Update on the Status of Obstacles to Storage Resources in Ontario

Prepared in Response to the Minister of Energy's November 10, 2021 Letter to the IESO

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Acknowledgements

The IESO would like to acknowledge the ongoing commitment, efforts and thoughtful contributions of the stakeholder community in working to advance the effective implementation of energy storage in the Province of Ontario, including contributions made to the development of this report.

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Background

When Ontario's electricity markets, supporting tools and processes, and regulatory frameworks were initially created over two decades ago, the widespread adoption of storage technologies had not been contemplated, and many of the storage technologies available today were unknown.

Recognizing there were important opportunities and challenges associated with integrating energy storage in Ontario, the Independent Electricity System Operator (IESO) established the Energy Storage Advisory Group (ESAG)[1] in 2018. The purpose of ESAG was to advise, support and assist the IESO in evolving policy, rules, processes and tools to better enable the integration of storage resources within the current structure of the IESO-administered markets.

Through feedback received via the ESAG, the IESO published a report at the end of 2018, entitled "Removing Obstacles for Storage Resources in Ontario".[2] This report focused on identifying obstacles and mitigating strategies to help ensure fair competition of energy storage resources in Ontario's electricity market. The report produced a total of twelve recommendations that were within the purview of either the IESO, the Ontario Energy Board (OEB), or the Ministry of Energy (ENERGY).

On November 10th, 2021, Ontario's Minister of Energy requested that the IESO provide an update on the implementation of the recommendations from the 2018[3] report. Where barriers still exist, the Minister requested an overview of how these barriers are being addressed.[4]

In response to the Minister's request, the IESO, with input from the OEB, has produced this status report on the recommendations under the purview of our respective organizations.[5] To inform this report, the IESO and the OEB held a stakeholder meeting on February 7th, 2022, reconvening members of the ESAG to provide their perspectives on the status of barriers to storage. The resulting stakeholder feedback has been documented and included in this report.

[1] See IESO's ESAG engagement site for details: https://www.ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Energy-Storage-Advisory-Group

[2] Report available at: https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/esag/Removing-Obstacles-for-Storage-Resources-in-Ontario_20181219.ashx

[3] The Minister's request referenced a 2016 report, however the IESO confirmed that the reference should be the 2018 report.

[4] The Minister's request is available at: https://www.ieso.ca/-/media/Files/IESO/Document-Library/corporate/ministerial-directives/Letter-from-the-Minister-of-Energy-MC-994-2021-717.ashx

[5] The Minister further requested that the IESO analyze the economics of different energy storage technologies and the role they can play in the decarbonization of Ontario's electricity system. However, due to the complexity of this analysis, this request will be completed at a later time.

Recommendations and Status

The IESO's 2018 "Removing Obstacles for Storage Resources in Ontario" report produced twelve recommendations and assigned them to the responsible entity. Of these twelve recommendations, eight fall within the purview of either the IESO or the OEB or both, as listed in the table below. This status report is limited to the eight IESO and/or OEB recommendations (the recommendations for the Ministry of Energy are not included).

In this section of the report, each recommendation is presented as follows:

i. An "Issues Overview" is provided, containing an excerpt from the 2018 report.

ii. The "Recommendations to the IESO/OEB" is provided, containing the quoted recommendation from the 2018 report.

iii. A progress update is provided, outlining activities that have been undertaken in relation to the recommendation.

Recommendations to the IESO and OEB from the 2018 Storage Report

Recommendation	Responsible Entity
Review and Amend Market Rules	IESO
Consider the Market-Efficiency Impact of Applying Wholesale Uplift Charges	IESO
Develop Guidance for Storage Resources Providing Multiple Services to Different Entities	OEB/IESO
Review the OEB Codes	OEB
Review the Application of Transmission and Distribution Charges	OEB
Clarify the Use of Forecast Revenues from Distribution and Transmission Rates as an Offset to Connection Costs	OEB
Provide a Clearer Framework for Including Storage Assets in Rate Base	OEB
Address the Incentive for Distributors to Favour Capital Investments	OEB

Review and Amend the Market Rules

Issue Overview

The 2018 report summarized the issue as follows:

> "Energy storage is not specifically identified in the IESO's Market Rules."
>
> "Further, software tools used for market administration and resource dispatch better support market participants that are loads or generators; these tools do not always effectively represent storage resources that can serve as both."
>
> "This lack of clarity in the Market Rules is a systemic issue related to other obstacles facing energy storage resources..."

