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

Recommendations for Enhanced Models

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# Agenda

1. DER Market Vision and Design Project Recap
2. Stakeholder Feedback From the September 2022 Session
3. DER MVP Enhanced Models
  1. Background and Objectives
  2. Summary of Enhanced Models
  3. Criteria to Trigger Enhancements
4. Appendix: Detailed Recommendations

# Summary

- The DER Market Vision and Design Project is a key focus area of the IESO's DER integration activities and is separated into two phases;
  - DER Market Vision Project (MVP) explores "foundational" participation models for DER integration and identifies the criteria for more "enhanced" models that will form the basis of future DER integration efforts
  - DER Market Design Project (MDP) will design and implement the foundational models from the MVP
- Recommendations for the foundational model were published in September to enable homogeneous and already existing non-homogeneous (wind + solar, renewable + storage) DER aggregations limited behind a single transmission node
- Enhanced models build on the foundational model design with the goal of enabling further DER participation, specifically targeting residential and small commercial and industrial (C&I) load resources

# Key Features of Foundational and Enhanced Models

Key Focus Area	Foundational Model	Enhanced Model
<b>Aggregation Details</b>	<ul style="list-style-type: none"> <li>• Enables aggregation at a single node</li> <li>• Enables heterogeneous aggregation of certain resource types</li> <li>• Aggregation of residential and small C&amp;I consumers not enabled</li> </ul>	<ul style="list-style-type: none"> <li>• Enables sub-zonal (or multi-nodal) aggregation</li> <li>• Enables heterogeneous aggregation of all resources except very small consumers which must be aggregated with resources similarly dependant on Smart Meters</li> <li>• Aggregation of residential and small C&amp;I consumers is enabled</li> </ul>
<b>Size</b>	<ul style="list-style-type: none"> <li>• Enables DER Aggregations (DER(A)) with a total size of 1 MW or more and will explore the possibility of reducing the threshold for the aggregation size; no minimum size for individual contributors</li> </ul>	<ul style="list-style-type: none"> <li>• Enables DER(A) of 100 kW or more; no minimum size for individual contributors to an aggregation</li> </ul>
<b>Products and Services</b>	<ul style="list-style-type: none"> <li>• Capacity, Energy and Operating Reserve</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity, Energy, Operating Reserve and, if there is a system need, regulation service</li> </ul>
<b>Metering and Settlement</b>	<ul style="list-style-type: none"> <li>• Applies existing, relaxed IESO requirements for small resources to DER(A)</li> </ul>	<ul style="list-style-type: none"> <li>• Will allow for alternative requirements for residential/small C&amp;I DER(A) (by utilizing the Smart Meter Entity for settlement purposes) that reflect the size of the resources and risk mitigation capabilities of participating in aggregate</li> </ul>



# DER Market Vision and Design Project and Foundational Models Recap

## Recap: Enabling Resources and the DER Roadmap

- The IESO's DER Market Vision and Design Project is a key initiative within the IESO's broader Enabling Resources Program (ERP), a five year-capital program through which the IESO will undertake the work to more fully enable hybrid, DER and storage resources to contribute to meeting Ontario's growing electricity needs
- The DER Market Vision and Design Project also advances the Wholesale Market Integration and Transmission-Distribution Coordination streams of the IESO's DER Roadmap



# Recap: DER Market Vision and Design Project Structure

- 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: DER MVP—Phase I Questions

Key Focus Area	Phase I Question
Participation & Aggregation	<ol style="list-style-type: none"><li>1. What participation and aggregation models will be established for DERs? And why?</li><li>2. Which entity/entities represents the IESO market participant in the IESO-administered markets?</li><li>3. Are maximum and minimum size thresholds needed for individual DERs or DER Aggregations (DER(A)s)?</li></ol>
Eligible Services	<ol style="list-style-type: none"><li>4. What products and services can DER(A)s provide?</li><li>5. In what timeframes will DER(A)s be eligible to participate?</li><li>6. What are appropriate visibility requirements for DER(A)s (i.e., telemetry)?</li></ol>
IESO-Distributor Coordination	<ol style="list-style-type: none"><li>7. What coordination protocol(s) will be used amongst the IESO-Distributors-Aggregators to enable reliable wholesale market participation?</li></ol>
Metering and Settlement	<ol style="list-style-type: none"><li>8. What revenue metering arrangements are appropriate for DER(A)s?</li><li>9. Will additional settlement arrangements need to be established for DER(A)s?</li></ol>

