

# Stakeholder Feedback and IESO Response

## Hybrid Integration Project – February 24, 2022

Following the February 24, 2022 engagement webinar on the Hybrid Integration Project (HIP), the Independent Electricity System Operator (IESO) received feedback from participants on the proposed design for hybrid facility participation in IESO markets for the two foundational models.

The IESO received feedback from:

- [Canadian Renewable Energy Association \(CanREA\)](#)
- [Electricity Distributors Association \(EDA\)](#)
- [Energy Storage Canada \(ESC\)](#)
- [Evolugen by Brookfield Renewable \(Evolugen\)](#)
- [Peterborough Utilities \(PUI\)](#)

The presentation materials and stakeholder feedback submissions have been posted on the [Hybrid Integration Project webpage](#). Please reference the material for specific feedback as the below information provides excerpts and/or a summary only.

### Notes on Feedback Summary

The IESO appreciates the feedback received from stakeholders. The IESO has provided a summary below, which outlines specific feedback or questions for which an IESO response was required at this time.

## Market Participation

*"Did you see any concerns from a participation perspective for co-located or integrated facilities?"*

All stakeholder submissions included comments and clarifying questions on participation for co-located or integrated facilities. These points are summarized in the table below.

Feedback	IESO Response
<p>CanREA</p> <ul style="list-style-type: none"> <li>Both participation models will prove useful and will be used by market participants.</li> </ul>	<p>Thank you for your feedback.</p>
<p>EDA:</p> <ul style="list-style-type: none"> <li>It appears that the IESO's dispatch instructions will impact the co-located storage device's State of Charge, the GA that is charged, and possibly other factors. We seek an explanation of how the IESO will avoid issuing dispatch instructions that inappropriately impact the operations of the hybrid facility. Has the IESO considered that the hybrid resource could, under some conditions, "spill" energy?</li> </ul>	<p>Global adjustment is charged to all loads based on the quantity withdrawn from the grid, and whether the load is Class A or B. Global adjustment will apply to grid-charging under either model, and dispatch instructions are based on participant-submitted dispatch data. IESO dispatch instructions based on participant-submitted dispatch data will also impact the storage state-of-charge. Dispatch data is under the control of the participant.</p> <p>Similar to all other IESO facilities, it is possible that hybrid facilities may be curtailed in the case of a security constraint, or if they are not scheduled due to economics (e.g., offer price is \$0/MWh but market price is -\$100/MWh). The IESO must ensure that scheduling of resources supports the operation of the grid at all times. However, under normal circumstances, hybrid facilities will not be curtailed:</p> <ul style="list-style-type: none"> <li>Under the co-located model, a VG resource will normally be able to inject according to ambient conditions.</li> <li>Under the integrated model, it is up to the participant to manage its bids/offers, and the storage technology will be able to help manage fluctuations in generator fuel. The storage load may lower the bid quantity for charging from the grid and/or charge storage behind-the-meter.</li> </ul>
<p>EDA:</p> <ul style="list-style-type: none"> <li>Among the matters that we seek to understand are:             <ol style="list-style-type: none"> <li>whether the integrated facility will be eligible to</li> </ol> </li> </ul>	<ol style="list-style-type: none"> <li>The combined generator resource of the integrated facility will participate as a quick-start generator. The load resource will participate as a dispatchable load. Both will provide dispatch data and comply with 5-minute dispatch instructions.</li> </ol>

