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Enabling Resources Engagement

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Purpose of this engagement

- To produce 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 is expected to take a stage gate approach, requiring a positive cost-benefit analysis prior to implementing enablement solutions
  - Engagement on solution development will take place through separate opportunity-specific engagements

Purpose of this engagement 2

- 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

Background

- As reported in the 2020 Annual Planning Outlook (APO), the IESO forecasts emerging system needs in the 2020s
- In recent years, the IESO has identified a number of opportunities to retain or enhance existing resources' contributions to maintaining system reliability, flexibility, and market competition
- With finite human resources and budget, the IESO must carefully consider if, how, and when it implements high-value enablement opportunities to ensure the value of ratepayer investments are maximized and avoid compromising the delivery of critical operations and projects (e.g. Market Renewal, Resource Adequacy)

Stakeholder Advisory Committee (SAC) Input

- The enablement opportunities and prioritization & sequencing approach was presented at the February SAC meeting
- The SAC was generally supportive of the initiative and the proposed approach, noting the IESO should particularly consider timing of Resource Adequacy procurements
- The SAC additionally encouraged IESO to fully leverage learnings and conclusions from preceding engagements such as Expanding Participation in Operating Reserve and Energy (EPOR-E) and projects such as the IESO Innovation White Papers and Storage Design Project

Resource enablement opportunities

- Identified resource enablement opportunities were drawn from previous work with stakeholders, including:
  - The EPOR-E initiative
  - The Storage Design Project
  - The IESO Innovation White Paper series regarding integrating Distributed Energy Resources (DER) into the wholesale market
  - Discussions through the Demand Response Working Group

Resource enablement opportunities 2

Resource Type	Enhancement/Enablement potential
Imports	Capacity, Operating Reserve (OR)
Variable Generation	Capacity, OR
Existing Reg. Service Providers	OR
Not-So-Quick-Start natural gas	OR
Demand Response	OR
Distributed Energy Resources	Capacity, Energy, OR
Hybrid variable generation-storage	Capacity, Energy, OR
Storage	Improve how storage provides energy, OR, and Regulation Service

Enablement mechanisms

Mechanism	Description	Typical Application
Pilot	Procurement of services on a time-limited, experimental basis, may or may not feature elements of market participation	Testing capabilities and building operational experience with emerging resources (e.g. IESO York Region Non-Wires Alternative pilot)
Program	Procurement of service(s) typically from a specific resource type, may or may not feature elements of market participation	Integration of policy-supported resources (e.g. prior Demand Response programs)
Market enablement	Establishment of a participation model applicable for a resource type(s) to enable it to compete to provide services in the wholesale market	Resources representing significant proportion of Ontario resource fleet (e.g. the Non-Quick Start participation model for thermal and hydro)

Meaning of "full enablement"

- To be fully enabled in the IESO markets, a resource must:
  - Have its operating characteristics and constraints considered by the IESO dispatch tool when calculating dispatch optimization
  - Provide all electricity products/services it is technically capable of providing
- The IESO's dispatch tools contain a unique resource model for each different resource type (e.g. hydro, natural gas)
- Newer resources must be added to the tools (and market rules, guides) in order for them to fully participate in the energy, operating reserve and/or capacity markets or provide other ancillary services