See [October 2021 Session](#) for additional considerations associated with the Phase I Questions

# Finalized Foundational Model

Key Focus Area	Features for the DER Foundational Model	What this Unlocks
Aggregations	<ul style="list-style-type: none"> <li>• Enable dispatchable stand-alone DER model and an aggregation model, i.e., DER(A) model</li> <li>• DER(A)s will be enabled to participate in capacity, energy, and operating reserve*</li> <li>• Enable homogenous (same underlying technology types) DER(A)</li> <li>• Enable certain permutations and combinations of heterogeneous (different underlying technology type) DER(A)**</li> </ul>	<ul style="list-style-type: none"> <li>• DER(A) models create opportunities for smaller resources to participate in IESO-Administered Markets, including unlocking additional capability from dispatchable resources that are currently limited to participation in DR</li> <li>• Constraints on heterogeneous aggregations necessary until IESO has more experience with system impacts of different technology combos</li> </ul>
Aggregation Connection	<ul style="list-style-type: none"> <li>• Enable contributors to a DER(A) at different sites to aggregate however the DER(A) must be at a single connection point (i.e., single transmission node) to the IESO-Controlled Grid</li> </ul>	<ul style="list-style-type: none"> <li>• Restricting DER(A) to a single connection point required due to cost and complexities associated tool upgrades needed to facilitate aggregations across connection points</li> </ul>

# Finalized Foundational Model (cont'd)

Key Focus Area	Features for the DER Foundational Model	What this Unlocks
Size	<ul style="list-style-type: none"> <li>• Enable contributors to a DER(A) to have a nameplate capacity of less than 1MW however the aggregation must be at least 1MW*</li> <li>• Set maximum size threshold for stand-alone DER and DER(A)</li> </ul>	<ul style="list-style-type: none"> <li>• Enables participation of smaller-sized resources that are not enabled to participate today or are currently limited to DR participation and could do more for reliability</li> <li>• Maximum size thresholds are needed to ensure appropriate reliability parameters are met</li> </ul>
TD Coordination	<ul style="list-style-type: none"> <li>• Establish <a href="#">new protocols</a> between the IESO, DER(A) and the Distributor to communicate aggregation capability changes /unavailability</li> </ul>	<ul style="list-style-type: none"> <li>• Since DER(A)s are distribution-connected, this process will serve to build relationships with Distributors by understanding their needs and build LDC understanding of IESO reliability needs with regards to DERs</li> </ul>
Metering and Settlement	<ul style="list-style-type: none"> <li>• Utilize existing hardware and verification requirement as per the Market Rules</li> <li>• Derive a process by which the DER(A) can be settled at the aggregation level</li> </ul>	<ul style="list-style-type: none"> <li>• Existing metering market rules do allow for a relaxation of certain requirements for smaller resources; this can represent a cost saving to the DER(A)</li> </ul>

## Recap: Out-of-Scope For Foundational Models

The Foundational MVP/D Project did not seek to:

- Propose changes to existing Demand Response models or Capacity Auction rules and requirements
- Enable dispatchable aggregations of residential or small commercial and industrial (C&I) loads
- 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 September Session

# Feedback Themes and IESO Response

## Feedback

In the September 2022 session, stakeholders expressed support for the development of the foundational and enhanced models, however, expressed concern over the pace of the development of the rules and recommended the IESO accelerate development of DER procurement process alongside capacity participation and send market signals with MW targets.

## IESO Response

With respect to the pace and development, the IESO is on target for a 2026 delivery, and has designed the foundational model such that DER(A)s would be positioned to participate in future procurements as they materialize.

In Oct. 2022, the IESO was directed by the Minister of Energy to procure additional peak demand savings of 285 MW and annual energy savings of 1.1 TWh of additional Conservation & Demand Management which – consistent with the recommendations of the DER Achievable Potential Study will provide a pathway to unlock value from certain DERs while the IESO puts new market participation models in place.



# Stakeholder Feedback Themes and IESO Response (cont'd)

## Feedback

Request to provide stakeholders with a better understanding of which specific tool changes are in scope.