Feedback	IESO Response
<p>participate as a quick start resource</p> <ol style="list-style-type: none"> <li>2. the ancillary services that a co-located or integrated facility can provide to the IAM</li> <li>3. whether the IESO will derate the capacity value of the generator deployed as part of an integrated facility</li> <li>4. the metering that the IESO will require if phasor-based monitoring is to be used</li> <li>5. the aggregation rules applicable to co-located facilities (e.g., if the relative size of the 2 devices matters for Market Power Mitigation purposes), in particular the need and rationale for each device being &gt;1MW in capacity</li> <li>6. how the IESO will treat co-located devices that are 'tied' (e.g., if the storage device follows the generator)</li> <li>7. whether the IESO will require reporting in addition to reporting required pursuant to the enabling OEB licences</li> </ol>	<ol style="list-style-type: none"> <li>2. Operating reserves can be provided by storage and by non-VG capability of a generator. At this time, there are no plans for procurement of additional ancillary services due to system needs</li> <li>3. De-rates are based on historical or fleet data during peak periods when the IESO needs to rely on the facility. The IESO will include this information in determination of the capacity value of the generator deployed as part of an integrated facility for the purposes of a capacity obligation under a procurement or capacity auction. Note that when participating in the energy market, the combined generator is expected to participate based on its capability in real-time.</li> <li>4. The IESO's monitoring requirements for synchrophasor data (link below) are expected to be integrated into the market rules in Q2 2022, with effective date generally targeting December 31, 2024. The synchrophasor data requirements for the resources under hybrid facilities are expected to be similar to those listed in proposed Market Rules Appendix 4.15 for generation facilities. Embedded generation and hybrid resources connected to distribution systems but participating in the IAMs are currently not required to provide synchrophasor data to the IESO under these proposed changes. <a href="https://www.ieso.ca/Sector-Participants/Engagement-Initiatives/Engagements/Updates-to-IESO-Monitoring-Requirements-Phasor-Data">https://www.ieso.ca/Sector-Participants/Engagement-Initiatives/Engagements/Updates-to-IESO-Monitoring-Requirements-Phasor-Data</a></li> <li>5. The relative size of the 2 technologies under the combined generator of the integrated hybrid is not a factor for mitigation of market power. The reason that technologies under the combined generator must each be &gt;1MW in injection capacity is to ensure that either technology meets the minimum size threshold and can participate even when the other technology has an outage. Otherwise, the entire combined generator would be unable to participate even if one technology was fully capable of doing so. Under the co-located hybrid, since the technologies are under separate resources, they are individually able to participate even if one is on outage. This rule for the combined generator creates parity between the two foundational models, in that the hybrid facility under both models has at least 2 MW of injection capability.</li> </ol>

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	<p>6. The resources under the co-located model are not tied to each other except for sharing a connection point to the IESO system. They are completely separate resources under this model, with separate dispatch data and separate revenue meters; therefore, the storage does not “follow” the generator.</p> <p>7. At this time, the IESO does not expect the foundational hybrid models to require any unique additional reporting, as the resources will participate according to the existing resource models for storage and generation. Reporting will be reassessed during implementation of the models in IESO market rules and market manuals.</p>
<p>EDA:</p> <ul style="list-style-type: none"> <li>While we anticipate that it will be uncommon, we seek to understand the process by which a co-located facility could transition to an integrated facility and vice versa.</li> </ul>	<p>From a facility registration perspective, the participant with a co-located hybrid facility would need to contact the IESO to change the registration of the separate storage and generation resources, instead registering a combined generator resource with underlying technologies. Registration would include completion of the connection assessment and approval process for the new resource; expediting of the system impact assessment would be determined as per applicable rules/manuals. Revenue meter registration would need to be addressed to meter the combined generator resource of the integrated hybrid under a single meter, rather than under the separate meters for the co-located hybrid storage and generation resources.</p> <p>However, from a contracting perspective, there may be additional considerations and implications on a facility is registered that a participant should consider.</p>
<p>ESC:</p> <ul style="list-style-type: none"> <li>ESC is supportive of the IESO’s proposed design for Hybrid Projects. We have not identified any material concern at this time, recognizing that this foundational design is using IESO’s current dispatch tools which may be upgraded in the future.</li> </ul>	<p>Thank you for your feedback.</p>