Recommendation to the IESO

The 2018 report included the following recommendation:

> "The IESO should review and amend its Market Rules, where possible, to clarify the participation of storage resources in the IESO-Administered Markets."

Progress Update from the IESO

In 2021, the IESO completed amendments to the Market Rules and associated Market Manuals to clarify participation of storage resources in the IESO-Administered Markets. The inclusion of storage in the Market Rules and Manuals has provided a foundational participation model for energy storage, unlocking participation in the wholesale markets and paving the way for energy storage resources to successfully clear in the two most recent IESO capacity auctions.[6]

In 2020, as part of its Storage Design Project (SDP), the IESO also developed a long-term design vision for enhanced participation of energy storage in the IESO-Administered Markets.[7] The long-term vision proposes a number of future enhancements, including a single resource model for storage, modelling of state-of-charge (SOC) in the Dispatch Scheduling Optimization (DSO) tool, and amended uplift treatment (described below). The changes included in the long-term vision would fully address the tool limitations identified in the 2018 obstacles to storage report. Due to the substantive nature of the tool changes required to implement the long-term vision, the IESO will not implement the changes until the post-Market Renewal Project (MRP) period in order to avoid adding complexity that could impact the completion of MRP. The criteria and potential timing for implementing the long-term vision are currently

[6] For information on storage related Market Rules, Manuals and other documentation, see the Interim Electricity Storage Operating Guide found at: https://www.ieso.ca/-/media/Files/IESO/Document-Library/training/Interim-Electricity-Storage-Operating-Guide.ashx

[7] See https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/esag/esag-20200915-long-term-design-vision.ashx

being explored within the IESO's Hybrid Integration Project (HIP) Design Vision.[8]

The IESO recognizes that it is imperative to ensure that storage will continue to have market access following the implementation of MRP. To that end, the IESO has dedicated staff focused on aligning the 2021 Market Rule amendments for storage integration (i.e. the foundational participation model) with the Market Rules being established for MRP. The IESO's proposed approach was outlined by IESO staff at the MRP implementation engagement meeting held in December 2021, as an opportunity to engage the storage community prior to finalization of the integrated rule set.[9] Market Rule and Manual amendments for MRP will be completed as per the schedule provided on the IESO engagement site.[10] Additionally, feedback that was received following the December 2021 MRP engagement session is being integrated into plans to develop future training, worked examples, and scenarios. The MRP team will continue to collaborate with the storage community on ways to bring the concepts of the renewed market to market participants, and will continue to provide updates to stakeholders on these plans at the MRP implementation updates.

In addition to ensuring that the foundational energy storage participation model will be included in the post-MRP market, the IESO has also committed to two key operational enhancements that aim to further integrate storage resources into IESO tools; these are (1) the Automatic Approval of State-of-Charge (SOC) project, and (2) the Supporting Changes for Storage in Automatic Generation Control (AGC).[11]

The Automatic Approval of SOC enhancement will allow storage resources to revise their capability due to SOC limitations via the Control Room Operations Window (CROW) tool. The use of this tool to communicate capability is fully available to generation resources today, however its functionality is only partially available to storage resources. Not only will this enhancement provide storage resources with additional flexibility when communicating SOC information, it will also help the IESO manage control room workload, and in doing so, support the reliable operation of the grid. This capability is of particular significance if a substantial number of new storage and hybrid resources enter the market via the Capacity Auction or procurements such as the IESO's Long-Term Request For Proposal (RFP).[12] The Automatic Approval of SOC enhancement is expected to be implemented by 2025.