## IESO Response

While the IESO appreciates and understands the desire to better understand the market and reliability tools, the IESO notes that it would be impractical to list all such tools and provide the required context to understand the functionality each tool performs, what systems they feed, what change to the coding/calculation is needed, and what the resulting impacts would be. All required tool changes to implement the foundational model will be identified during the Market Design Project phase of implementation.

# Stakeholder Feedback Themes and IESO Response (cont'd)

## Feedback

## IESO Response (cont'd)

Requests to: relax telemetry, metering and visibility enhancements, consider “moderate” tool changes, and reduce the 1 MW nameplate capacity threshold to 100 kw as other markets have already implemented.

With respect to a relaxation of existing requirements, the IESO has, in its foundational model recommendations, allowed for the aggregation of telemetry (subject to reliability assessment) and has relied on precedence from existing IESO market rules to reduce precision/hardware metering requirements for a certain size of contributor to an aggregation. The IESO understands that other system operators, who, for the most part, also require individual metering like the IESO, have not elected to relax these precision/hardware requirements. The IESO remains open to learning about and considering specific approaches taken by other jurisdictions should stakeholders wish to flag them.

As previously indicated, individual resources with a nameplate capacity less than 1MW will be allowed to participate in aggregations with no minimum size requirement for individual contributors.

# Stakeholder Feedback Themes and IESO Response (cont'd)

## Feedback

## IESO Response

Noted that the foundational model be detailed and specific, and that timelines should be specified for the IESO's enhanced models.

The IESO intends to provide additional detail with respect to how the recommendations will be further designed and implemented during the Market Design Phase. The IESO will not outline timelines associated with the enhanced model at this time, rather will outline the necessary criteria to trigger the initiation of the enhanced models in this presentation. Once the enhanced model vision has been finalized, the timelines for implementation will be established through the IESO's capital planning process.

Noted that the model excludes local distribution companies from participating as a foundational model DER or DER(A), and suggested this be reviewed with the OEB prior to the Market Design phase.

The IESO maintains that leveraging the expertise of distributors will be an integral step in the development of both the DER foundational and enhanced models. With respect to distributor energy & ancillary service participation, the IESO will continue to engage with the OEB on this topic. The IESO would also like to note the diversity of opinion on this particular issue as seen by the feedback received via the Transmission-Distribution Working Group (TDWG).



# Enhanced Participation Models

## Background – Foundational Model Limitations

- Focused on enabling DER aggregations with minimal tool changes which prevented residential and small commercial and industrial (C&I) load from participating
- Enabled DER aggregations limited to homogeneous and already existing non-homogeneous (wind + solar, renewable + storage) types behind a single node

