

Stakeholder Feedback and IESO Response

Hybrid Integration Project – June 23, 2021

Following the June 23, 2021 engagement webinar on the Hybrid Integration Project (HIP), the Independent Electricity System Operator (IESO) received feedback from participants on the types of Hybrid pairings most likely to be developed in Ontario, as well as on the appropriateness of the proposed Vision questions

The IESO received feedback from:

- [Capital Power](#)
- [Canadian Renewable Energy Association \(CanREA\)](#)
- [Consortium of Renewable Generators, Energy Storage Providers and the Canadian Renewable Energy Association \(The Consortium\)](#)
- [Energy Storage Canada \(ESC\)](#)
- [Evolugen by Brookfield Renewable \(Evolugen\)](#)
- [Ontario Waterpower Association \(OWA\)](#)
- [Power Workers' Union \(PWU\)](#)

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.

Hybrid Pairings

Submissions from six stakeholders included comments on the types of Hybrid pairings (technology and storage-to-generation ratios) most likely to be developed in Ontario. The following table summarizes these comments and considerations.

Feedback	IESO Response
<p>Capital Power suggested that the commercial and operational viability of Hybrid resources (regardless of pairing) will be entirely dependent on the market structure of the IESO Administered Markets (IAMs), system needs identified by the IESO, and revenue mechanisms available to project developers/owners, and that clear identification of system needs (well in advance of required commercial operations), the development and clear articulation of suitable revenue mechanisms are required to answer this question.</p>	<p>One of the goals of the Annual Acquisition Report released on July 19th is to provide investors with clarity and details of Ontario’s system needs.</p> <p>Suitable revenue mechanisms will be articulated through details of the Resource Adequacy procurements. Other revenue mechanisms will be explored when our work on participation models progresses further. These participation models will outline which market services can be offered by hybrid facilities.</p>

Feedback	IESO Response
<p>CanREA suggested that developers will be considering all manner of hybrid pairings because of the wide range of services that energy storage can provide, and provided the following comments:</p> <ul style="list-style-type: none"> • Storage-to-generation ratios will also span the range from very small to 1-to-1. • The decision to build a particular configuration will depend on the revenue models that the IESO makes available to the various projects. • Price arbitrage may become of interest for those projects with expired contracts and are exposed to the HOEP. • Participation in the capacity auction and the ancillary services markets are other obvious revenue sources. • Increasingly, hybrid projects should be considered for the supply of transmission and distribution deferral and congestion management services and revenue models will need to be developed to compensate for those services. 	<p>The IESO appreciates CanREA’s comments regarding hybrid configurations and market services. The comments will be taken into consideration when exploring different participation models and during the design phase for selected participation models.</p>
<p>The Consortium stated that:</p> <ul style="list-style-type: none"> • Hybrid wind and solar (i.e. variable) generators (VGs) paired with energy storage will provide significant pairing opportunities in Ontario – especially considering over 8,000 MW of operating distribution- and transmission-connected VGs. • Additional to hybrid VG and energy storage projects, there will also be opportunities to pair hydro electric generators with energy storage 	<p>We agree with the Consortium’s point about potential of VGs paired with storage and appreciate the additional comments about hydroelectric paired with energy storage. We will take this comment into account when exploring different participation models and during the design phase for selected participation models.</p>

Feedback	IESO Response
<p>ESC anticipates that the following types of pairs are most likely based on project economics, existing connection capacity, desire to see reduced emissions:</p> <ul style="list-style-type: none"> • Existing distributed-connected solar or wind projects with storage, pre-contract expiry depending on contract/commercial terms with IESO • Existing transmission-connected solar or wind projects with storage, pre-contract expiry depending on contract/commercial terms with IESO • Existing gas-fired generation, pre contract expiry depending on contract/commercial terms with IESO (See for example, ENMAX’s Crossfield project in Alberta) • New renewable + storage projects, both transmission and distribution connected, pending procurement mechanisms enabling new development • Hydrogen solutions – for example, pairing electrolyzers with baseload generation (e.g., nuclear) to offset surplus energy; or pairing variable renewable generation with CHP using hydrogen fuel 	<p>The IESO appreciates ESC’s comments regarding various hybrid pairings and the perspective that existing generation, pre-contract expiry, is likely to want to seek to pair with storage if IESO’s contracting/commercial terms allow. The comments will be taken into consideration during the contracting phases of future Resource Adequacy procurements.</p>
<p>Evolugen suggested the likely hybrid pairings are as follows:</p> <ul style="list-style-type: none"> • Wind and storage to shift generation profile and to improve wind capacity rating. • Large hydro and hydrogen electrolysis: using baseload and renewable generation to produce blue hydrogen. • Wind and solar acting as complements to each other’s profile. 	<p>The IESO appreciates Evolugen’s comments regarding the various hybrid pairings and combinations. The comments will be taken into consideration when exploring different participation models and during the design phase for selected participation models.</p>