The Supporting Changes for Storage in the AGC enhancement also enables storage resources to provide services (in this case regulation service) via the same medium as generation resources do today (i.e. through the AGC tool). In the absence of these enhancements, storage resources can only provide regulation service through an alternate tool that is not coordinated with market sequences in the same manner as the AGC tool; this limits the IESO's ability to utilize energy storage for regulation service. The Supporting Changes for Storage in AGC enhancement is expected to be implemented by 2027.

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[8] Information regarding the Hybrid Integration Project found at: https://www.ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Hybrid-Integration-Project

[9] See https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/imrm/imrm-20211215-presentation.ashx

[10] See https://www.ieso.ca/en/Sector-Participants/Change-Management/Pending-Changes-Documents for Market Rule and Market Manual amendment schedules.

[11] See https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/enabling-resources/er-20211216-presentation.ashx

[12] See https://www.ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Long-Term-RFP

Consider the Market-Efficiency Impact of Applying Wholesale Uplift Charges

Issue Overview

The 2018 report summarized the issue as follows:

> "…uplift charges are used to recover the costs associated with such items as cost guarantees, ancillary services and reliability expenses. As part of operating the market, the IESO calculates uplift charges and allocates them to market participants on their withdrawals of electricity.

> "Storage resources withdrawing electricity to charge their facilities are required to pay wholesale uplifts according to their consumption, much like a traditional load. The storage community has indicated that this may result in inefficient market outcomes if the storage facilities recover these costs through the market when providing a wholesale market service."

Recommendation to the IESO

The 2018 report included the following recommendation:

> "The IESO should lead further discussions to consider the potential impacts to market efficiency resulting from the application of uplift charges. These discussions should be coordinated with design changes as part of the IESO's Market Renewal initiatives."

Progress Update from the IESO

Considerations around the removal of uplift charges have been investigated with stakeholders through the SDP and an amended uplift treatment for storage resources has been included as part of the long-term vision. Specifically, the long-term vision proposes that energy storage resources participating within the wholesale market be exempt from uplift charges on the energy withdrawn as 'fuel' solely for the purpose of being able to provide services (e.g., energy and ancillary services) back to the grid at a future point in time.[13] The IESO determined in the long-term vision that applying uplift costs on all withdrawals made by storage resources would ultimately result in higher costs for the end-use consumer; this is because uplift charges on suppliers must ultimately be passed through to consumers in the same market. In the case of stand-alone storage, this cost will be reflected in their offers back to the wholesale market, whereas other end-use loads can pass this cost onto to some secondary market. The impact of these pass-through costs from charging can ultimately lead to higher costs to end-use consumers. Alternatively, if the cost of uplifts cannot be recovered, the resource must exit the market; neither of these scenarios result in ideal market outcomes.

[13] This approach is consistent with the approach in other jurisdictions. See: https://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/esag/esag-20200624-presentation.ashx

As with other elements of the long-term vision, implementing this exemption requires changes to existing IESO tools and therefore will be considered for the post-MRP period and will be assessed alongside the HIP.

Develop Guidance for Storage Resources Providing Multiple Services to Different Entities

Issue Overview

The 2018 report summarized the issue as follows:

> "Currently, there are limited means for energy storage facilities to accrue revenues from offering multiple, non-overlapping services. While they have the potential to provide services behind-the-meter [BTM], at the distribution and transmission levels, and to wholesale markets, existing frameworks are not conducive to optimizing the services [energy storage facilities] can provide."

Recommendation to the OEB

The 2018 report included the following recommendation:

> "Recognizing that storage can provide services behind-the-meter and at the distribution and transmission levels, the OEB should develop guidance on providing multiple services to different entities."