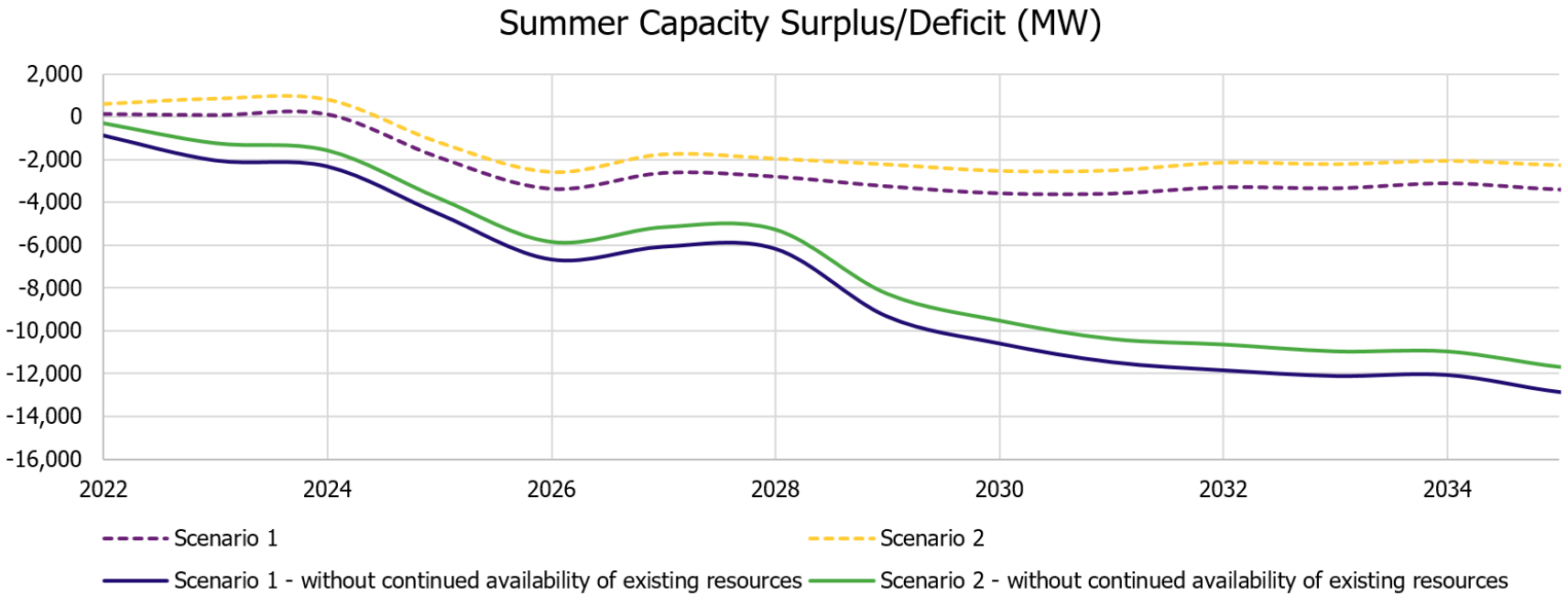
Proposed approach to prioritization and sequencing

- The IESO intends to use the following criteria to prioritize and sequence enablement opportunities:
  - The timing and magnitude of forecasted system needs;
  - The timing, quantity (MW), and capability, that would be made available by each enablement opportunity;
  - Potential interrelationships between enablement opportunities; and
  - IESO capacity (e.g. human resources, budget availability, etc.) for additional initiatives

