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Energy Storage Design Project—Long-Term Design

Energy Storage Advisory Group Webinar

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Introduction

This webinar will have 2 presentations:

1. IESO
   - Reintroduce long-term design questions
   - Invite stakeholder input on key design feature: state-of-charge (SoC) management
   - Provide update on next steps
2. Electric Power Research Institute (EPRI)
   - Provide update on US storage integration efforts
   - Describe how IESO long-term design questions are being addressed in US jurisdictions
   - Discuss high-level SoC management options

Recap – Two Key Timeframes With Different Objectives

The Storage Design Project will:

1. Clarify how energy storage resources (ESRs) can participate in today's IESO Administered Markets (the **interim period**), and
2. Provide a vision for how ESRs will participate on an enduring basis in markets resulting from the Market Renewal Program (the **long-term period** - once IESO tool upgrades to fully integrate ESRs are deployed)

Goals for the Interim Period

- Develop a design with sufficient detail to integrate storage resources into today's markets
  - Draft design presented at Feb 18 Energy Storage Advisory Group Meeting
- Draft rule and manual changes to clarify treatment of energy storage resources in today's markets
- Identify tool and process changes required to implement interim design
- Produce schedule for market enhancements
  - Will clarify timelines for completion of rules, manuals, and tool changes

Goals for the Long-Term Period

- Answer key high-level questions about how storage will participate in the IAMs on an enduring basis
- Develop a vision for how storage will participate in the IAMs over the long-term
- Work together with stakeholder community to make progress on a timely basis
- Provide clarity on when enduring design will be implemented
  - i.e., alongside or after the Market Renewal Program (MRP)?
- Position the IESO to move quickly on completing high-level and detailed design at the appropriate time

Long-Term Design Questions (a)

Design Element:

1. State-of-charge (SoC) management in real-time (RT) energy market.

Design Question:

1.1 Who should optimize SoC of energy storage resources (ESRs) in the RT energy market: the ESR, the system operator; or give ESRs the choice?

1.2 Should SoC be included in Multi-Interval Optimization?

Design Element:

2. Day-ahead-market (DAM) bidding and scheduling of ESRs.

Design Question:

2.1 Who should optimize SoC of ESRs in the DAM: the ESR, system operator, or give ESRs the choice?

Long-Term Design Questions (b)

Design Element:

3. RT energy and operating reserve markets: bidding and scheduling of ESRs

Design Question:

3.1 What offer curve shape (e.g., continuous/discontinuous) should ESRs be allowed to use to offer into the energy and operating reserve markets?

Design Element:

4. Ability of ESRs to set market-clearing price in the energy and operating reserve markets

Design Question:

4.1 Should ESRs be able to set the market-clearing price?

Long-Term Design Questions (c)

Design Element:

5. Regulation service

Design Question:

5.1 What are the rules for what proportion of an ESR's total capacity gets used for regulation, energy and operating reserve – both at different times and simultaneously?

Design Element:

6. Settlement and charges

Design Question:

6.1 How will uplift charges stipulated by the IESO Market Rules be applied to energy storage resources?*

*Question has been rephrased to increase clarity

Long-Term Design Questions (d)

Design Element:

7. Market and facility

Design Question:

7.1 How should an energy storage facility be registered into the IAMs?

State-of-Charge Management

- Because storage resources have unique physical characteristics (i.e., they are energy limited and can both withdraw and inject energy) they pose unique challenges and opportunities for electricity market design
- Design choices around who should manage SoC and how it should be done are foundational questions for energy storage integration into wholesale markets and impact a number of dependent design features (e.g. facility registration, offer curve structure, etc.).
- There are a range of options for SoC management which are outlined in the EPRI presentation
- The options include potential trade-offs between reliability, efficiency, implementability and other design principles and considerations

Stakeholder Feedback on SOC Management

A key objective of today's webinar is to invite stakeholder input on SoC management options

The IESO is seeking stakeholder perspectives in relation to the following questions:

1. **What design principles and considerations (see next slide) are most important to you in developing a state-of-charge management framework and why?**
   - E.g., **efficient** market outcomes, the ability for storage to **compete** on a level playing field, a practical approach that could be **implement**ed on a timely basis, etc.
2. **Based on the Storage Design Project principles and considerations, what state-of-charge management option(s) do you support and why?**
   E.g., Self-Schedule, Self-SoC-Management, SoC-Management-Lite, ISO-SoC-Management

Recap – Design Principles and Considerations for Decision Making

- Adhere to Market Renewal Program principles (Efficiency, competition, implementability, certainty, and transparency*)
- And reflect design considerations discussed with ESAG

- Through this project we will seek design solutions that contribute to reliability, efficiency, and competition at the bulk level
- We will build on the practical experiences of other jurisdictions that are integrating energy storage resources into wholesale markets

*See appendix for further description of Market Renewal Principles

Recap – Design Principles and Considerations for Decision Making Continued

- We will seek to maximize the chances of timely implementation by:
  - Accounting for the capabilities of the software tools that will be selected outside the scope of this project
  - Reducing design complexity wherever possible
  - Avoiding design by exception – i.e. ensure that we have a single framework that can be applied to the widest possible range of storage technologies

*See appendix for further description of Market Renewal Principles

Current Design Efforts of Relevance to SoC

MRP detailed design is addressing resources with unique operating constraints

- Hydroelectric Resources: IESO has proposed dispatch data parameters for a range of constraints including: multiple daily energy limits, forbidden regions, intertemporal dependencies on a cascade river system, etc.
- Combined Cycle Resources: the pseudo unit model (currently used in the day-ahead commitment process) will recognize operational linkages between combustion and steam turbines in day-ahead, pre-dispatch, and real-time

Note: See appendix for links to materials related to hydroelectric and combined cycle proposals

Current Design Efforts of Relevance to SoC Continued

Key IESO positions

- Modelling the unique operating constraints of resource types may be appropriate when doing so supports system **reliability** and market **efficiency**

- The IESO, through its tools and processes, will optimize schedules and dispatch instructions for all resources based on **competitive** bids and offers into the market

Next Steps

- IESO has received stakeholder feedback on interim design proposals and will post responses in the near future
- IESO is requesting stakeholder feedback on the options for SoC management
  - Please use the feedback form found under the March 26 entry on the ESAG webpage and send to engagement@ieso.ca by April 16
  - IESO will work to consider feedback and incorporate comments as appropriate and post responses on the ESAG webpage
- Next SDP meeting planned for May/June (date TBC), will include:
  - Proposals for long-term design questions
  - Draft rule and manual language reflecting interim design

APPENDIX

MRP Principles

- Efficiency - lower out-of-market payments and focus on delivering efficient outcomes to reduce system costs
- Competition - provide open, fair, non-discriminatory competitive opportunities for participants to help meet evolving system needs
- Implementability - work together with our stakeholders to evolve the market in a feasible and practical manner
- Certainty - establish stable, enduring market-based mechanisms that send clear, efficient price signals
- Transparency - accurate, timely and relevant information is available and accessible to market participants to enable their effective participation in the market

MRP Hydroelectric and Pseudo Unit Proposals

- For more information on hydro dispatch data refer to November 14, 2019 and Feb 6, 2020 documents at the link below
- For more information on pseudo units refer to February 27, 2020 document at the link below
- For discussion on the IESO's position with respect to the use of competitive bids and offers along with physical facility constraints, refer to the November 14, 2019 meeting summary (response to OPG comments) at the link below

http://www.ieso.ca/en/Market-Renewal/Stakeholder-Engagements/Energy- Detailed-Design-Engagement