Progress Update from the OEB

The OEB's 2021 Conservation and Demand Management (CDM) Guidelines[14] incorporate the treatment of energy storage. The CDM Guidelines:

i. indicate that energy storage in front or behind the meter (and other CDM activities) are potentially eligible for distribution rate funding if they address a specific system need, at the distribution level or the regional level;

ii. indicate that a distributor's CDM activities may include non-distributor owned behind-the-meter solutions where the cost (and benefit) of the solution may be shared between the distributor and another party;

iii. provide options for distributor cost recovery where distributor CDM activities also earn revenues from the IESO markets; and

[14] Available at: https://www.oeb.ca/regulatory-rules-and-documents/rules-codes-and-requirements/cdm-guidelines-electricity

iv. provide guidance on cost responsibility for distributor CDM activities at the distribution level that are intended to address (in whole or in part) regional needs, including where the system need being addressed is entirely at the transmission level.

In 2020, OEB staff released a Bulletin related to energy storage,[15] expressing the view that a distributor may own and operate behind the meter storage assets as a distribution activity if needed to remediate comparatively poor reliability of service.

Further, as the OEB's Framework for Energy Innovation (FEI)[16] Working Group explores how distributors can use Distributed Energy Resources (DERs) as alternatives to traditional distribution solutions, the Working Group may identify issues related to DERs providing services to different entities, including entities that are not distributors, and may communicate these issues to the OEB.

Recommendation to the IESO

The 2018 report included the following recommendation:

> "The IESO should lead discussions with the storage community to better understand the breadth of wholesale market services that energy storage could provide and how to integrate these services into the current IESO-administered markets. [These discussions] should include engagement with the ESAG."

Progress Update from the IESO

Prior to the formal integration of storage resources via the SDP, the IESO worked substantially with the storage community to test and pilot storage resources to fully understand their capabilities and overall impact to grid reliability. The findings from these pilots indicated that energy storage facilities could provide a wide range of services needed to reliably operate the power system in Ontario including; regulation, voltage control, operating reserve, and flexibility. The IESO's full report on storage capabilities was published in March 2016 in response to a request from the Minister of Energy in April 2015, which asked the IESO to work with the storage community to review the outcomes of the existing energy storage procurements and incorporate resulting learnings, along with any other relevant analyses or new knowledge.[17]

In the foundational participation model designed and implemented in the SDP, the IESO was able to apply the lessons learned from past pilots to effectively enable opportunities for storage in capacity (through the Capacity Auction Rules), energy, operating reserve, and regulation service.[18]

Through the IESO's DER Market Vision (MVP) and Design Project (MDP)[19] the IESO is seeking to enable even more opportunities for storage and other resources less than 1MW in size with the objective of

[15] Available at: https://www.oeb.ca/sites/default/files/OEB-Staff-Bulletin-ownership-of-BTM-storage-20200806.pdf

[16] Available at: https://engagewithus.oeb.ca/fei

[17] This report is available upon request to the IESO.

[18] The IESO has taken initial steps to enable storage to provide Regulation and continues to evolve this work via the Supporting Changes for Storage in the Automatic Generation Control (AGC) project.

[19] For details see: https://www.ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Distributed-Energy-Resources-Market-Vision-and-Design-Project

establishing participation models that enhance the ability of DERs to compete and provide the services they are technically capable of providing. Coordination protocols necessary for wholesale integration and distribution operations will be explored through the IESO's Transmission-Distribution Working Group (TDWG) and will feed directly into the MVP.[20] These protocols will be established in consultation with stakeholders such as resource owners, aggregators, distributors, consultants, and regulatory entities.

Review the OEB Codes

Issue Overview

The 2018 report summarized the issue as follows:

> "Energy storage resources are not specifically referenced in OEB Codes, such as the Transmission and Distribution System Codes and the Retail Settlement Code. These Codes set out the obligations of distributors and transmitters and, among other things, provide the rules regarding connection of customers, as well as the economic evaluation of connections and expansions.
>
> "Because storage is not specifically identified in these Codes, sector participants, including transmitters and distributors, apply the existing regulatory framework to storage-related proposals, creating the risk of inconsistency."