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<p>Evologen:</p> <ul style="list-style-type: none"> <li>• A clearly defined interconnection process, in particular the System Impact Assessment, with examples and timelines (e.g., “day in the life” case studies) would help developers meet the IESO’s 2025 needs.</li> <li>• Given that hybrid projects present a new and unfamiliar challenge to developers, the IESO, and the transmitter alike, this regulatory and permitting risk can result in delayed project delivery, or developers simply deciding to “wait and see” till the next procurement. As such, we strongly recommend the IESO create a new fast-tracked interconnection process for hybrid projects that seek to exploit existing interconnections.</li> </ul>	<p>The IESO is committed to enabling hybrid facilities for participation in the LT RFP, and we wish to ensure that proponents have all the required information about our processes.</p> <p>The connection assessment and approval (CAA) process is adequately streamlined, and is fully described in rules/manuals (<a href="https://www.ieso.ca">Overview of the Connection Process (ieso.ca)</a>). Note that the timelines for completing the entire process shown on the website are intended to cover a new facility of a significant size (generation or load facility) that seeks to connect to the transmission system.</p> <p>The actual time required for system impact assessment (SIA), which is part of “Stage 2 – Obtain conditional approval to connect”, is determined by the specifics of each project and its connection area, and also by the quality of the data provided by the connection applicant to initiate the process. In the IESO’s experience, the SIAs are not generally a barrier for connecting a new or modified facility to the transmission system. The IESO works closely with connection applicants to ensure projects can be completed in a timely manner.</p> <p>An important part of the connection process that is not within the control of the IESO and can have a much larger impact on the overall time required to connect a new or modified facilities is “Stage 3 – Design and Build”. In this stage, the connection applicant and transmitter (or distributor) enter a construction related agreement and may need to obtain other approvals that are required for construction (environmental, land use, OEB license, etc.) before they can proceed with the final design to build the facility. Refinements to the project/ equipment during the detailed design and build stage may require an addendum to the SIA report, so the IESO should be contacted promptly regarding these changes.</p> <p>For discussion regarding your specific project(s), you may wish to contact IESO Connection Assessments at: <a href="mailto:connection.assessments@ieso.ca">connection.assessments@ieso.ca</a></p>
<p>Evologen:</p> <ul style="list-style-type: none"> <li>• In addition, developers would appreciate the IESO acting as a</li> </ul>	<p>The IESO has informed the OEB that the IESO is enabling hybrid facilities. As there are multiple ownership and relationship structures possible for hybrid facilities the OEB has recommended that proponents, or</p>

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<p>coordinator with other regulatory entities and ministries relevant to project development—an IESO organized workshop that involves all such parties would be very helpful to the developer community. Delayed project delivery due to other permitting and regulatory issues would be unfortunate.</p>	<p>industry associations, should contact the OEB directly to confirm the licensing requirements for their situation by providing specific questions and project information. The OEB can be contacted at: <a href="mailto:IndustryRelations@oeb.ca">IndustryRelations@oeb.ca</a>.</p> <p>The IESO has also informed the Ministry of Energy, who are responsible for Ontario regulations such as O. Reg. 429/04, Adjustments under Section 25.33 of the Electricity Act, 1998 Global Adjustment, that hybrid facilities are being enabled in the IAMS and that amendments to the regulation may be needed to address storage charging under the integrated hybrid model.</p>
<p>PUI:</p> <ul style="list-style-type: none"> <li>We question the need for the VG resource to be a dispatchable resource. There are currently thousands of MWs of VG under contract with the IESO, much of which is self-scheduling. These facilities should be permitted to add a co-located energy storage facility and continue to operate under their existing contract as self-scheduling entities with the only the co-located energy storage facility becoming a dispatchable resource. Adopting this approach could enable deployment of potentially thousands of MWs of energy storage expeditiously and economically as such facilities would utilizing existing property rights and grid connections, and avoid the need to construct new distribution or transmission infrastructure.</li> </ul>	<p>All VG that are under contract with the IESO and participating in the IESO markets are dispatchable. Under the co-located hybrid model an IESO VG resource, although dispatchable, is allowed to inject according to ambient conditions in real-time unless there is a security constraint that requires the generator to reduce output or if the generator is uneconomic. Although the generator is required to submit dispatch data and actively participate in the market, the variability of the fuel is addressed through the current VG participation model, while considering system constraints that may occur.</p> <p>If an embedded VG under contract with the IESO does not wish to participate under the IESO VG model, it must remain an embedded retail generator that does not participate in IESO markets. However, a developer may be able to build a storage facility on the same property, and connect to the IESO system as a stand-alone embedded storage facility. Alternatively, if the integrated hybrid model is an option, the embedded VG and storage technologies can participate as a combined generator; however, in this case, the generator must comply with 5-minute dispatch instructions using storage to manage fuel variability.</p>

*"Are there any dependencies between resources or technologies that make up the hybrid models that the IESO should be accounting for?"*

Three stakeholder submissions identified dependencies between resources or technologies that the IESO should be accounting for. These points are summarized in the table below.

