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Enabling Resources – Update & Hybrid Integration Project: soliciting stakeholder input on potential foundational hybrid participation models

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Enabling Resources Program: Work Plan Update

Recap: Enabling Resources Program 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

ERP Work Plan: Progress to date

- In April 2021, IESO presented on a system needs-based approach to prioritize and sequence identified enablement opportunities, which established enablement opportunities for Hybrid variable generation-storage, Distributed Energy Resources (including Demand Response), and Storage as the highest priorities
- The IESO communicated that it would share an ERP work plan in Q3 that would include feasible timelines for implementing highest-priority opportunities considering the timelines for upcoming Resource Adequacy procurements; staging impacts of other, related IESO projects (i.e. Market Renewal) and IESO capacity (e.g. human resources, budget availability, specialized vendor availability) for additional initiatives

Alignment with Resource Adequacy framework

- Stakeholders have emphasized the importance of alignment between ERP and the Resource Adequacy (RA) framework to produce a meaningful ERP work plan that provides stakeholders greater certainty about timing and nature of future revenue opportunities
- The details of the planned RA acquisitions are still evolving in consultation with stakeholders
- The IESO is now planning to defer publishing the ERP work plan to end-of-year to help ensure alignment with RA plans

Continued progress on priority enablement initiatives

Enablement opportunity	Status
Distributed Energy Resources (DER)	DER Potential Study underway – consultant presenting on work plan and study details at September engagement days
	DER Roadmap under development – introducing objectives and long-term timelines at October engagement days
	DER Market Vision under development– launching engagement at October engagement days
Hybrids	Hybrid Integration Project underway – presenting Foundational Participation model options, evaluation criteria, potential risks at September engagement days (see following slides)

Hybrid Integration Project: Soliciting stakeholder input on potential foundational hybrid participation models

Agenda

- Hybrid Stakeholder Engagement Feedback
- Background & Objectives of Foundational Model
- Foundational Model Overview
- Foundational Model Comparisons
- Next Steps & Timelines
- Questions to Stakeholders

Response to June Stakeholder Feedback

Context – Hybrid Design Vision

The Hybrid Integration Design Vision will detail the long-term design proposals – to be developed through the Hybrid Integration Project – which will serve as a basis for future Hybrid design efforts.

What Types of Pairings are Most Likely to be Developed in Ontario? Why?

Common Themes/Input from Stakeholders	IESO Response
Pairings include distribution and transmission-connected variable generation (solar and wind) w/ storage; gas-fired generation w/ storage; new renewables w/ storage; Hydrogen solutions Commercial and operational viability of hybrid resources (all manner of pairings) will be dependent on market structure of IESO administered markets (IAMs), system needs, and revenue mechanisms	One of the goals of the Annual Acquisition Report released July 19th is to provide investors w/ clarity and details on Ontario's system needs. Suitable revenue mechanisms will be articulated through details of any future Resource Adequacy procurements. Other revenue mechanisms will be explored when our work on participation models through the visioning work progresses further. These participation models will outline which market services can be offered by Hybrid facilities.

Are the Vision Questions Appropriate?

Common Themes/Input from Stakeholders	IESO Response
For the most part, the vision questions are appropriate. Additional considerations around reviewing market rules, integrating the perspective of investors, considerations for expiring contracts, and providing clarity and removing barriers for participation of any identified model.	IESO will implement the suggestions during the execution of the visioning stage for the enhanced hybrid model and within the design of the foundational model. Stakeholder input continues to be important for this initiative.