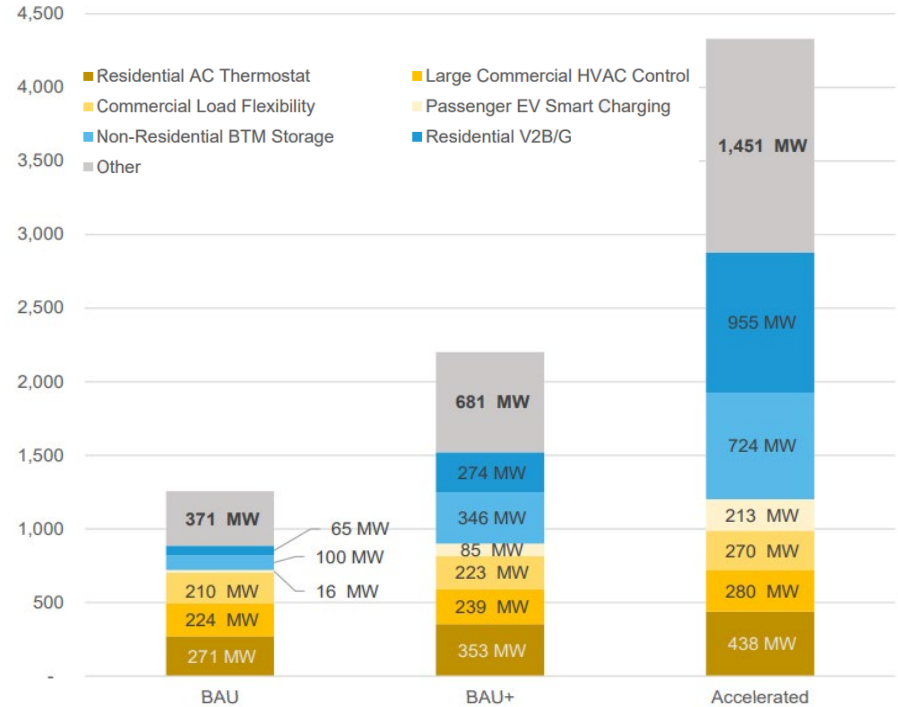
# Objectives of the Enhanced Model

- Maximize opportunity for DER(A) to participate in future procurements and to unlock flexibility they can provide, specifically targeting residential and small C&I resources
- Build on the DER foundational participation models to develop more inclusive models and unlock greater DER capacity
- Derive criteria to determine what conditions will trigger implementation of enhanced models
- Target DER resource types with the most potential as identified through the [DER Potential Study](#)
- Leverage overlapping IESO initiatives wherever appropriate such as the DER Potential Study and the Hybrid Integration Project

# DER Potential Study – High Potential Resources

- The enhanced models address three main areas not enabled through the foundational models:
  - **Vehicles:** Greatest growth opportunity
  - **C&I Flexibility:** Greatest easily accessible potential
  - **Residential Thermostats:** Greatest residential opportunity
- Figure 1 illustrates the notional capacity unlocked by the foundational and enhanced models

Figure 1: DER Achievable Potential by 2032 by resource type (Source: IESO DER APS, 2022)



# New Functionality for DER Enhanced Models

Key Focus Area	Features for the DER Enhanced Model	What this Unlocks
Aggregation Composition	<ul style="list-style-type: none"> <li>Enable heterogeneous aggregations of all resources except very small consumers and enable homogeneous aggregations of very small consumer loads (including non-fleet level electric vehicles, residential, and small C&amp;I consumers)</li> </ul>	<ul style="list-style-type: none"> <li>More opportunity for individual DER technology types to aggregate together through new a resource model that is implemented in the IESO's market clearing software</li> </ul>
Aggregation Connection	<ul style="list-style-type: none"> <li>Enable contributors to a DER(A) at different sites to aggregate across different sub-zonal nodes on the IESO-Controlled Grid</li> </ul>	<ul style="list-style-type: none"> <li>More opportunity for smaller DER contributors (particularly those in rural locations) to aggregate up to the 0.1 MW minimum DER(A) size threshold through upgrades to IESO tools</li> </ul>
Size	<ul style="list-style-type: none"> <li>Lower minimum size threshold to 100 kW for DER(A)*</li> </ul>	<ul style="list-style-type: none"> <li>Along with other enhancements, enables participation of small residential and C&amp;I resources that are not enabled to participate through the foundational model</li> </ul>

\* If not already lowered through foundational model



# New Functionality for DER Enhanced Models (cont'd)

Key Focus Area	Features for the DER Enhanced Model	What this Unlocks
Products and Services	<ul style="list-style-type: none"> <li>Explore enabling DER(A) to provide regulation service (in addition to capacity, energy and operating reserve)</li> </ul>	<ul style="list-style-type: none"> <li>Regulation service should be analyzed post-2026 to determine if there is an additional need that can be met through DER(A) capabilities</li> </ul>
Revenue Metering	<ul style="list-style-type: none"> <li>Relaxation of metering requirements for residential DERs and small consumer loads by utilizing the Smart Meter Entity for settlements purposes</li> </ul>	<ul style="list-style-type: none"> <li>Along with other enhancements, enables participation of small residential and C&amp;I resources that are not enabled to participate through the foundational model while minimizing administrative burden when providing metering information</li> </ul>

No changes were made to the following key focus areas:

- telemetry requirements
- timeframes for DER(A) participation
- [IESO-Distributors-Aggregators protocols](#) from the foundational models (the total distribution system operator (DSO) Model will continue to be explored via the Transmission-Distribution Coordination Working Group (TDWG))

# Triggering Criteria: When to Implement Enhanced Model

1. **Mandatory:** Completion of the IESO's Market Renewal Program
2. **Mandatory:** Implementation of the IESO's DER Foundational Model
3. **Optional:** Availability of external sources of funding for enhanced storage, hybrid and DER model implementation
4. **Optional:** Commitment to implement enhanced models as part of other ERP initiatives (enduring storage model, enhanced hybrid models)