Feedback	IESO Response
<p>CanREA:</p> <ul style="list-style-type: none"> <li>The IESO has proposed that the UCAP for hybrid models for procurement processes will be the sum of the UCAPs for the individual resources. While simple, CanREA is not sure that this methodology fully reflects the capabilities of hybrid resources. CanREA recommends that the IESO conduct a detailed modelling analysis of hybrid resources to determine their true capacity value.</li> </ul>	<p>For the co-located hybrid model, the sum of the UCAPs for individual resources is appropriate as this model includes two independent standalone resources that happen to be located behind the same connection point. There is no interaction between these resources in the market.</p> <p>For the integrated hybrid model, where the storage and generation are coupled behind the revenue meter, there can be interactions between the injecting resources which could impact the capacity value. The IESO believes that using the sum of the two UCAPs of the underlying resources is a reasonable starting point. The capacity value may be reassessed as historical and/or fleet data availability/production data is provided through participation in the energy market.</p>
<p>EDA:</p> <ul style="list-style-type: none"> <li>Depending on the connection the hybrid resource may be able to participate in either the IAM or in a local area market. How will the IESO ensure that its dispatch instructions are fulfilled if it is more economically advantageous for the facility to participate in the local area market?</li> </ul>	<p>The IESO authorization and registration process ensures that LDC-embedded resources under IESO registered market participants meet their obligation to participate exclusively in the IAMs. This process includes the requirement for OEB license, connection assessment &amp; approval, facility registration and revenue meter registration. This process will also apply to hybrid facilities that are LDC-embedded IESO market participants, providing the required clarity regarding obligations as a market participant.</p> <p>The IESO continues to address transmission-distribution (T-D) coordination to support both transmission and distribution level reliability while ensuring there are no conflicting instructions, double-counting, or other unintended consequences, through the recently launched T-D Coordination Working Group <a href="https://ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Transmission-Distribution-Coordination-Working-Group">https://ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Transmission-Distribution-Coordination-Working-Group</a>.</p>

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<p>PUI:</p> <ul style="list-style-type: none"> <li>Consideration needs to be given to the size of the co-located energy storage facility based on the UCAP of the existing VG to mitigate periods where the ES resource cannot be fully dispatched (or conversely the VG has to be curtailed to allow the ES resource to be fully dispatched), as in either case the system need will not be fully met. We recognize that for co-located facilities the maximum capacity that can be injected into the grid will be limited by the grid connection infrastructure and connection agreement. At times, the VG will be generating above its UCAP and at other times below its UCAP. When operating above its UCAP, the ES resource cannot be fully dispatched unless the VG resource is curtailed. This decision could be left to the Generator to make based on economics, either incur penalties for failing to fully dispatch the ES resource or reduce output and revenue from the VG resource. However, we recognize that in either case, system need is not being fully met. To mitigate this scenario, the IESO could establish limits on the size of the co-located ES resource.</li> </ul>	<p>Under the co-located hybrid facility model, the VG and storage resources must separately participate in IESO markets using the current participation models. Market participants are able to meet dispatch instructions by adjusting their bids and offers to reflect resource capabilities and market conditions. The market participant should consider injection and withdrawal capabilities when determining the optimal size for a facility.</p>



## General Comments/Feedback

Three stakeholder submissions included additional feedback and/or general questions, which are included in the table below.

Feedback	IESO Response
<p>CanREA:</p> <ul style="list-style-type: none"> <li>CanREA is concerned about the timing of the implementation of the hybrid participation models as it relates to the objectives for the Long-Term RFP procurement process. The LT-RFP is asking for resources to be available by April 1, 2027 with the opportunity to be available by April 1, 2025. Wind, solar and storage are the prime technologies to respond to the LT-RFP due to the combination of low carbon footprint and quicker development timelines compared to other technologies. In addition, the LT-RFP is focussed on procuring capacity, which means that hybrid resources are a strong fit for the IESO needs. CanREA is concerned that by leaving the implementation of the hybrid models too late, market participants will see participation in the LT-RFP as too risky because they and the IESO have little to no opportunity to get comfortable with the participation models.</li> <li>CanREA recommends that implementation of the Hybrid Participation Models be prioritized in order to give the LT-RFP the highest probability of successfully procuring low cost, clean and reliable projects for Ontario consumers.</li> </ul>	<p>The implementation of hybrid facilities is included in ongoing business planning activities of the IESO, and is aligned with timelines for the LT RFP. Due to resources being utilized to implement MRP at this time, changes to market rules and market manuals as well as IESO tools (e.g., registration) are not yet scheduled, but are planned for 2024. There is adequate time to schedule activities to ensure milestones are met. The IESO has committed to completing implementation prior to the beginning of the commitment period under the LT RFP for procured hybrid facilities, whether co-located or integrated.</p> <p>The co-located hybrid facility model appears to require fewer changes for implementation. The assessment of changes to enable the co-located model is ongoing; the IESO will report back to stakeholders regarding whether the co-located model can be implemented sooner. The IESO will update stakeholders on implementation planning by June 2022, when the design document is published.</p> <p>For the integrated hybrid facility model, the IESO believes it has identified all relevant changes to market participation, and this information should allow proponents to participate in the LT RFP this year.</p> <p>The design for both models will be formalized in a design document to be published June 2022 in order to provide additional clarity and certainty for the foundational hybrid models.</p>
<p>CanREA:</p> <ul style="list-style-type: none"> <li>CanREA appreciates the clarity on uplift and Global Adjustment</li> </ul>	<p>The IESO agrees that changes to uplift allocation are required so that storage is not charged uplift on energy withdrawn for the purpose of reinjection. The</p>

