning responsibilities
- Clarification of the exact timing of acquisition activities is not expected to impact the ERP work plan

# The Enabling Resources Program work plan



## Resource Adequacy – ERP alignment

- As indicated in the Annual Acquisition Report (AAR) the IESO plans to initiate a series of RFPs and continue to run annual Capacity Auctions to address Ontario's resource adequacy needs
  - The following slide summarizes the alignment between planned Resource Adequacy mechanisms and Enabling Resources Program activities

# Resource Adequacy – ERP alignment (cont'd)

Acquisition	Expected capacity (UCAP)*	Timing**	Commitment Period	Emerging resource eligibility***
<b>Medium-Term RFP 1</b>	Up to 750 MW	Present – Q3 2022	May 2026 start for three/five year term	Storage, DER with existing market participation models, DER providing energy via alternate contract mechanisms
<b>Long-Term RFP</b>	At least 1000 MW	Q1 2022-Q3 2023	May 2026 to May 2028 start for 7-10 year term	Storage, Hybrids, DER with existing market participation models
<b>Medium-Term RFP 2</b>	TBD	2025-2026 (exact timing to be determined)	May 2029 start for 3-5 year term	Storage, Hybrids, DER with existing market participation models, DER with new market participation models (TBC)
<b>Capacity Auctions</b>	1000 MW summer growing to up to 1800 MW by 2026  At least 500 MW winter	Annual	Annual	Currently: Storage  2026 or after: Storage, Hybrids, DER with existing market participation models, DER with new market participation models

\*Expected capacity represents unforced capacity based on the [2021 Annual Acquisition Report](#). Please refer to the AAR for more information including anticipated technical requirements for the different acquisition mechanisms

\*\* Specific timing of procurement activities to be confirmed

\*\*\*Assumes resources meet the acquisition mechanism's applicable technical requirements (e.g. energy duration, dispatchability, size). For clarity, existing market participation models will reflect Market Renewal Program updates such as Day-Ahead Market participation requirements.

# High-level work planning considerations

- The availability of highly-specialized IESO staff and external vendors to support new participation model design/implementation will be very limited before Market Renewal Program “go-live” in late 2023
- More fundamentally, some new participation model design/implementation decisions will be dependent on final Market Renewal Program solutions
- To ensure acquired resources are able to satisfy RFP requirements, between participation model “go-live” and commitment period start, the ERP work plan must allocate sufficient time for newly enabled resources to proceed through equipment registration, commissioning, and performance validation

# Approach to resource enablement under ERP

- As discussed in the following slides, the general approach to resource enablement under ERP will include identifying foundational models for implementation, while concurrently exploring enhanced models and the criteria for implementing those models

# Foundational model approach

- The IESO is focused on establishing pragmatic “foundational” market participation models that enable resources to provide required grid services with manageable implementation cost and complexity
- Pursuing foundational models will:
  1. Ensure that resources acquired through Resource Adequacy mechanisms will be successfully integrated in market in time to meet forecasted system needs
  2. Provide resource owners/developers confidence that the participation model described when developing RA mechanism bids will align with the participation model in place at the start of the obligation period



# Hybrid enablement

- [Hybrid Integration Project engagement](#) launched in April 2021
- The Hybrid Integration Project has identified two foundational market participation models for hybrid resources and will implement by July 2025 to facilitate participation in the Long-Term procurement and subsequent procurements and capacity auctions
- Starting in Q1 2022, the IESO will work with stakeholders to clarify the foundational market designs that will allow hybrid resources to participate in the IESO-administered markets
  - E.g. registration, capacity qualification, day-ahead market (DAM) & real-time market (RTM) participation, settlement, etc.

## Hybrid enablement (cont'd)

- The project, as part of the Design Vision stage, will also explore the costs and benefits of more sophisticated models from the foundational models (Interim Storage Model + Generator Resource (ISM+G) and Integrated Hybrid Model) and establish criteria (e.g. penetration levels, capabilities) for when the IESO should consider implementation

## Hybrid enablement – work plan considerations

- The terms of the first Medium-Term RFP are not expected to support large capital investment required to “hybridize” existing resources (e.g., building new storage)
- Significant quantity (~400 MW installed) of variable generation will be available for start of the Long-Term RFP commitment period and annual Capacity Auctions
- The additional time before the start of the Long-Term RFP commitment period reduces the timeline risk for successful implementation of the hybrid participation models, protecting system reliability and supporting private investment

# DER enablement

- DER Market Vision and Design Project, part of the [DER Roadmap](#), launched in September 2021
- The DER Market Vision and Design Project will identify new/enhanced foundational market participation models for DERs and DER aggregations, by March 2023 and implement by July 2026 to facilitate participation in annual Capacity Auctions and potentially the second Medium Term RFP<sup>2</sup>
  - The diversity of DERs (e.g. dispatchable vs. non-dispatchable, generation vs. storage vs. load, etc.) may make it appropriate to establish multiple models to reflect different operational characteristics and capabilities