Recommendation to the OEB

The 2018 report included the following recommendation:

> "The OEB should review its Codes to consider energy storage participation and its regulatory framework, including processes and requirements for connections. This work may be undertaken in the context of broader initiatives outlined in the OEB's Business Plan, such as the initiative to enable DERs."
>
> "Pending a comprehensive review of its Codes, the OEB could provide information on how to interpret the existing requirements in the Codes with respect to energy storage resources."

Progress Update from the OEB

In 2019, the OEB launched a consultation to review its requirements regarding the connection of DERs, to identify barriers to the connection of DERs and, where appropriate, to standardize and improve the connection process. As part of that initiative, the OEB established a DER Connections Review Working Group[21] comprised of representatives from utilities, developers, the IESO, and other stakeholders. Based on the Working Group's recommendations, in March 2022 the OEB amended the Distribution

[20] For TDWG information see: https://ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Transmission-Distribution-Coordination-Working-Group

[21] See https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/distributed-energy-resources-der

System Code (DSC) to, among other things, establish a Distributed Energy Resources Connections Procedures (DERCP) document. The DSC amendments and the DERCP are intended to standardize connection procedures and provide additional clarity on the treatment of energy storage resources for the purpose of connections.

The OEB has not identified issues within the Transmission System Code (TSC) or the Retail Settlement Code (RSC) that are barriers to storage. Although stakeholders have raised general concerns about the Codes, specific issues have not been raised. The OEB welcomes further input from stakeholders on specific issues they encounter.

Review the Application of Transmission and Distribution Charges

Issue Overview

The 2018 report summarized the issue as follows:

> "Without a specific rate class for energy storage resources, transmitters and distributors must interpret the existing framework to determine the applicability of transmission and distribution charges to energy storage resources. This issue means that energy storage resources are generally treated as loads for the purposes of the application of these charges."
>
> "The storage community also expressed concern with respect to gross load billing for the line and transformation connection components of the transmission charges. Specifically, the concern is that storage resources experience a lower threshold for triggering gross load billing than embedded renewable resources."

Recommendation to the OEB

The 2018 report included the following recommendation:

> "As the application of transmission and distribution charges is a complex and multi-faceted problem that involves cost allocation and rate design, the OEB should lead further discussions on this issue."

Progress Update from the OEB

In October 2021, the OEB issued a Notice of Generic Hearing on issues related to Uniform Transmission Rates,[22] and two of the contemplated issues identified in that Notice include the basis for billing energy storage facilities (issue 6 in the Notice) and gross load billing thresholds for renewable and non-renewable generation (issue 7).

The Generic Hearing is proceeding in phases. The first phase will focus on the Export Transmission Service rate, while other issues are intended to be addressed in subsequent phases.

[22] See https://www.oeb.ca/participate/applications/current-major-applications/eb-2021-0243

Clarify the Use of Forecast Revenues from Distribution and Transmission Rates as an Offset to Connection Costs

Issue Overview

The 2018 report summarized the issue as follows:

> "Because energy storage resources are often treated as loads, they are subject to transmission and distribution charges based on their withdrawals of electricity. In some cases, these revenues are not considered when determining capital cost contributions related to new or expanded connections… This issue has resulted in inconsistent treatment of energy storage as it relates to the provisions of the [Distribution System Code] and [Transmission System Code]."

Recommendation to the OEB

The 2018 report included the following recommendation:

> "To the extent that there is an inconsistent application of the DSC and TSC for energy storage facilities when it comes to connection costs, the OEB should provide clarification on the intention and expected application of these provisions.
>
> "The OEB should also ensure stakeholders are aware of the process for filing complaints regarding incorrect application of rules."

Progress Update from the OEB

The OEB has amended the DSC to include a new section that confirms the OEB's existing regulatory requirements to include forecast distribution revenues as an offset to connection costs (i.e., to reduce capital contribution) for energy storage. This amendment formally recognizes that DERs have the potential to create revenues for distributors that should be considered in determining the amount of a capital contribution. The same approach is also already reflected in the OEB's TSC.