Forecasted needs

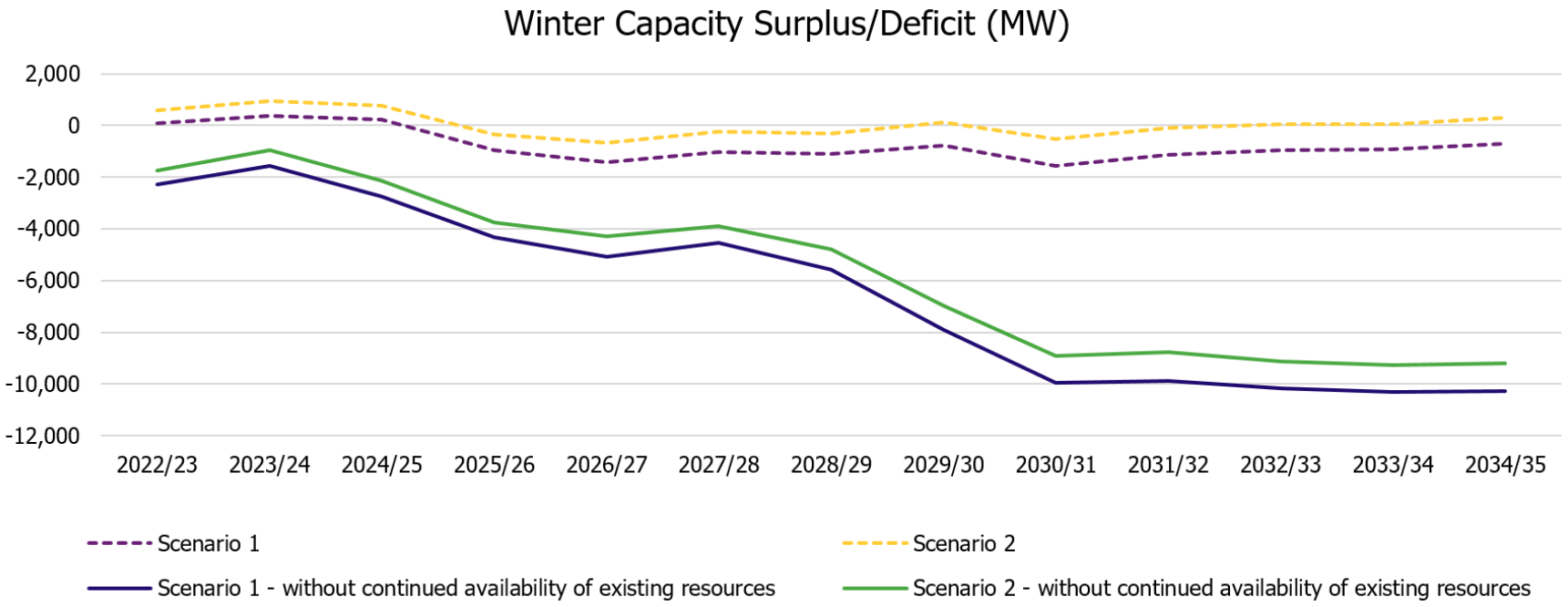
- Slides 12-14 show the the timing and magnitude of forecasted system needs as indicated in the 2020 APO