\***Optional** triggers may expedite when models are implemented after **Mandatory** triggers are met



# Next Steps and Stakeholder Questions

# Timeline and Deliverables

<b>Date</b>	<b>Deliverables</b>
October 2021	<ul style="list-style-type: none"><li>• Introduce the DER Market Vision and Design Project</li><li>• Phase I Questions</li></ul>
January 2022	<ul style="list-style-type: none"><li>• Electric Power Research Institute (EPRI) Presentation on FERC Order 2222</li><li>• MVP timelines and deliverables for the remainder of 2022</li></ul>
June 2022	<ul style="list-style-type: none"><li>• Criteria used to determine foundational vs. enhanced models</li><li>• Initial set of options of Phase I questions for foundational models</li></ul>
September 2022	<ul style="list-style-type: none"><li>• Recommendations for Phase I questions for foundational models with associated rationale</li></ul>
January 2023	<ul style="list-style-type: none"><li>• Present options and draft recommendations for enhanced models with associated rationale and criteria to trigger implementation</li></ul>
March 2023	<ul style="list-style-type: none"><li>• Finalize Foundational and Enhanced Model proposals and discuss Enabling Resource Program Next Steps</li></ul>

# Feedback

Questions for stakeholder feedback:

1. Are the IESO's recommendations appropriate for enhanced models? Do any recommendations risk inhibiting DER(A) participation in wholesale markets?
2. Based on the recommendations, are there key options that should be prioritized for the enhanced models?

Please use the feedback form found under the January entry on the [DER Market Vision and Design engagement page](#) to provide feedback and send to [engagement@ieso.ca](mailto:engagement@ieso.ca) by February 15, 2023.

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# Thank You

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# Appendix: Detailed Draft Enhanced Model Recommendations

# Detailed Recommendation: Minimum Size Threshold

Question	Options	Foundational Model	Enhanced Models
Are maximum and minimum size thresholds needed for individual DERs or DER(A)s?	<ol style="list-style-type: none"> <li>Existing 1MW minimum IESO Administered Market (IAM) participation requirement for DER(A)s</li> <li>FERC requirement of minimum aggregation size of 100kW</li> <li>Value Between 100kW and 1MW</li> </ol>	<p>The Market Design Phase will examine the feasibility of reducing the minimum size threshold to 100kW in the foundational model.</p> <p>If not feasible, maintain current 1MW minimum IESO Administered Market (IAM) participation requirement for DER(A)s</p>	<p>Recommendation: A 100 kW minimum size threshold for all markets</p>

**Rationale:** A lower minimum size threshold for the total aggregation better enables DER resources; creating aggregations larger than 100 kW imposes a barrier for DER(A)s, especially those consisting of emerging residential resources that provide small per-device capacity (e.g.: smart thermostats, EV smart charging and V2G) but high potential value; a high minimum size limit would also limit participation of rural customers by greatly restricting their ability reach the minimum size threshold; all US ISOs are implementing a 100 kW minimum size for aggregations per FERC Order 2222.



# Detailed Recommendation: Maximum Size Threshold

Question	Options	Foundational Model	Enhanced Models
Are maximum and minimum size thresholds needed for individual DERs or DER(A)s?	<ol style="list-style-type: none"> <li>Maximum size thresholds for both DERs and DER(A)s</li> <li>Maximum size threshold Required for DER(A)s only</li> <li>Maximum size threshold for contributors to a DER(A) to provide individual telemetry</li> <li>No maximum size thresholds required for DERs or DER(A)s</li> </ol>	Require a maximum size threshold for both the individual DER and the DER(A) (TBD during the market design stage)	<p>Recommendation: Maximum size threshold to individual DER and DER(A) size (subject to IESO reliability assessment based on location).</p> <p>Consider a maximum of 1MW to 10 MW for individual contributor to DER(A) with individual modelling and participation requirements (subject to reliability review from IESO)</p>

**Rationale:** Contributors to a DER(A) above a certain size threshold could pose a reliability risk to IESO if only modelled as part of a DER(A); IESO to determine a threshold (1 MW to 10 MW) above which a DER must be modelled and participate separately; US ISOs have individual contributor and DER(A) size limits ranging from no limit to 20 MW with California imposing a 1 MW and 20 MW limit for contributors and aggregators respectively.