As stakeholders may be aware, complaints about the incorrect application of regulatory requirements may be filed through the OEB's website. Energy sector participants or interested parties may raise issues, seek guidance regarding policy or regulatory obligations, or forward allegations of non-compliance activity through the OEB's Industry Relations Enquiry process.

Provide a Clearer Framework for Including Storage Assets in the Rate Base

Issue Overview

The 2018 report summarized the issue as follows:

> "Regulated utilities now have more potential cost-effective options for meeting their distribution or transmission needs, including storage. Distributors and transmitters are more practised in the process for cost recovery of "poles and wires" solutions through the rate base, while there is less experience in the inclusion of other types of cost-effective assets in the rate base. While some distributors have already included storage in rate base, more clarity is required on how a distributor or transmitter can include a cost-effective storage asset in its rate base."

Recommendation to the OEB

The 2018 report included the following recommendation:

> "With new potential cost-effective options to meet needs, the OEB should provide the sector with greater clarity on how to include options such as cost-effective energy storage in the rate base."

Progress Update from the OEB

As noted above, in 2020, OEB staff issued a Bulletin expressing the view that ownership and operation of behind-the-meter storage assets may be considered a distribution activity if the main purpose is to remediate comparatively poor reliability of service.

The OEB's CDM Guidelines state that distributor costs for CDM activities (including energy storage) should be assigned to capital expenditures or operating expenses in accordance with a distributor's capitalization policy, and can potentially include a capital expenditure component.

Further, the OEB's FEI consultation is exploring how DERs can be used as alternatives to traditional distribution solutions. In June 2022, the FEI Working Group is expected to provide recommendations to the OEB on how distributors can assess the benefits and costs of various DER solutions relative to traditional distribution solutions. The working group is also expected to make recommendations regarding incentives for distributors to adopt third-party owned DER solutions as alternatives to conventional, rate-based capital solutions.

Currently, the FEI Working Group is focusing on enabling distributors to adopt DER solutions where the DER assets are owned by third parties. As indicated in its May 2021 letter, the OEB expects that subsequent work streams will explore whether and how to enable distributor-owned DER solutions.

Address the Incentive for Distributors to Favour Capital Investments

Issue Overview

The 2018 report summarized the issue as follows:

> "Under the current regulatory framework, distributors may be incented to pursue their own capital investments over third-party solutions to provide a distribution service. This is not only because distributors earn a return on capital but not on operating expenses, through which third-party solutions would be financed, but also because distributors have a legal responsibility to maintain the safety and reliability of their systems and relying on a third-party solution to meet those obligations may be perceived as riskier."

Recommendation to the OEB

The 2018 report included the following recommendation:

> "The OEB should consider emerging alternatives for service provision, such as energy storage, in its planned review of utility remuneration."

Progress Update from the OEB

In June 2022, the FEI Working Group is expected to provide recommendations on appropriate incentives for utilities to adopt DER solutions that do not require equity investment by the utility. Once the OEB has received the Working Group's recommendations, the OEB will invite stakeholders to provide comments on them. Next steps will be determined after considering the Working Group's recommendations and comments received from other stakeholders.

Stakeholder Feedback

Following the February 2022 stakeholder session with the storage community to solicit input to this report, the IESO made available a feedback form in relation to this consultation, and subsequently received responses from three organizations: Energy Storage Canada (ESC), the Canadian Renewable Energy Association (CANREA), and Hydro One (HONI). General feedback was received, as well as feedback in relation to the specific topics covered in the 2018 report.

Stakeholder feedback is summarized below along with brief commentary from the IESO and/or OEB as appropriate.

Summary of Feedback

- ESC and CanREA expressed a desire for both the IESO and the OEB to move more quickly to fully address remaining obstacles to energy storage.
- ESC noted that a number of storage related issues are being dealt with through broader consultations and expressed a preference for more storage specific forums for discussion.

