Energy Storage Design Project – Long-Term Design Stakeholder Feedback and IESO Response from March 26th Webinar

Following the March 26th public webinar on the Energy Storage Design Project – Long-Term Design, the Independent Electricity System Operator (IESO) invited stakeholders to provide comments and feedback on the options for State-of-Charge (SoC) Management.

The IESO received feedback from:

- CanSIA on behalf of NEXUS members
- Capital Power
- Energy Storage Canada
- Fasken on behalf of H2GO Canada
- Ontario Power Generation
- Power Workers Union
- TC Energy

This feedback has been posted on the Energy Storage Advisory Group webpage.

Note on Feedback Summary

The IESO appreciates the feedback received from stakeholders on the options for SoC Management. The feedback has been noted and will be considered as the engagement moves forward. The IESO has provided a summary table below, which outlines specific feedback or questions for which an IESO response was required at this time.

Stakeholder Comments and IESO Responses

Topic	Feedback	IESO Response
Design principles and considerations	Stakeholders noted that principles and considerations are meant to guide decision-making and optimize benefits of market design changes, and that all principles are important and must be balanced when attempting to evolve the IESO-Administered Markets (IAMs) to appropriately integrate Energy Storage Resources (ESRs). While all principles are considered important, stakeholders paid particular attention to, and provided feedback on, the principles of competition, certainty, and implementation. In short, stakeholder feedback indicated a desire for resources to be able to compete on a level playing field where possible, and that the design should provide a level of predictability to allow participants to manage risks. Additionally, all things being considered, the design needs ultimately to be implementable and reduce barriers where possible.	The IESO appreciates the support stakeholders offered for the design principles underpinning the Storage Design Project (SDP) and the perspectives shared on the relative priority of principles for developing an SoC management framework.

State-of-charge management options	Stakeholders provided feedback on the presented state- of-charge management options, with support provided for a range of SoC management options. The key themes of stakeholder feedback include: 1. A desire for storage resources to have the opportunity/flexibility to manage their own resources • A number of stakeholders noted that the SoC management framework should not restrict participants' ability to manage risk and opportunity, and that participants should have choice and flexibility to adjust as required where ESRs have opportunity to reduce risk, and increase flexibility and revenues. • For more complex ESRs, such as pump storage facilities coupled with downstream hydroelectric stations, it was suggested the ESR must be able to manage its own optimization in order to coordinate and optimize benefits from the hydroelectric stations.	At the May 20 Energy Storage Advisory Group (ESAG) meeting, the IESO presented its proposed SoC management framework (SoC Lite) for an enduring energy storage design. Materials are available here. Understanding stakeholders' key objectives for SoC management was helpful in developing the SoC Lite proposal and in communicating the merits of the approach. The IESO believes that its proposed SoC management framework aligns well with the key themes that emerged in stakeholder feedback. For example, the IESO proposal will provide energy storage facilities with a high degree of flexibility to manage their own state-of- charge through their offers while still reflecting SoC within the IESO's tools to ensure that schedules and dispatch instructions are feasible and efficient.

2. The potential for ISO management to result in more efficient outcomes
    - With respect to large ESRs in particular, it was noted that ISO-SoC Management provides overall system-wide least cost, along with guaranteed feasibility. Stakeholders explained further that large ESRs would most efficiently be managed by the ISO to meet power system needs, especially essential reliability services.
    - For ESRs such as stand-alone pump storage hydro and battery storage facilities, it was noted the ISO would be in the best position to schedule these ESRs given the view of the electricity system afforded to the ISO, and the knowledge of the offer stack and system optimization requirements.

For stakeholders that advocated for optionality between self-management and ISO management of SoC, the SoC Lite proposal provides the opportunity for a storage participant to take a more or less active role in managing its SoC by virtue of its offer strategy. For example, a storage participant could take a relatively hands-off approach and offer its full capability in all hours, resulting in a greater degree of system operator influence on SoC management and related schedules and dispatch instructions. On the other hand, a storage participant could employ a more active offer strategy resulting in a more targeted use of its SoC for wholesale market purposes, and a reduced role for the system operator in SoC management.

TransAlta recommends that the IESO consider establishing an hourly threshold below which claw-backs are not incurred	3. A desire for participants to be able to choose between greater or lesser amounts of ISO outcomes management • ISO-SoC Management should produce the best outcome for the ESR while maintaining grid reliability, however the system is dynamic and should unforeseen conditions occur in Pre-Dispatch/RT market it may be beneficial for the ESRs to switch to Self-SoC Management to take advantage of opportunities while providing support to the grid. • One stakeholder noted that a Self-SoC-Management model would allow for ESRs to offer multiple services to several entities (e.g. wholesale markets, grid operators, customers) which could serve to maximize the value that ESRs can offer the electricity sector. • Since not all services are provided directly to the IAMs, there are many instances where an ESR will need to manage its SoC to meet objectives that may not align with the optimization of an ISO-SoC-Management system.	Further, to ensure that the proposal shared with stakeholders at the May 20 meeting leverages existing solutions to the extent possible and meets the "implementability" principle, the IESO has engaged in initial discussions with the software vendor selected through the Market Renewal Program. At this time, the IESO is not contemplating a different SoC management framework for resources of different sizes.