Forecasted needs – Summer capacity (MW)



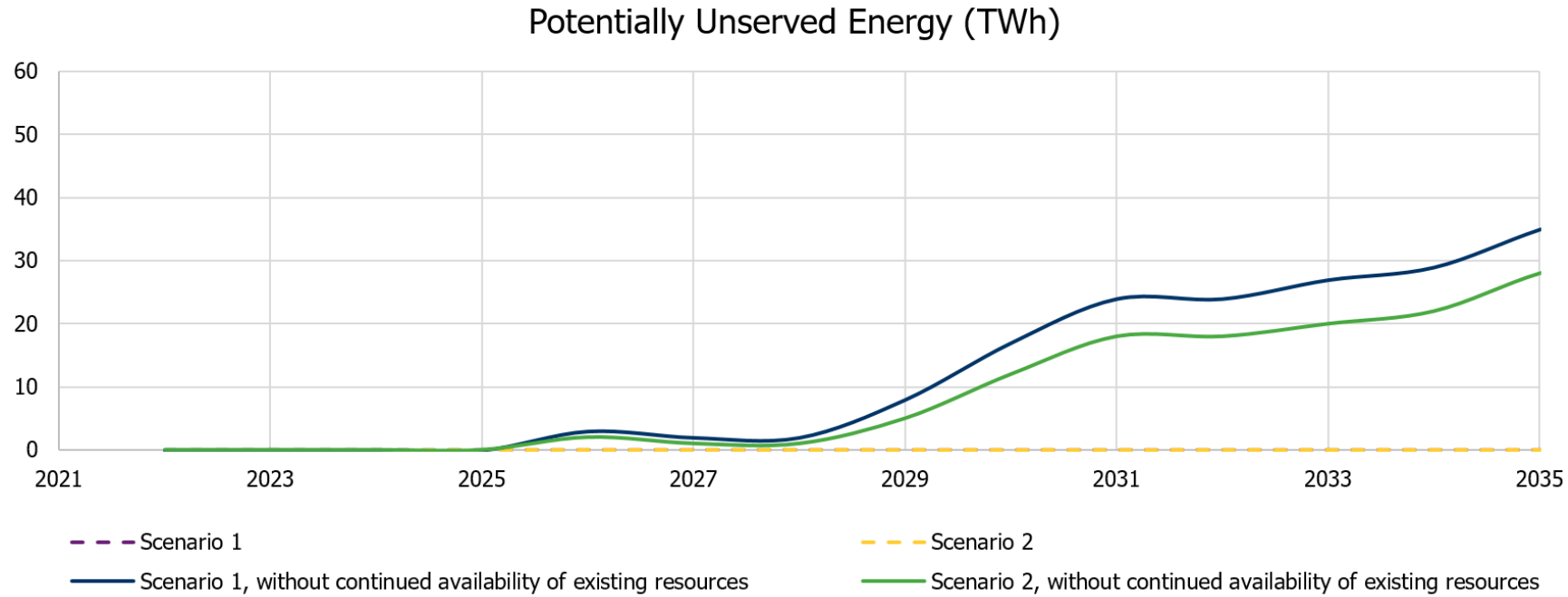
Source: 2020 APO
Note: Scenario 1 represents a quicker economic recovery from COVID-19 vs. Scenario 2