IESO Response

The IESO has numerous initiatives planned to further integrate energy storage in Ontario. Energy storage has already been incorporated into Market Rules and Manuals and enabled to provide energy, operating reserve, capacity, and regulation service where applicable. Where further enhancements have been prioritized or are under consideration, the IESO has been transparent about when the enhancements will be undertaken (e.g., the operational enhancements for storage explained above) and/or how decisions will be made for undertaking additional enhancements (e.g., assessing the criteria for implementing the long-term vision as part of the HIP).

In this report, the IESO has detailed how the identified barriers to storage resources have been or will be addressed. The IESO has sought to make best use of its available resources to make progress in integrating energy storage. In a number of cases, the most efficient and expedient path is to undertake the work within broader market enhancement efforts. For example, the criteria for implementing the long-term vision is being explored through the HIP and the foundational participation model will be ported into MRP Market Rule amendments within the MRP.

OEB Response

The OEB has taken steps to support the integration of energy storage including, CDM Guidelines and a staff bulletin on ownership of behind-the-meter storage that provide paths for distributors to use storage to meet system needs, as well as code amendments to modernize connection requirements for storage and other DERs. Many issues related to energy storage reside within a broader context such as, integrating DERs generally, and rate design that balances many objectives (e.g. fairness to customers, avoids undue cross-subsidization, fully recovers costs, etc.). Issues pertaining to storage are being explored in forums such as the FEI consultation and the Generic Hearing on Uniform Transmission Rates to support a coherent regulatory response. The OEB's Innovation Sandbox and Industry Relations Enquiry process remain in place to provide near-term support in the form of regulatory guidance.

Summary of Feedback

HONI highlighted that operational coordination between the transmission and distribution systems is an important issue that requires focused attention.

IESO Response

This issue being addressed through the IESO's DER MVP and the TDWG. The objectives and timelines for completing this work have been communicated as part of the DER Roadmap. The IESO has committed to developing high-level transmission-distribution protocols by the end of Q1, 2023 and to implementing those protocols as part of the DER MDP by the summer of 2026.

Summary of Feedback

ESC suggested that the IESO commit additional resources and funding to expedite storage integration into wholesale market design.

IESO Response

The IESO is exploring avenues for non-traditional funding sources for market enhancement opportunities including through federal programs. See Market Rules section of this report for commentary on timing.

Summary of Feedback

- CanREA requested additional clarity on which market rules and manuals have been amended to incorporate storage, and highlighting the benefits of moving to the long-term vision.
- Both CanREA and HONI requested additional clarity on when the long-term vision will be implemented.

IESO Response

In order to assist stakeholders with navigating the various amendments and requirements for participation in wholesale markets, the IESO published the Interim Storage Guide which provides support from the subject areas of Connection Assessment to Settlements for storage resources specifically. In addition, a complete list of storage-related Market Rule and Manual amendments remains available on the ESAG webpage. With respect to MRP and long-term vision timing, see the Market Rule section.

An in-depth study through the HIP will assess the criteria for implementing the long-term vision through a cost-benefit analysis.

Summary of Feedback

CanREA indicated the IESO's Unforced Capacity (UCAP) methodology was inappropriate and should be revisited.

IESO Response

The UCAP methodology will be explored through the IESO's ongoing Resource Adequacy engagement.

Summary of Feedback

HONI requested that the IESO enable behind-the-meter storage resource participation in wholesale markets.

IESO Response

BTM storage can already participate in IESO-Administered Markets today through the Hourly Demand Response participation model or as a dispatchable load. Additional participation models and opportunities for DERs and DER aggregations (including BTM resources) will be explored through the DER Market Vision and Design Projects.

Because the IESO has facilitated BTM access to the Hourly Demand Response market, there is the potential for market revenues to support distributor investments in storage for reliability, as provided for in the OEB's CDM Guidelines.

Summary of Feedback

All stakeholders expressed a desire to address the application of Global Adjustment to storage resources.