	4. A desire for participants to be able to choose between greater or lesser amounts of ISO outcomes management • Due to the potential computational complexity, it was recommended that ESRs below a certain size threshold could opt for a Self-SoC-Management model, or potentially SoC-Management- Lite. • Focusing IESO-SoC-Management on the tier of larger ESRs, defined as broadly as practicable, should limit the burden and maximize the value.	
Additional design areas	Stakeholders submitted feedback on the following additional elements of the design:	
	1. **A continuous offer curve**: The long-term solution should model storage resources as a single resource (from maximum withdrawal to maximum injection).	1. The IESO has included a single resource model and continuous offer curve as part of its enduring vision for storage participation in the IAMs.
	2. **Treatment of uplift**: Storage resources should not be subject to uplift if they are providing grid services and the OEB should also review application of network charges for storage resources.	2. Treatment of uplift for storage resources will be explored at a forthcoming ESAG meeting discussion.

	3. **Self-scheduling of resources**: Should not be permissible for ESRs with an installed capacity greater than 1 MW.	3. The IESO does not intend to change the 10 MW threshold for self- scheduling resources within the scope of the SDP. However, the IESO agrees that this is a topic that could be explored as part of broader, future market development discussions.
	4. **Pricing**: Storage resources should be able to set price.	4. As with dispatchable generators, the IESO has proposed that dispatchable storage facilities will be able to set price.
	5. **Incorporating SoC into Multi-Interval Optimization (MIO)**: Analysis should be conducted on how storage is treated in MIO and the potential benefits.	5. As with dispatchable generators, the IESO has proposed that dispatchable storage facilities will be able to set price.

Other	One stakeholder recommended the IESO conduct a cost/benefit analysis on the SoC management options to further understand potential net incremental benefits associated with each option.	The IESO does not intend to conduct a cost benefit analysis on the range of potential SoC management options, though we are aware of the comparative study of SOC management options conducted by the Electric Power Research Institute (EPRI)[1]. The EPRI study demonstrated modest differences in overall market outcomes between the various SOC models, in a purely simulated environment. To date, there is a little empirical evidence from actual application of these models in established electricity markets, given that they are currently are approaching early stages of deployment. Amidst this present uncertainty, the IESO believes SOC Lite offers the greatest flexibility to individual electricity storage market participants while balancing the reliability imperative of the electricity system as a whole. Another important design consideration that has informed the IESO's proposed SoC Lite approach is the ability to leverage existing or planned software tools in order to identify a cost effective and implementable solution.

[1] See also, EPRI webinar, "*Energy Storage Integration into Electricity Markets: Current Status and Ongoing Research, September 25, 2019"* available on the website of the Energy Systems Integration Group: https://www.esig.energy/event/webinar-energy-storage-integration-into-electricity-markets-current-status- and-ongoing-research/

	Capital Power recommends the IESO revise the proposed "after-the-fact" settlement claw-back to account for the compliance deadband. Claw-backs should only apply when production rises beyond the upper deadband limit. Exceptions should also be granted if, in response to an activation, the directed incremental energy was delivered in full. These changes respect the compliance deadband, do not create unintended consequences and do not require tool changes since it could be incorporated as part of settlement.	Please refer to the IESO response to TransAlta above regarding the including a deadband in the proposed OR settlement claw-back. The proposed OR settlement claw-back will not be applied for intervals when OR is activated. If a resource can provide the incremental energy associated with its OR schedule, which will be determined based on a resource's capability offered into the market and its actual output/consumption, there will not be an OR settlement claw-back. Therefore, the IESO does not believe that an exception is required for the claw-back.
	Another stakeholder recommended the design should not be limited to batteries, and consideration should be made for hydrogen storage projects as well.	A key design consideration for the SDP is to develop a vision for storage participation that is applicable to the widest range of technology types for stand-alone electricity storage facilities that fall within the defined scope of the project.
	Stakeholders also expressed a desire for the enduring storage design to be implemented within MRP and cautioned not doing so could lead to inefficiencies in re-opening market design decisions and revisiting foundational design concepts.	The IESO will discuss this topic at the June ESAG meeting.