Foundational Hybrid Participation Models

Purpose

- The IESO assessed various simple models with a focus on system benefits and implementation risks
- The two most promising models from this assessment were selected as potential foundational models
- The IESO would like to gather stakeholder feedback regarding these two models to determine stakeholder interest (from an investment perspective) and overall viability
- Foundational Model to be determined by November with design work to begin in parallel with the Visioning Work exploring other enhanced models with cost-benefit analysis

Hybrid Foundational Participation Model Objectives

a) Foster greater competition by unlocking hybrid capability to address future reliability needs

b) Make efficient use of IESO resources and minimize implementation risks in light of other priorities

c) Promote faster hybrid implementation to enable hybrids as an option to meet system needs (as per prior stakeholder feedback)

d) Serve as a benchmark for more enhanced models

Criteria Used to Evaluate Foundational Model Options

Benefits Assessed

- Capacity Value Extraction
- Energy Value Extraction
- Operating Reserve Value Extraction
- Regulation Service Value Extraction
- Reactive Support and Voltage Control Value Extraction
- Value Stacking of Market Services
- Operational Benefits (e.g. minimize forecast error)
- Modularity

Risks Assessed

- Potential for Unintended Market Consequences
- Loss of Economic Efficiency
- Negative Impact to Operability
- Complexity of Implementation
- Ongoing Operational Cost
- Cost of Implementation
- Challenges/Costs for Market Participants

Model 1: Interim Storage Model + Generator Resource (ISM+G)

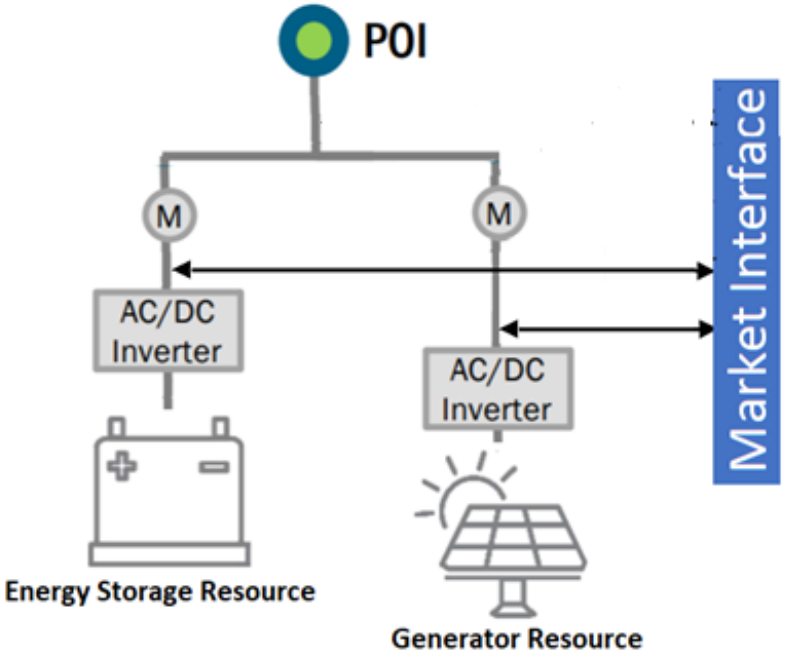
Each hybrid facility would be registered in the markets as three separate resources with a single point of interconnection:

a. A dispatchable generator (one resource)

b. An energy storage resource (two resources) - using the interim storage design which models a storage facility as two resources at the same site including 1) a dispatchable load and 2) a dispatchable generator

Three resources would bid/offer into the market separately (1 from the generator resource and 2 from the storage resource) and be settled separately

Figure 1. ISM + G Market Model Concept



POI = Point of Interconnection to IESO-Controlled Grid
M = Metering

Model 1: Interim Storage Model + Generator Resource (ISM+G) - continued

Functionality

- Ability to charge from the grid or on-site generator
- Adaptable to future changes of different resource models
- Simpler design/easier to implement
- Leverage interim storage rules and processes