# Detailed Recommendation: Aggregation Types

Question	Options	Foundational Model	Enhanced Models
What aggregation types and compositions are enabled for DER(A)s?	<ol style="list-style-type: none"> <li>1. Dispatchable resources only</li> <li>2. Limited mixed dispatchable and non-dispatchable resources</li> <li>3. Unconstrained resource type as long as aggregation is dispatchable</li> <li>4. Unconstrained resource type</li> </ol>	Contributors to the DER(A) do not have to be dispatchable as long as the aggregation is dispatchable.	<p>Recommendation: No change. Allow for unconstrained resource types in a DER(A) so long as aggregation is dispatchable.</p> <p>i.e., the DER(A) is required to be compliant with the dispatch instruction, not the individual contributors</p>

**Rationale:** Requiring aggregations comprised only of dispatchable resources limits the kinds of DER(A)s that can participate in markets; the IESO plans to allow all DERs and DER(A)s to participate in all markets where technically possible; scope of the project is to enable a 5-minute dispatchable product.

# Detailed Recommendation: Aggregation Composition

Question	Options	Foundational Model	Enhanced Models
What aggregation types and compositions are enabled for DER(A)s?	<ol style="list-style-type: none"> <li>1. Homogeneous only (utilizing existing single resource models e.g., hydro, thermal, variable generation etc.)</li> <li>2. Homogeneous and limited heterogeneous (only for certain resource types)</li> <li>3. Homogeneous and fully heterogeneous (residential including non-fleet level electric vehicles and small consumer loads must be homogeneous)</li> </ol>	Homogeneous and limited heterogeneous	<p>Recommendation: Homogeneous and fully heterogeneous</p> <p>Enable heterogeneous aggregations of all resources except very small consumers and enable homogeneous aggregations of very small consumer loads (including non-fleet level electric vehicles, residential, and small C&amp;I consumers)</p>

**Rationale:** Modelling constraints for limited heterogeneous aggregations to be resolved for enhanced models, enabling fully heterogeneous aggregations; due to metering limitations, residential and small C&I can only be practically enabled through existing smart metering infrastructure thereby requiring modelling as a separate homogeneous aggregations.

# Detailed Recommendation: Aggregation Location

Question	Options	Foundational Model	Enhanced Models
What geographic level of aggregation is enabled for DER(A)s	<ol style="list-style-type: none"> <li>1. Single transmission node</li> <li>2. Hybrid (select groupings of geographically close nodes)</li> <li>3. Multiple transmission nodes</li> <li>4. Transmission sub-zone</li> <li>5. Transmission (capacity) zone</li> </ol>	Single transmission node	Recommendation: Allow multi-nodal or sub-zonal aggregations; the IESO to conduct transmission analysis to determine allowable multi-nodal groupings or to define sub-zones which have sufficiently low transmission congestion within sub-zone

**Rationale:** Restricting DER aggregations to a single transmission node limits the ability of aggregation up to the minimum DER(A) size threshold, especially in rural areas and for residential load; other ISOs allow for multi-nodal (ISO-NE and PJM) and sub-zonal aggregations (CAISO) so long as nodes are grouped in a way that takes local transmission constraints into effect; sub-zonal aggregation can potentially utilize distribution factors functionality which has already been established in MRP’s day-ahead financial model for virtual transactions.

# Detailed Recommendation: Eligible Market Services

Question	Options	Foundational Model	Enhanced Models
What products and services can DER(A)s provide?	<ol style="list-style-type: none"><li>1. Capacity</li><li>2. Energy</li><li>3. Operating Reserve</li><li>4. Regulation</li><li>5. Other ancillary services</li></ol>	Capacity, Energy, Operating Reserve	<b>Recommendation:</b> Capacity, Energy, Operating Reserve. Regulation service should be analyzed post-2026 to determine if there is an additional need that can be met through DER(A) capabilities.

**Rationale:** The IESO continually re-assess regulation service needs and should establish the participation infrastructure for DER(A)s that have the capability to respond, in the event the need for more regulation service materializes. Unlikely that DER(A)s will be able to provide sufficient wholesale level support in other ancillary service such as reactive support and voltage control (RSVC) and black start.

