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Distributed Energy Resources (DER) - Market Vision and Design Project

Decision Criteria & Options to the Phase I Questions for Foundational Models

Angeli Jaipargas
Lead, System & Sector Development, Innovation, Research & Development

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Agenda

1. DER Market Vision and Design Project Recap
   - Project structure, Timelines, Phase I Questions, Foundational Models, Out-of-scope items
2. Stakeholder Feedback from the January 2022 Session
3. DER Market Vision Project Criteria for Foundational Models
4. DER Market Vision Project Criteria for Enhanced Models
5. Options Under Consideration for Foundational Models

DER Market Vision Project and Foundational Models Recap

Recap: DER Market Vision and Design Project Structure

- This project is a key focus area of IESO's DER integration activities and is what much of the near-term DER Roadmap efforts build towards
- The DER Market Vision and Design Project will be separated into two phases:
- **Phase I:** 2021-(Q1)2023 *DER Market Vision Project* (MVP)
  - Identify "foundational" wholesale participation models for design and implementation in Phase II and "enhanced" participation models to be implemented at a future date
- **Phase II:** 2023-2026 *DER Market Design Project* (MDP)
  - Design in detail and implement "foundational" wholesale participation models (includes market rule/manual amendments and process/tool updates based on recommendations identified in Phase I)

Recap: Foundational Vs. Enhanced Models

Foundational Models

Focus on establishing pragmatic participation models that enable resources to provide required grid services with manageable implementation cost and complexity

- Solutions that will not require upgrades to core IESO dispatch tools
- Outcomes of this work will progress to design & implementation (i.e., Phase II or MDP)

Enhanced Models

Explore more sophisticated, participation models and the criteria for implementing those models

- Explore remaining options not selected in the foundational stage for applicability to the enhanced models
- Outcomes of this work will progress to detailed design and implementation once the criteria have been met

Recap: Timeline and Deliverables

Date	Deliverables
October 2021	• Introduce the DER Market Vision and Design Project • Phase I Questions
January 2022	• Electric Power Research Institute (EPRI) Presentation on FERC Order 2222 • MVP timelines and deliverables for the remainder of 2022
Q2 2022	• Criteria used to determine foundational vs. enhanced models • Initial set of options of Phase I questions for foundational models
Q3 2022	• Recommendations for Phase I questions for foundational models with associated rationale
Q4 2022	• Options and draft recommendations for enhanced models with associated rationale and criteria to trigger implementation
Q1 2023	• Contingency and finalization of participation models

Recap: Definition

- To date, the IESO has defined DERs as:

  "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"

  - DERs can be modelled as a single resource (i.e., a single facility such as a generation facility or dispatchable load facility) or an aggregation of resources (i.e., multiple facilities aggregated into a DER Aggregation, "DERA")
  - The IESO will continue to work with stakeholders and others in the sector (e.g., the Ontario Energy Board) to develop consistent definitions of DERs in Ontario

Recap: DER MVP—Phase I Questions

Key Focus Area	Phase I Question
Participation & Aggregation	1. What participation and aggregation models will be established for DERs? And why? 2. Which entity/entities represents the IESO market participant in the IESO-administered markets? 3. Are maximum and minimum size thresholds needed for individual DERs or DER Aggregations (DERAs)?
Eligible Services	4. What products and services can DER(A)s provide? 5. In what timeframes will DER(A)s be eligible to participate? 6. What are appropriate visibility requirements for DER(A)s (i.e., telemetry)?
IESO-Distributor Coordination	7. What coordination protocol(s) will be used amongst the IESO-Distributors-Aggregators to enable reliable wholesale market participation?
Metering and Settlement	8. What revenue metering arrangements are appropriate for DER(A)s? 9. Will additional settlement arrangements need to be established for DER(A)s?

See October 2021 Session for additional considerations associated with the Phase I Questions

Recap: What is Enabled Today?