Feedback	IESO Response
<p>OWA noted that most of the discussion and emphasis to date has been on the pairing of storage with other renewable technologies, and suggested that Ontario’s waterpower fleet provides a unique opportunity and jurisdictional advantage that should be incorporated into this project.</p>	<p>The HIP will take a technology agnostic approach for any generator + storage pairings. Most of the presentation material has placed an emphasis on inverter based renewable + storage pairings due to the prominence of these sorts of pairings in other jurisdictions. The work completed as part of the HIP will allow for the participation of hydroelectric generation or any other generator technology as long as it is paired with energy storage.</p>

Draft questions for Hybrid Vision Phase

Submissions from six stakeholders indicated that the Vision questions are appropriate given IESO’s intent to pursue a foundational participation model. Two stakeholders provide further considerations which are summarized below.

Feedback	IESO Response
<p>Capital Power, CanREA, ESC, Evolgen, OWA and the Consortium indicated that the Vision questions are appropriate.</p>	<p>None</p>
<p>With consideration for helping to justify and communicate to stakeholders the rationale for enabling hybrid participation, ESC suggested an additional question as follows: “Are the IESO’s market rules just and reasonable, in light of barriers that prevent hybrid resource participation and reduce market competition?”</p>	<p>The HIP will include this question in the visioning scope.</p> <p>Any work on a foundational model will naturally include a review of the IESO’s market rules to assess for suitability of and barriers to market participation.</p>

Feedback	IESO Response
<p>Evolugen recommended the IESO further consider the visioning exercise from the perspective of potential investors, recognizing most of the draft visioning questions are raised from a system needs perspective. Evolugen suggested that if the IESO wished to rely on market mechanisms to promote hybrid projects, it should publicly consider whether current market designs are sufficient for investors to take action. The following examples were provided:</p> <ul style="list-style-type: none"> • Would revenue sources be different for FTM and BTM projects (e.g. how would grid benefits be valued differently)? • Would FTM and BTM projects incur different infrastructure costs (e.g. delivery charges)? • Would projects incorporating existing assets (e.g. existing wind + new storage) be treated differently than new projects? 	<p>The IESO appreciates Evolugen’s recommendation regarding investor perspectives and existing market designs. While work on the hybrid minimum model will mostly be geared towards the risks from a system perspective, the hybrid team will be in a better position to include investor perspective when completing visioning work on the enduring hybrid model (in particular, the cost benefit analysis that will be completed as part of that work).</p> <p>In regards to the examples provided, the hybrid team would like to note that BTM projects are not part of the scope of HIP.</p>

General Comments/Feedback

Six stakeholders included additional comments and recommendations in their feedback submissions, which are summarized below.

Feedback	IESO Response
<p>Capital Power noted that owners of resources with expiring or near-expiring contracts may be interested in exploring whether their assets can be reconfigured as Hybrid resources capable of supplying the Ontario grid with needed capacity, energy, and ancillary services, and requested that information necessary to fully evaluate investment decisions be made available to participants as early as possible.</p>	<p>The feasibility of reconfiguring existing sites is also of significant interest to the IESO and we would like to engage with existing resource owners to learn more about this area.</p> <p>One of the goals of the Annual Acquisition Report released on July 19th is to provide investors with clarity and details of Ontario’s system needs. This Fall, the IESO will begin to engage stakeholders on the first Medium Term RFP to be undertaken for Resource Adequacy. Through this engagement the IESO will provide further details of procurement eligibility and take into account related stakeholder feedback.</p>
<p>CanREA noted their member involvement in the development of hybrid projects in other jurisdictions, and an interest in bringing their experience and expertise to hybrid projects in Ontario.</p>	<p>We would like to continue our dialogue with CanREA to gain their insights and expertise from other jurisdictions.</p>
<p>In developing the Foundational model and the Vision document, CanREA recommended the IESO keep in mind that the most efficient solutions will be delivered when the IESO can clearly describe the need, identify the relevant revenue model and remove barriers to participation to allow market participants to supply low cost solutions while managing the relevant risks.</p>	<p>We agree that these are all key factors to consider.</p> <p>One of the goals of the Annual Acquisition Report released on July 19th is to provide investors with clarity and details of Ontario’s system needs.</p> <p>The revenue models and barriers to participation will all be better documented once work on participation models progresses further. Further details of potential revenue opportunities will also be provided through specific Resource Adequacy procurement engagements.</p>

Feedback	IESO Response
<p>In reference to the table on slide 8 of the June 23 presentation (Hybrid Projects in ISO/RTO Build Queues):</p> <ul style="list-style-type: none"> • The Consortium believes the volume of hybrid projects within the listed connection queues provide clear indication of increasing development of hybrid projects – indicating a growing and lasting trend. • The Consortium requests that IESO provide similar data and information for hybrid projects within connect queues in the following Canadian and U.S. wholesale electricity markets administered by: IESO; NYISO; PJM; and SPP, along with explanation why material deviations in the volume of developing hybrid projects may exist from market to market. 	<p>We will look to add more information from different jurisdictions in future slides.</p>
<p>In reference to slide 13 of the June 23 presentation:</p> <ul style="list-style-type: none"> • The Consortium is very pleased to learn that through its visioning process IESO plans to work with stakeholders to determine potential scope for its Grid Innovation Fund (GIF) to administer a procurement for hybrid project proposals (i.e., via Request for Proposals (RFP) resulting in contracts). The Consortium encourages IESO to provide more information on this potential initiative including timing for any such RFP(s). 	<p>We will work with stakeholders to develop the scope of any GIF targeted call for proposals. Work on developing the scope will begin Q3 of this year.</p>