Forecasted needs – Winter capacity (MW)



Source: 2020 APO
Note: Scenario 1 represents a quicker economic recovery from COVID-19 vs. Scenario 2

Forecasted needs - potentially unserved energy (TWh)



Source: 2020 APO
Note: Scenario 1 represents a quicker economic recovery from COVID-19 vs. Scenario 2

Forecasted needs summary

- Ontario's forecasted system needs can be summarized as:
  - Significant forecasted summer and winter capacity needs during the 2020s including a need for new resources in the latter half of the decade
  - A limited energy need emerging the latter half of the decade which is expected to be met by existing and available resources
  - Additionally, increased fleet flexibility is desirable for operational and market efficiency benefits (e.g. increased supply quantity and diversity capable of responding to changing conditions on an intra-hourly timeframe)

Forecasted needs summary 2

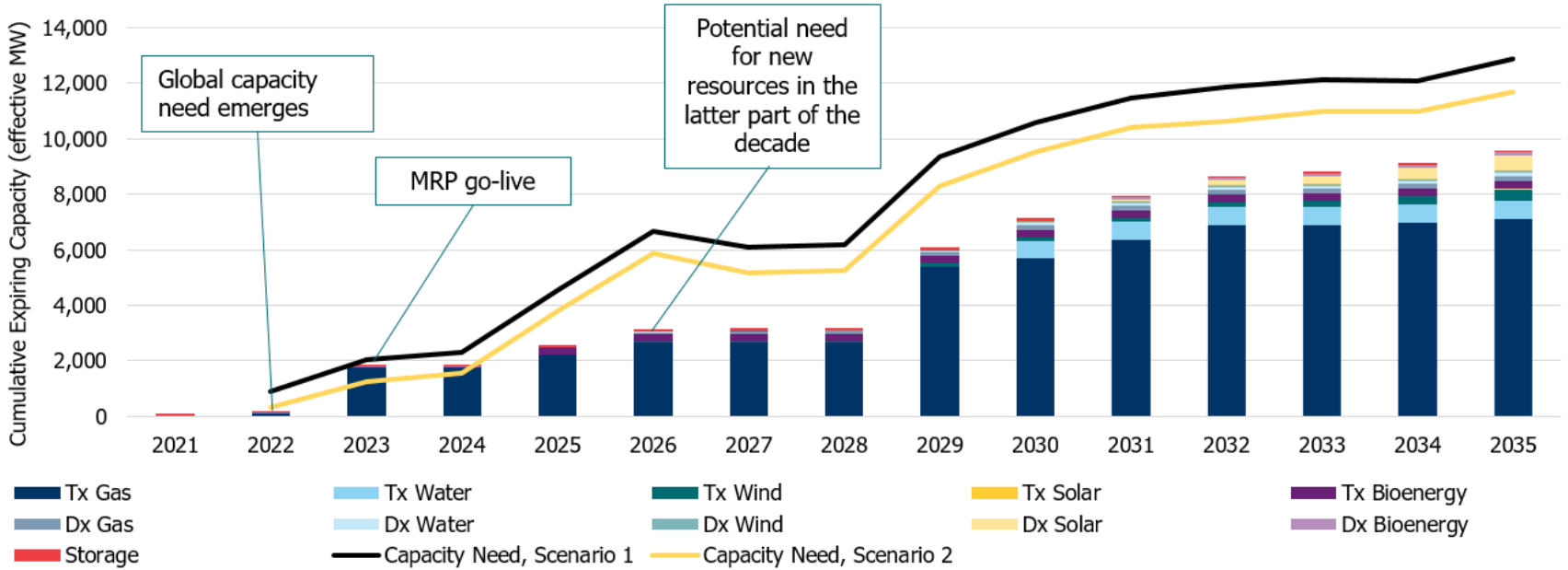
- Consequently the resource enablement opportunity assessment will prioritize opportunities that support meeting capacity needs, with additional consideration where also enhancing flexibility

Forecasted capacity needs and resource availability 1

- Slide 18 compares forecasted system incremental capacity needs under the two scenarios contemplated in the APO (fast and slow post-pandemic economic recovery) and the timing and quantity of capacity that will be available from existing resources with expiring contracts 2021-2035[1]
- As noted in the March Resource Adequacy engagement presentation on Forecasting Uncertainties, a number of uncertainties exist that will impact the resource requirement in 2026 and beyond

[1] Expiring capacity data is consistent with the 2020 APO except for additional storage data not included in APO

Forecasted capacity needs and resource availability 2



Note: Data is aligned with 2020 APO except for additional storage data not included in APO
Note: Tx = Transmission-connected, Dx = Distribution-connected

Relationship to Resource Adequacy framework

- IESO is currently engaging on development of a Resource Adequacy framework to competitively acquire capacity to meet short, mid, and long-term electricity system needs
- The Enabling Resources initiative is complimentary to the Resource Adequacy framework, supporting achievement of its objective of attaining cost-effective reliability for the province by:
- Increasing competition in the Resource Adequacy mechanisms
- Ensuring full value is realized from ratepayer investments in existing resources capable of providing required services

Application of prioritization approach

- The following slides present the application of the prioritization approach to the identified enablement opportunities to determine which enablement opportunities present the greatest potential for retaining/enhancing the contribution of existing resources to meeting system reliability and market competition
- For high-priority opportunities, the slides also identify when the opportunity materializes (e.g. when do existing resources roll off contract and become available for re-acquisition)

Application of prioritization approach 2

- As part of next steps, the IESO will consider organizational IESO capacity (e.g. human resources, budget availability, etc.) for additional initiatives to inform proposed sequencing and work planning
- Unless otherwise noted, capacity figures are sourced from IESO inputs to the 2020 APO, and are aligned with the APO
  - Data captures IESO-contracted, Ontario Electricity Financial Corporation-contracted, and rate-regulated resources
  - Effective capacity figures are for summer