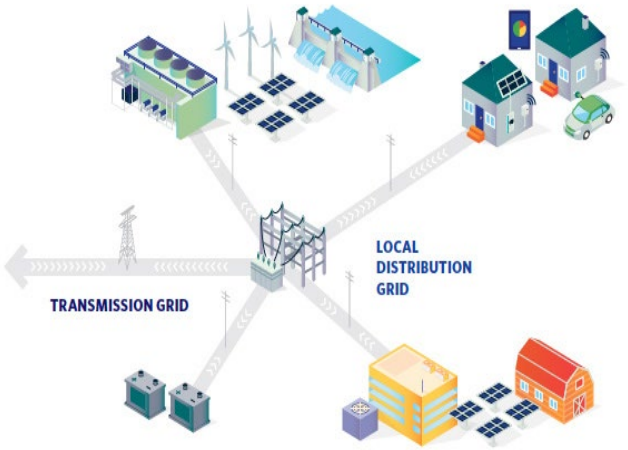
Through existing market rules, DER(A)s can participate in either the "Single Resource" model or the "Demand Response" aggregation model

Requirements	Single Resource Model	Demand Response (DR) Aggregation Model
A) Aggregation	Single resource (e.g., generation, storage or dispatchable load)	Part of a physical hourly demand response (HDR); virtual HDR – residential; virtual HDR – commercial and industrial (C&I); and dispatchable loads (DLs)
B) Delivery Point	Single delivery point	Multiple connection points; aggregated by zone
C) Size	1MW of greater	Contributors can be less than 1MW; aggregation must be 1 MW or greater
Eligible Services if A+B+C are met	Capacity, Energy, Ancillary Services	Capacity (majority are not 5-min dispatchable)

Recap: What We Are Seeking to Enable Via New Foundational Models

The DER MVP is seeking to establish new foundational participation models for DER(A) integration into wholesale markets by:

- creating opportunities for aggregations to provide additional wholesale services by becoming 5-minute dispatchable
- enabling aggregations to be comprised of different fuel/technology types (where possible) and modelling aggregations as single resource (where possible)
- enabling wholesale market participation in order to expand opportunities for resources to participate in future procurements
- seeking to expand opportunities for resources less than 1 MW to participate
- seeking to reduce participation barriers by re-examining telemetry and metering requirements



Out-of-Scope For Foundational Models

The MVP/D Project is not seeking to:

- Propose changes to existing Demand Response models or Capacity Auction rules and requirements
- Enable dispatchable aggregations of residential or small consumer loads
  - This item will be explored as a part of enhanced participation models given the need for additional tool changes to accommodate numerous smaller-scaled resources from an operational, metering and settlement perspective
- Design and implement the enhanced model recommendations from other IESO initiatives (e.g., the Storage Design Project long-term vision or the Hybrid Integration Project's enhanced models)

Stakeholder Feedback Themes from the January Session

Stakeholder Feedback Themes and IESO Response

Feedback	IESO Response
Request for additional clarity for establishing criteria and initial options for Phase I questions	Criteria selected for foundational models presented in today's session.
Request for generally expected timing of deliverables within a quarter.	MVP stakeholder sessions will be scheduled in the later part of the quarters (i.e., June, September, 2022).
Request to give thought to coordination issues between aggregators, distribution utilities and the IESO.	The IESO has established the Transmission-Distribution Working Group (TDWG) which is committed to developing high-level transmission-distribution protocols by the end of Q1, 2023 (for implementation as part of the DER Market Design Project (MDP) by the summer of 2026).

Stakeholder Feedback Themes and IESO Response (cont'd)

Feedback	IESO Response
Request for clarity on whether changes to IESO dispatch tools would be considered in the foundational model considering the proposed implementation period is post-MRP?	Enhancements requiring changes to major tools such as the Dispatch Scheduling and Optimization (DSO) engine post-MRP will be considered for enhanced participation models rather than the foundational.
Request for clarity on how the MVP will address behind-the-meter resources, metering and telemetry complexities, aggregation composition (homogenous/ heterogeneous) and locational requirements	Options in these areas of focus will be presented in today's session; recommendations will be presented in Q3.

MVP Participation Model: Decision Criteria

Criteria Used to Evaluate Foundational Model Options - Context

- For consistency across the Enabling Resources Projects, the DER MVP will leverage similar criteria as the Hybrid Integration Project (HIP) to support the decision making process when selecting options for foundational models
- The intention is to use the criteria to assess the options (and sub options) of each of the Phase I Questions for the foundational models
- Given the number of Phase I Questions and associated decisions required to enable DER(A)s, the MVP has streamlined the criteria (slide below) compared to the HIP
- For foundational models, the IESO is prioritizing criteria that support reliable operation of the grid, extract wholesale market benefits, represent manageable implementation costs and minimize complexities associated with tool changes for foundational models

Criteria Used to Evaluate Foundational Model Options

Risks	Benefits
Strategic • Minimize complexity of implementation (i.e., calculation engine tool changes) and associated costs	Capacity Value Extraction
Reliability • Reduce negative impacts to operability	Energy Value Extraction
Market • Avoid potential for unintended market consequences and lost economic efficiency	Operating Reserve Value Extraction
Market Participant • Reduce costs and challenges to market participants	Other Ancillary Services Value Extraction