# Detailed Recommendation: Level of Telemetry

Question	Options	Foundational Model	Enhanced Models
What are appropriate telemetry levels for DER(A)s?	<ol style="list-style-type: none"><li>1. Need for individual contributor telemetry points and statuses</li><li>2. Aggregate Telemetry points and statuses</li></ol>	Allow aggregate telemetry points and status where possible. Individual contributor telemetry may be required if aggregate telemetry is not available or does not meet reliability standards	Recommendation: No change

**Rationale:** Foundational model already relaxed requirements though aggregate telemetry; reliability issues can be mitigated through the determination of a maximum DER contributor size limit above which, an individual DER would be modelled and participate separately.

# Detailed Recommendation: Telemetry Latency

Question	Options	Foundational Model	Enhanced Models
What are appropriate telemetry requirements for DER(A)s?	<ol style="list-style-type: none"> <li>1. Keep current latency requirements under current market rules</li> <li>2. Keep current latency requirements also adapt latency requirements based on size and market product:</li> </ol>	<p>Require the DER(A) to meet market rule requirements depending on the size DER(A) and be subject to a reliability assessment.</p> <p><u>Existing Market Rule (MR):</u></p> <ol style="list-style-type: none"> <li>1. MR “high” requirements (2-second latency) <math>\geq 20</math> MVA</li> <li>2. MR “medium” requirements (10- second latency) between 1 – 20 MVA</li> <li>3. MR “low” requirements (1-min latency) between 1 – 20 MVA</li> </ol>	<p>Recommendation: Adapt telemetry latency requirements based on size and market product (subject to review from the IESO)</p> <p>For DER(A)s less than 1MVA:</p> <ol style="list-style-type: none"> <li>1. Real-Time Energy: existing “low” requirement (1-min)</li> <li>2. Operating Reserves: existing “medium” requirement subject to reliability assessment</li> <li>3. Regulation: existing “high” requirement (2-sec)</li> </ol>

**Rationale:** Current Market Rule requirements for telemetry are relaxed for small resources; to enable reserve or regulation service, more stringent requirements are required as these are reliability products with potentially short response times.

# Detailed Recommendation: Metering & Settlement Arrangement

Question	Options	Foundational Model	Enhanced Models
What level of revenue metering and settlement arrangements are appropriate for DER(A)s?	<ol style="list-style-type: none"><li>1. Individual metering of each contributor</li><li>2. An “aggregate metering” construct</li></ol>	Individual metering of each contributor as per today’s Market Rules.	Recommendation: Require individual metering for each contributor in non-residential/small C&I DER(A)s. Utilize Smart Meter Entity to enable aggregations of individual residential and small C&I

**Rationale:** Aggregated metering construct is not feasible for multi-nodal aggregation; aggregated metering is only feasible if all the elements behind that meter are part of the aggregation; residential DER(A) can be aggregated utilizing smart meters which are already Measurement Canada compliant; using any other metering arrangement for residential and small C&I resources presents a significant barrier to enabling their participation.



# Detailed Recommendation: Metering Hardware

Question	Options	Foundational Model	Enhanced Models
What revenue metering hardware requirements are appropriate for DER(A)s?	<ol style="list-style-type: none"> <li>1. Existing hardware metering requirements for non-residential and small consumer loads</li> <li>2. Relaxation of hardware requirements for some residential DERs, Electric Vehicles, and small consumer loads utilizing the Smart Meter Entity</li> </ol>	Existing hardware metering requirements which include relaxed requirements for smaller resources.	<p>Recommendation: Establish alternative hardware requirements for residential DERs, Electric Vehicles, and small consumer loads utilizing the Smart Meter Entity (as per the previous slide).</p> <p>The IESO to consider studying the impact of allowing some high-growth DERs (such as electric vehicles) to access markets directly with their device meters via a sub-metering protocol with less strict accuracy requirements.</p>

**Rationale:** Revenue meter precision requirements and metering installation arrangements (i.e. requiring a meter service provider) impose barriers that exclude residential and small consumer load DERs, even if the resulting level of accuracy is not strictly required for the products in question; innovative device-meter methods can be explored by the IESO but Measurement Canada approved metering required in all cases.