Market Services Offered

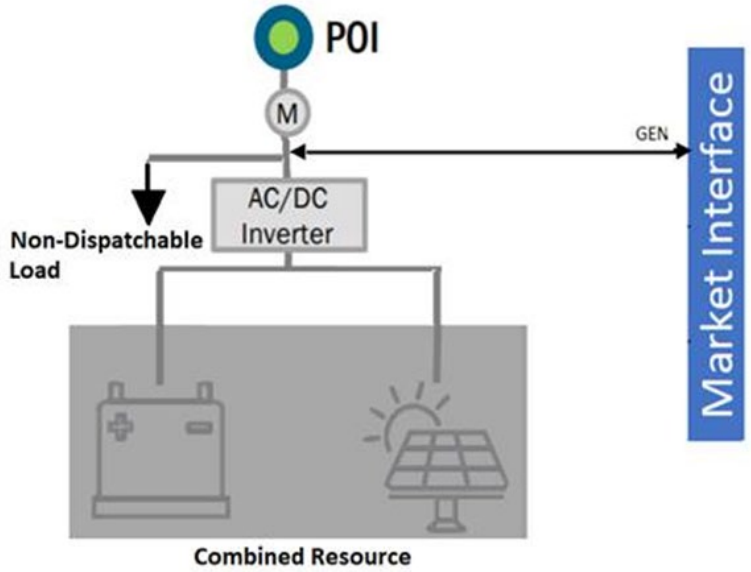
(based on underlying storage and generator resources)

- Capacity
- Energy
- Operating Reserve
- Regulation (if needed)

Model 2 - Single Resource w/ Non-Dispatchable Load

- Generator resource registered together with behind-the-meter storage resource and represented as one larger generator resource resulting in a new combined quick start generation facility at a single connection point with a single offer into the market
- Implementation is simplified by the market participant being responsible for managing all aspects of their energy offer and forecasting
- Non-dispatchable load at the site used to allow charging from the grid

Figure 2. Single Resource Market Model Concept



POI = Point of Interconnection to IESO-Controlled Grid
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Model 2 - Single Resource w/ Non-Dispatchable Load - continued

Functionality

- Ability to charge from the grid or on-site generator
- Suitable for both AC coupled and DC coupled facilities
- Single Revenue Meter w/ settlement as one combined facility

Market Services Offered

- Capacity
- Energy
- Operating Reserve (to be determined)

Foundational Model – Comparison of Functionality

Functionality	ISM + G Model	Single Resource Model
Charging from the grid	✓	✓
Adaptable to changes of different resource models	✓	X
Suitable for AC-coupled facilities	✓	✓
Suitable for DC-coupled facilities	X	✓
Settled and metered as a single resource	X	✓
IESO centralized forecasting for variable generators	✓	X
IESO managed state of charge for storage	X	X

Foundational Model – Comparison of Market Services

Market Services Offered	ISM + G Model	Single Resource Model
Capacity	✓	✓
Energy	✓	✓
Operating Reserve	✓	TBD
Regulation (if needed)	✓	X

Foundational Model – Comparison of Issues & Risks

- High risk indicates that implementation time may be on the critical path of a new project coming into service or that the item is a material uncertainty that could affect project viability

Risk to Implementation	ISM + G Model	Single Resource Model
New OEB licence class required	No	No
New data entries for registration needed	No	Yes
New settlements processes needed	Yes	Yes
Unintended market consequences	Yes*	Yes*
Day-ahead market after Market Renewal	Yes*	Yes*
New capacity qualification process needed	Yes*	Yes
Complex power system study modelling	Yes*	Yes
New contracting terms required	Yes*	Yes*

Legend
High Risk
Medium Risk

* Risk can be mitigated w/o major investments or regulatory changes

Next Steps

- Collect stakeholder input on the viability of both foundational models
- Final decision targeted for November to enable the selected model to proceed to the design phase in the near-term
- Future participation models (built on the foundational models) and cost-benefit analysis to be explored as part of Hybrid Vision work

Key Dates & Timelines

Action Item	Date
Collect and address stakeholder feedback on the Foundation Model	Current - mid-Oct
Finalize decision on Foundational Model	Nov 2021
Begin Foundational Model design work	End of 2021
Hybrid Vision work on enhanced models	Nov 2021 – Sept 2022

Stakeholder Feedback

- How would your willingness to participate in IESO markets and invest in the development of hybrid facilities vary under each proposed model?
- What other operational or implementation considerations should the IESO factor into its decision-making about which foundational model to implement?
- Please use the feedback form found under the September 2021 entry on the Hybrid Integration Project webpage to provide feedback and send to engagement@ieso.ca by October 12, 2021

Thank You

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