IESO Response

As noted above, criteria for implementing the components of the long-term vision (including the IESO's proposed application of uplift charges for storage resources) will be explored as part of HIP. The application of Global Adjustment is a regulatory issue outside of the IESO's scope of authority, however IESO recognizes the rationale for its proposed uplift treatment can equally apply to Global Adjustment (GA) charges for energy storage participating in the wholesale markets. The IESO will continue to engage with the Ministry of Energy on this topic.[23]

Summary of Feedback

HONI suggested the OEB provide guidance or a framework for evaluating storage connection projects that consider the full range of their potential benefits, including societal and environmental benefits.

OEB Response

The FEI Working Group is considering approaches for assessing the benefits and costs of DERs, including storage. The OEB is expecting recommendations from the FEI Working Group in June 2022. Stakeholders will have an opportunity to comment on the recommendations to inform the OEB's policy determinations and next steps.

Summary of Feedback

HONI suggested clarification was needed on DSC cost responsibility.

OEB Response

The OEB has amended the Distribution System Code to address the cost responsibility rules for energy storage. The amendments confirm the OEB's existing regulatory requirements for consideration of forecast distribution revenues in offsetting connection costs. This is not a change to the cost responsibility rules; rather, it continues to recognize that DERs have the potential to create revenues for distributors that should be considered in determining the amount of a capital contribution. The same approach is already reflected in the OEB's Transmission System Code.

Summary of Feedback

- CANREA and ESC noted the importance of considering transmission-connected storage issues.
- HONI indicated that the OEB has yet to address rate design aspects related to storage, including the application of T&D charges and gross-load billing.

[23] The IESO administers and settles GA based on Ontario Regulation 429/04.

OEB Response

The basis for billing energy storage facilities and gross-load billing thresholds are being examined within the OEB's generic hearing on Uniform Transmission Rates.

Summary of Feedback

- When private storage developers are contracted by a regulated utility to provide services to the system, CANREA suggested, to maintain fair consideration by the utility, the costs of the storage contract option need to be treated on the same basis as the wires option. This needs to extend to transmission connected storage.
- HONI suggested the OEB should provide further clarity for utilities to make enabling investments to accommodate more DERs and optimize existing assets.

OEB Response

The OEB's CDM Guidelines and staff bulletin on behind the meter storage provide pathways for distributors to use storage to address system needs.

The FEI consultation is also addressing these issues. In the near term, recommendations from the FEI Working Group related to DER benefit cost assessment and incentives for distributors to deploy DER solutions as non-wires alternatives will support use of storage to meet system needs. In its May 2021 letter, the OEB confirmed that the FEI consultation would consider DER issues beyond those identified as current priorities and noted its expectation that "issues relating to utility remuneration and utility ownership of DER assets [would] be considered in subsequent phases". The OEB has asked the FEI Working Group to identify issues to be addressed in the next phase of the FEI consultation and will seek broader stakeholder input on those recommendations.

Conclusion and Next Steps

Since the release of the 2018 "Removing Obstacles for Storage Resources in Ontario" report, the IESO and the OEB have worked diligently to act on the report's recommendations. This has involved short-to-medium term solutions, such as clarification and guidance surrounding energy storage in the IESO's Market Rules and through the OEB's Codes and guidance documents. While much has been accomplished since 2018, as the storage community points out, there is more progress that can be made. To that end, IESO and OEB have sought to provide a pathway to achieve an enduring, effective, fair and efficient framework for the participation of energy storage as both a market participant and as an alternative to traditional wires solutions. Successfully navigating this long-term pathway will necessitate the continued involvement and insights provided by Ontario's passionate storage stakeholder community and involve the continued collective efforts of the IESO, the OEB and the Ministry of Energy.

Independent Electricity System Operator
1600-120 Adelaide Street West
Toronto, Ontario M5H 1T1

Phone: 905.403.6900
Toll-free: 1.888.448.7777
E-mail: customer.relations@ieso.ca

ieso.ca

@IESO_Tweets
linkedin.com/company/IESO

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