Feedback	IESO Response
<p>In reference to slide 23 of the June 23 presentation and the research currently underway:</p> <ul style="list-style-type: none"> The Consortium appreciates IESO providing some information regarding the above listed areas of research, and requests IESO to provide more information within a future HIP stakeholder engagement meeting before the end of 2021. 	<p>Progress on hybrid research activities (including the projects presented during the June 23rd engagement) will be updated in the future.</p>
<p>ESC provided the following comment:</p> <ul style="list-style-type: none"> Based on experience our members have operating in other North American jurisdictions, we recommend removing the subcategories of “hybrid” vs “co-located”. While these subcategories are used in other ISOs (e.g., CAISO and NYISO) it quickly becomes challenging when the overall topic (“hybrid”) has the same name as one of the subcategories. The latest FERC whitepaper keeps “hybrid” as the overall topic and then differentiates the subcategories into “co-located” or “integrated”. 	<p>We will take this feedback into consideration. The terminology used will be particularly important during the project design and implementation stage when the existing set of IESO market rules are revised.</p>
<p>ESC provided the following comment:</p> <ul style="list-style-type: none"> IESO should plan early on to distinguish between AC-coupled and DC-coupled hybrids in the rules. Therefore, hybrids have four main sub-categories: AC-co-located; DC-co-located; AC-integrated; DC-integrated. We suggest, however, that market participation rules should be consistent across all configurations (e.g., participation model reflecting energy delivered/consumed at the POI, and potential variations on how the resources are modelled from forecasting/resource perspective). 	<p>Sub-categories grouped by coupling will become apparent once our work on participation models progresses further. Due to the limitations of our market tool and models, certain hybrid coupling configurations may not be possible.</p> <p>We agree that market rules should be as consistent as possible amongst all configuration types but note that this may not be entirely possible due to modelling, metering, contracting and registration requirements.</p>

Feedback	IESO Response
<p>ESC provided the following comment:</p> <ul style="list-style-type: none"> ESC acknowledges that IESO will consider DER aggregation as part of the DER Roadmap. For example, this would include the coordination of multiple, separately-connected DERs located on a single feeder. That said, IESO should acknowledge that DER aggregation is effectively a “hybrid solution” that may consist of a multiple supply, storage, and load-control resources. As IESO moves forward with HIP & DER Roadmap, it would be appropriate for IESO to acknowledge these linkages to ensure equitable treatment of DER Aggregations and Hybrid Resources. 	<p>We agree that there are many linkages between a hybrid solution and aggregation, however, the HIP is primarily focused on transmission connected and large distribution connected projects with assets located at the same site. In addition to any challenges presented by a lack of hybrid solution, aggregation also imposes additional challenges such as efficient grouping and participation of resources that are too small to participate in existing IAMs today.</p> <p>Regardless, since both the HIP and the DER Roadmap fall under the broader Enabling Resources umbrella, both projects will have coordination to ensure consistency wherever possible.</p>
<p>Evolugen commented that the investments to enable the anticipated hybrid pairings require long term contracts, a significantly larger capacity auction that reflects Ontario’s true resource adequacy needs, pricing mechanisms to adequately value a project’s ancillary benefits, and/or renewable portfolio standards or other renewable procurement requirements that provide long term funding.</p>	<p>One of the goals of the Annual Acquisition Report released on July 19th is to provide investors with clarity and details of Ontario’s system needs.</p> <p>This Fall, the IESO will begin to engage stakeholders on the first Medium Term RFP to be undertaken for Resource Adequacy. Through this engagement the IESO will provide further details of procurement eligibility and take into account related stakeholder feedback.</p>

Feedback	IESO Response
<p>The PWU recommended the IESO should:</p> <ul style="list-style-type: none"> • Validate the ability of hybrid resource configurations to economically supply peak demand; • Examine the potential investment interest of hybrid resources project developers to participate in the IAM, following the closure of the Pickering Nuclear Generation Station; • Determine the optimal use of energy storage; and • Consider alternative hybrid resource pairings such as nuclear and storage that can provide lower cost, longer duration capacity. 	<p>We will explore many of these issues more thoroughly once work on the minimum model is completed and the HIP transitions into looking at more enduring solutions for hybrids.</p> <p>As mentioned in other responses, the IESO is taking a technology agnostic approach to hybrids and welcomes any generation – storage pairings, including ones that include nuclear.</p>