<sup>2</sup> Note that >1 MW DER and < 1MW Demand Response resources (when contributing to aggregated Hourly Demand Response) are currently enabled in the wholesale market

## DER enablement (cont'd)

- As part of the project, IESO will explore opportunities to facilitate greater participation by smaller resources (including generation, load, and storage) in energy, Operating Reserve, and other ancillary services
- During the Design Vision stage, the IESO will explore the costs and benefits of more sophisticated models and establish criteria for when the IESO should consider implementation of those more sophisticated models to complement/supplant the foundational models

## DER enablement – supporting activities

- The IESO-OEB Joint Targeted Call for demonstration projects will address how to maximize the system-wide and ratepayer value that DERs can provide at both the wholesale and distribution system levels
  - Learnings from the pilots are expected to help inform IESO decisions regarding design/implementation of new DER market participation models
- The IESO is also undertaking a [DER Potential Study](#) to better understand the types and capabilities of DERs likely to emerge in Ontario as another input into the DER enablement work

## DER enablement – work plan considerations

- A limited quantity of existing DER that is not currently enabled in the market will be off-contract for start of the first Medium-Term RFP and Long-Term RFP commitment periods
- IESO intends to enable non-market participating DER in the first Medium-Term RFP via contract mechanisms
- The ERP prioritization exercise resulted in hybrids being prioritized ahead of DERs, which is, in part, why the DER work begins later than the hybrid work (DERs also already have some opportunities to access the market)

## DER enablement – work plan considerations (cont'd)

- Types of DER that will be enabled through the DER Market Vision and Design Project are unlikely to be able to meet all of the anticipated technical requirements for the Long-Term RFP (e.g. energy duration/production requirements, dispatchability)<sup>3</sup>
- Additional time is required for engagement and development of a Transmission-Distribution interoperability framework with Local Distribution Companies
- Timeline allows IESO to draw on learnings from IESO-OEB Joint Targeted Call

<sup>3</sup> The Annual Acquisition Report provides further details of Ontario's anticipated long-term needs



# Storage enablement – operational enhancements

- The IESO has identified and scoped two operational enhancements for storage resources<sup>4</sup>
  - Automatic Approval of State-of-Charge (SOC)
  - Supporting Changes for Storage in the Automatic Generation Control (AGC)
- IESO is now confirming timelines for these projects, as detailed in the following slides

<sup>4</sup>The Energy Storage Design Project (ESDP) Long-Term Design Vision document discusses the AGC changes for storage being in place at some point in the future. The automatic approval of state-of-charge project may be internal-facing only (i.e. stakeholders may not be aware of any change for them, but it will reduce control room workload, facilitating an increased penetration of storage and hybrid resources).

# Storage enablement – automatic approval of State-of-Charge

- The Automatic Approval of State-of-Charge Changes project expected to be implemented by July 2025
  - The project will allow storage resources to revise capability due to state-of-charge limitations within the mandatory window without requiring manual approval by the IESO control room and enable Dispatchable Loads to communicate outages via the Control Room Operations Window (CROW) tool
  - The project is important to manage control room workload (and support reliable operation of the grid), particularly if a significant number of new storage and hybrid resources enter the market

# Storage enablement – supporting changes for storage in the AGC

- The Supporting Changes for Storage in the Automatic Generation Control (AGC) project is expected to be implemented by January 2027
  - The AGC tool enables resources to provide Regulation Service by moving a generator's power levels on a second-to-second basis in response to frequency changes and power system imbalances
  - Energy Storage Resources currently provide Regulation Service on a pilot basis through an interim process outside of the AGC tool and cannot simultaneously participate in the energy market

## Storage enablement – supporting changes for storage in the AGC (cont'd)

- While the IESO is currently implementing enhancements to the AGC tool to allow it to model energy storage<sup>5</sup>, this project will implement complimentary changes to supporting tools necessary to eventually enable storage resources to offer and be settled for Regulation Service like other resources
  - Updates will eventually allow a storage resource to simultaneously participate in both Regulation Service and energy markets
- For clarity, additional work will be required to complete enablement

<sup>5</sup>See the SCADA/Energy Management System (EMS) Upgrade project

# Storage enablement enhancements – work planning considerations

- Work planning considerations:
  - While IESO has taken initial steps to enable storage to provide Regulation Service, the absence of a pressing forecasted need for additional Regulation Service capability allows the IESO to defer implementation of the Supporting Changes for Storage in the Automatic Generation Control (AGC) project until later to allow other projects that will support meeting more urgent capacity needs to proceed

## Next steps and reporting

- IESO will publish an engagement summary close-out document and conclude the Enabling Resources Program engagement
- IESO will continue with implementation of the ERP work plan
- IESO will report on work plan progress at the individual project / work stream level through project-specific engagements (e.g. [Hybrid Integration Project](#), [DER Market Vision and Design Project](#), and at the program-level, semi-annually at the Stakeholder Advisory Committee

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# Thank You

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