Imports

Opportunity	Enable resource-backed imports to provide capacity (in addition to system-backed) Expand opportunities for operating reserves (OR) provision from imports
Quantity/Availability timing	Global import limit of 80 MW is expected to increase based on experience and performance of capacity import resources and operational needs, and unconfirmed quantity of OR capability
Interrelationships	N/A
Other considerations	Complex changes to the interchange agreements and scheduling processes with neighboring control areas regarding providing OR over interties would be required to enable OR provision (currently agreement in place only with Hydro Quebec)
Prioritization Assessment	OR - Low priority – Need to negotiate intertie agreements to access import OR adds risk and complexity, limited near-term potential, can revisit post-Market Renewal Program (MRP) Capacity - High priority – As part of Capacity Auction evolution, resource-backed imports will be enabled in the 2022 CA

Variable generation (VG)

Opportunity	Enable off-contract solar and wind to provide capacity Enhance existing market participation model to enable variable generation to provide operating reserves (OR)
Quantity/Availability timing	Up to **~500 effective MW** of capacity provided by transmission-connected resources becoming available 2021-2035, up to ~4200 installed MW of existing VG resources that could provide OR upon implementation but unconfirmed OR capability due to uncertainty around fuel availability
Interrelationships	N/A
Other considerations	Variable nature of fuel limits dispatchability and ability to reliably maintain energy output over period of time required for OR, existing contracts strongly incent resources to maximize energy output when fuel available
Prioritization Assessment	Low priority (OR) – Limited near-term potential related to uncertain fuel availability, can revisit post-MRP Mid priority (Capacity) - To be addressed as part of post-2022 Capacity Auction evolution

Existing Regulation Service providers

Opportunity	Enhancements to existing participation model to enable resources that provide Regulation Service to simultaneously provide Regulation Service and operating reserves (currently constrained by tool limitations to providing energy and Regulation Service or OR at same time)
Quantity/Availability timing	Up to **~150 effective MW** of additional OR capability upon implementation
Interrelationships	N/A
Other considerations	N/A
Prioritization Assessment	Low priority - Limited near-term potential, can revisit post-MRP

“Not-So-Quick-Start” (NSQS) natural gas

Opportunity	Enhancements to unlock incremental OR opportunities which these resources are technically capable of providing but currently not modelled as being able to provide
Quantity/Availability timing	Unconfirmed but limited additional 10 and 30 minute OR capability upon implementation
Interrelationships	N/A
Other considerations	Limited apparent interest from current NSQS gas generators at this time
Prioritization Assessment	Low priority - Limited market interest, limited near-term potential, can revisit post-MRP

Demand Response

Opportunity	Enable flexible loads too small to currently participate as Dispatchable Load (current minimum size for direct participation is 1MW), particularly those with behind-the-meter storage or generation, to provide operating reserves, either through enhancements to the existing Hourly Demand Response or Dispatchable Load participation models or to explore resource capability through a pilot
Quantity/Availability timing	Up to an estimated **150-200 effective MW** of additional OR capability (based on Energy Storage Canada estimates of provincial behind-the-meter storage installation)
Interrelationships	Similar challenges to DER market integration opportunity (e.g. establishing appropriate telemetry and metering requirements) Potential to address opportunity via a new DER participation model
Other considerations	Opportunity to pilot through Grid Innovation Fund to support development of DER market participation model
Prioritization Assessment	Mid-priority – despite modest quantity, the Grid Innovation Fund presents an opportunity for a pilot to inform solution development for the high-priority DER opportunity

Distributed Energy Resources (DER)

Opportunity	Establish enhanced participation model(s) for off-contract distributed energy resources (DER), including aggregations to provide capacity, energy, and potentially operating reserves
Quantity/Availability timing	Up to **~1000 MW** of effective capacity becoming available 2021-2035
Interrelationships	N/A
Other considerations	Requires development and implementation of a Transmission-Distribution interoperability framework Ontario Energy Board study indicates potential for significant DER growth over 2020s (~2500 installed MW by 2030 in mid scenario)
Prioritization Assessment	High-priority – based on large quantity of existing resource capability becoming available, anticipated future growth
Timing considerations	First major tranche of resources **(~100 effective MW**) rolls off contract in 2026