Criteria Used to Evaluate Enhanced Model Options

- The IESO will establish a consistent set of criteria for enhanced participation models for hybrids, storage and DER resources within the Enabling Resource Program
- Criteria for the DER enhanced models will be discussed in Q3 or Q4 of 2022
- The rationale for updating the criteria for enhanced participation models reflects that as foundational models are established, a re-prioritization or a reexamination of criteria may be required

Options for Phase I Questions for Foundational Participation Models

Foundational Option Determination - Methodology

- Today's session will only present options under consideration; selection of options & associated rationale will be presented in Q3 for foundational and in Q4 for enhanced models
- The IESO has leveraged a number of the sources below to identify the foundational model options in today's presentation; all of these sources will be used to identify recommended options for foundational and enhanced models

1. Learnings from past studies, whitepapers, and previous Grid Innovation Fund projects
2. Jurisdictional scans from system operators implementing FERC Order 2222 and findings from industry leaders such EPRI
3. Outcomes of the DER potential study
4. Outcomes and suggestions from T-D Coordination Working Group
5. Stakeholder feedback

Participation & Aggregation – Question 1

Phase 1 Question	Sub-Feature/Sub Question	Options
What participation and aggregation models will be established for DER(A)s, and why?	Dispatchability	1. Dispatchable 2. Non-Dispatchable and Self-Scheduling 3. Both Dispatchable and Non-Dispatchable
	Locational Requirements	1. Modelled behind a single node 2. Modelled behind multiple nodes 3. Single and Multi-nodal
	Aggregation Composition	1. Homogenous (utilizing existing single resource models e.g., hydro, thermal, variable generation etc.) 2. Heterogeneous (combination of resource types and capabilities) 3. Homogenous and heterogeneous

Participation & Aggregation – Question 2

Phase 1 Question	Options	Additional Considerations
Which entity/entities represents the IESO market participant?	DER Owners	• Will take on all of the roles and responsibilities of an IESO Market Participant
	DER Aggregators	• Will take on all of the roles and responsibilities of an IESO Market Participant if the DER(A) is participating in the wholesale market(s) and ancillary services
	Distributors	• Distributor participation in IESO markets is subject to legislation (the OEB Act) and regulatory interpretation of that legislation

Participation & Aggregation – Question 3

Phase 1 Question	Sub-Feature/Sub Question	Options
Are maximum and minimum size thresholds needed for individual DERs or DERAs?	Minimum Size	1. Existing 1MW minimum IESO Administered Market (IAM) participation requirement for DER(A)s 2. FERC requirement of minimum aggregation size of 100kW 3. Value Between 100kW and 1MW
	Maximum Size	1. No maximum size thresholds required for DER or DERA 2. Maximum Size Thresholds required for both DER and DERA 3. Maximum Size Threshold Required for single resource (i.e., DER) only 4. Maximum Size Threshold Required for DERA only

Eligible Services– Question 4

Phase 1 Question	Options	Options	Additional Considerations
What products and services can DER(A)s provide?	1. Capacity	1. Yes 2. No	• Capacity needs emerge starting from mid-2020s including locational capacity needs due to limitations on transmission system
	2. Energy	1. Yes 2. No	• Energy needs expected to emerge starting from mid-2025
	3. Operating Reserve	1. Yes 2. No	• Will require 5-minute dispatchability
	4. Regulation Service	1. Yes 2. No	• IESO will continue to forecast and evaluate Regulation needs post-2026
	5. Other Ancillary Services	1. Yes 2. No	• IESO assessment required to determine if additional ancillary services will be needed post 2026 and the feasibility of delivery from DER(A)s

Eligible Services– Question 5

Phase 1 Question	Sub-Feature/Sub Question	Options	Additional Considerations
In what timeframes will DER(A)s be eligible to participate?	Day-Ahead Market (DAM) participation	1. Yes 2. No	• Determine what inputs are appropriate for DER(A)s participation in the DAM (e.g., energy-limited data if applicable) • Determine what DAM settlement treatments are appropriate for DER(A) • Determine if DER(A) will be eligible for DAM unit commitments*
	Pre-dispatch Unit Commitment Eligibility	1. Yes 2. No	• Determine if DER(A) will be will be eligible for pre-dispatch unit commitments*
	Real-Time Market participation	1. Yes 2. No	• Determine if additional real-time requirements are needed for participation in wholesale markets and ancillary services