Feedback	IESO Response
<p>that are included in the presentation. However, since energy storage is not the end user of the electricity then CanREA recommends that charging not be charged Global Adjustment or uplift under both hybrid participation models.</p>	<p>assessment of requirements to enable this change is ongoing; the IESO will report back to stakeholders on this matter.</p> <p>The Ministry is responsible for Ontario regulations such as O. Reg. 429/04 (global adjustment). The IESO has identified the concern with global adjustment applied to grid-charging of storage resources under the integrated hybrid facility model to the Ministry. For the co-located model, the regulation already reimburses global adjustment upon reinjection by storage.</p>
<p>CanREA:</p> <ul style="list-style-type: none"> <li>• CanREA recommends the IESO coordinate with other regulatory agencies to ensure hybrid resources can be developed sufficiently quickly to ensure the success of the capacity auction, LT1 RFP and other IESO procurement processes.</li> </ul>	<p>Thank you for your feedback. The IESO has informed the OEB and the Ministry that the IESO is enabling hybrid facilities. See response above for further information.</p>
<p>CanREA:</p> <ul style="list-style-type: none"> <li>• Clarity is needed on the expedited SIA (<a href="#">slide 17</a>).</li> </ul>	<p>An expedited SIA is intended for simple modifications to existing facilities that require fewer and simpler studies that generally take a shorter time to complete. It was designed to allow a quicker start to the SIA process, as it can use a previously signed Cost Recovery Agreement and does not require a deposit. Section 9.2 of Market Manual 1.4 (<a href="#">caa (2).pdf</a>) is used to determine if a project qualifies for an expedited SIA or not. For example, the addition of less than 10 MW of capacity at an existing generation facility may qualify for an expedited SIA.</p> <p>Regardless of whether it is determined that a project should proceed through an expedited or full SIA, the volume of work to complete the assessment is determined by the complexity of the project and its intended connection area. Every assessment must be done thoroughly to ensure that the reliability of the integrated power system is maintained.</p>
<p>ESC:</p> <ul style="list-style-type: none"> <li>• We are pleased to see the progress that the IESO has made to date on this initiative. We</li> </ul>	<p>Thank you for your feedback. As noted in a response above, the implementation of hybrid facilities is included in ongoing business planning activities of the IESO, and is aligned with the LT RFP timelines. The design for both</p>

Feedback	IESO Response
<p>understand that Hybrid projects are likely to be considered as part of the IESO’s upcoming LT1 RFP, and therefore the completion of this project is essential. Therefore, we recommend that the IESO establish a detailed plan as soon as possible to ensure that the timelines for market rule amendments and implementation align with the LT1 RFP, including internal IESO resources that will be dedicated to the plan. We look forward to next steps related to design and implementation of these foundational models.</p>	<p>models will be formalized in a design document to be published June 2022, followed by implementation activities, which will include assigned IESO resources from across the organization, including subject matter experts from Markets, Operations, Settlements, Market Rules and IT. The IESO will update stakeholders on implementation planning by June 2022, when the design document is published.</p>
<p>PUI:</p> <ul style="list-style-type: none"> <li>We feel strongly that hybrid integration provides numerous system benefits and value to rate payers, and that the IESO should adopt programs to maximize the adoption of hybrid solutions, including with existing self-scheduling VG resources.</li> </ul>	<p>Thank you for your feedback. The IESO agrees that the foundational hybrid models provide opportunities for participants to maximize system benefits, and the current IESO model for VG resources will successfully facilitate these opportunities.</p>