Hybrid generation-storage

Opportunity	Establish a participation model(s) to enable resources consisting of paired and/or co-located off-contract generation and storage to provide capacity, energy, and potentially operating reserves
Quantity/Availability timing	Potential to increase **~500 effective MW** of capacity provided by ~4200 installed MW of transmission-connected variable generation resources becoming available 2021-2035, additional potential from other resource types
Interrelationships	Potential to leverage storage model enhancements (e.g. single resource model, State of Charge management) as foundation for new hybrid resource participation model
Other considerations	Potential for additional benefits from reduced variable generation forecast error
Prioritization Assessment	High-priority – based on large quantity of existing Variable Generation becoming available and opportunity to enhance capability by pairing with storage
Timing considerations	First major tranche of resources **(~25 effective MW from ~400 MW installed)** rolls off contract in 2026

Energy storage

Opportunity	Implement enhancements to existing interim storage participation model to achieve operational and market efficiency improvements in how storage enabled to provide energy, OR, and Regulation Service (building from the Storage Design Project's *Long Term Design Vision Document*)
Quantity/Availability timing	Applicable to **~50 installed MW** of existing storage upon implementation
Interrelationships	Potential to leverage storage model enhancements (e.g. single resource model) as foundation for new hybrid and DER participation models
Other considerations	N/A
Prioritization Assessment	Mid-Priority - despite modest quantity, likely foundational to solution for the high-priority hybrids-opportunity
Timing considerations	Likely efficiencies with linking implementation with hybrid participation model work

Opportunity assessment summary

Resource Type	Opportunity Assessment
Existing Reg. Service Providers	OR: low-priority
Not-So-Quick-Start natural gas	OR: low-priority
Demand Response	OR: mid-priority – proposed to be addressed through Grid Innovation Fund pilot
Variable Generation	Capacity: mid-priority – to be addressed through Capacity Auction evolution OR: low-priority
Storage	Energy, OR, and Regulation Service: mid-priority – linked to hybrids opportunity
Imports	Capacity: high-priority – to be addressed through Capacity Auction evolution Operating Reserve (OR): low-priority
DER	Capacity, Energy, OR: high-priority
Hybrid variable generation-storage	Capacity, Energy, OR: high-priority

Stakeholder feedback requested

1. Are there resource enablement opportunities missing from this analysis?
2. Is the prioritization and sequencing approach sound and is there clear alignment between the approach and the analysis presented today?
3. Do stakeholders have additional information or comments on input assumptions for consideration (e.g. limited resource life after contract expiration, additional contribution to meeting local system needs?)

Stakeholder feedback requested 2

4. Do stakeholders agree with the prioritization outcomes?
5. Are there any additional timing considerations IESO should be aware of (e.g., time-sensitive resource re-investment decisions)?
6. Are stakeholders supportive of the objectives and approach detailed in the draft Enabling Resources Engagement Plan?

Stakeholder feedback requested 3

- Please use the feedback form found under the April 21, 2021 entry on the Enabling Resources webpage

- Send written feedback to engagement@ieso.ca by May 12, 2021

Next steps

- Following receipt of stakeholder feedback the IESO will update priorities if applicable and develop a work plan to implement the high-value enablement opportunities considering:
  - IESO resource availability (e.g. human resources, budget availability), particularly coordinating with requirements for MRP
  - Additional information in the Annual Acquisition Report (AAR) regarding future resource acquisitions
  - Stakeholder feedback on timing considerations captured in this deck
  - Trade-offs between different enablement mechanisms

Next steps 2

- In Q3, the IESO will share the draft work plan for implementing the high-priority resource enablement opportunities to stakeholders for feedback
- In the interim, the IESO will launch parallel engagements to support scoping of solutions to resource enablement opportunities for hybrids and DERs
- Implementation of the low-priority opportunities will be reconsidered post-MRP

Thank You

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