**Today's Day Ahead Production Cost Guarantee will be replaced by a DAM Generator Offer Guarantee (DAM_GOG) for eligible non-quick start (NQS) generation units that are committed by the DAM calculation engine. The Real Time Generator Cost Guarantee will be replaced by a Real-Time Generator Offer Guarantee (RT_GOG for eligible NQS generation units committed during the pre-dispatch. timeframe.*

Eligible Services– Question 6

Phase 1 Question	Sub-Feature/Sub Question	Options
What are appropriate visibility requirements for DER(A) (i.e., telemetry)?	Level of Telemetry* & Associated Modelling	1. Need for individual resource telemetry points and statuses 2. Aggregate Telemetry points and statuses from DER Owner/Aggregator
	Maximum and Minimum Requirements (based on size of the resource)	1. Existing market Rule (MR) "high" requirements (2-second latency) ≥ 20 MVA 2. MR "medium" requirements (10-second latency) between 1 – 20 MVA 3. MR "low" requirements (1-min latency) between 1 – 20 MVA
	Treatment of Variable Generation (VG)	1. Standalone or aggregated VG provides telemetry based on size and follows existing (dispatchable) participation model requirements 2. Allow DER(A) VG to be self-scheduling and provide telemetry with more relaxed requirements

*Telemetry is the collection of measurements and data and the automatic transmission of such information to the receiving equipment for monitoring, and it is crucial for the operation of the IESO-controlled grid

IESO-Distributor Coordination – Question 7

Phase 1 Question	Sub-Feature/Sub Question	Options
What coordination protocol(s) will be used amongst the IESO-Distributors-Aggregators to enable reliable wholesale market participation?*	In addition to the existing emergency, forced outage, safety, equipment, & applicable law "dispatch deviation" Market Rules today, are there additional distribution conditions that should qualify for "override"?** ** Distributor "override" of IESO schedules/dispatch	1. Yes 2. No
	For Distributor "override," does IESO require new communication processes between the DER(A) and the IESO outside of existing Market Rule/Market Manual requirements (for outage management and real-time dispatch data submission)?	1. Yes 2. No
	Are there assurances that the IESO needs regarding communications between DER(A) and Distributor (e.g., to ensure processes are in place and followed, for audit/dispute purposes, etc.).	1. Yes 2. No

*These items are being actively examined as a part of the Transmission-Distribution Working Group

Metering and Settlement– Question 8

Phase 1 Question	Sub-Feature/Sub Question	Options
What revenue metering arrangements are appropriate for DER(A)s?	Level of Metering Installations	1. Individual metering of each resource as per today's MRs 2. An "aggregate metering" construct
	Hardware requirements (See Market Rules Ch. 6)	1. Existing hardware metering requirements (e.g., wholesale revenue requirements for a main/alternate meter, accuracy, latency etc.) 2. Relaxation of hardware requirements
	Size Thresholds	1. No change to existing metering requirements (for hardware and verification) given the size of the DER(A) 2. Changes to existing metering requirements (for hardware and verification) given certain sizing thresholds
	Delivery point* methodology for aggregation models	1. New delivery point methodology to model DER(A)s – dependency with locational requirements and aggregation composition from Question #1 2. Leverage existing delivery point methodology from the MRs

*The delivery point is the logical reference point for settlements in the wholesale energy market, and for the transmission tariff market

Metering and Settlement– Question 9

Phase 1 Question	Sub-Feature/Sub Question	Options
Will additional settlement arrangements need to be established for DER(A)s?	Are non-performance charges due to Distributor override appropriate?	1. Yes 2. No – all times 3. No – when established protocols were followed
	Should consideration be given to settlement implications at the aggregation level vs. the individual resource contributor level?	1. Yes 2. No
	When DER(A)s provide both distribution and wholesale market services should DER(A)s be compensated if the service does not directly benefit the IESO-Controlled Grid?	1. Yes 2. No

Feedback

Questions for stakeholder feedback:

1. Has the IESO identified the appropriate options to the Phase I Questions for the foundational DER model(s) for this project? If not, provide details on additional options for consideration and associated rationale for the option.
2. Based on the criteria outlined in this presentation, are there any key considerations you would like the IESO to take into account as we assess options for the Phase 1 Questions?

Please use the feedback form found under the June 22nd entry on the DER Market Vision and Design webpage to provide feedback and send to engagement@ieso.ca by July 14, 2022.

Thank You

ieso.ca

1.888.448.7777

customer.relations@ieso.ca

engagement@ieso.ca

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