

Storage Design Project (SDP)

Energy Storage Advisory Group

June 24, 2020

Agenda

1. Project Recap and Next Steps
2. Initial Schedule Details for Market Updates
3. Interim Design: Draft Market Rule and Manual Changes
4. Long-Term Design: Uplift Charges for Storage Facilities

ESAG – June, 2020

PROJECT RECAP AND NEXT STEPS

Storage Design Project - Scope

The Storage Design Project will:

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

The SDP is an important step towards ensuring energy storage can fully compete to reliably and efficiently provide needed system services.

Storage Design Project - Deliverables

1. Design Considerations

- Answer key questions about how IESO will treat storage in IESO Administered Markets (IAMs)
- Reflect different timeframes (e.g. greater detail for interim period and a higher-level-vision for the long-term)

2. Market Rules and Manuals

- Draft, and invite stakeholder feedback on, market rule/manual language required to implement interim measures
- Produce inventory and description of future market rules/manual changes required to implement long-term design questions addressed in the project

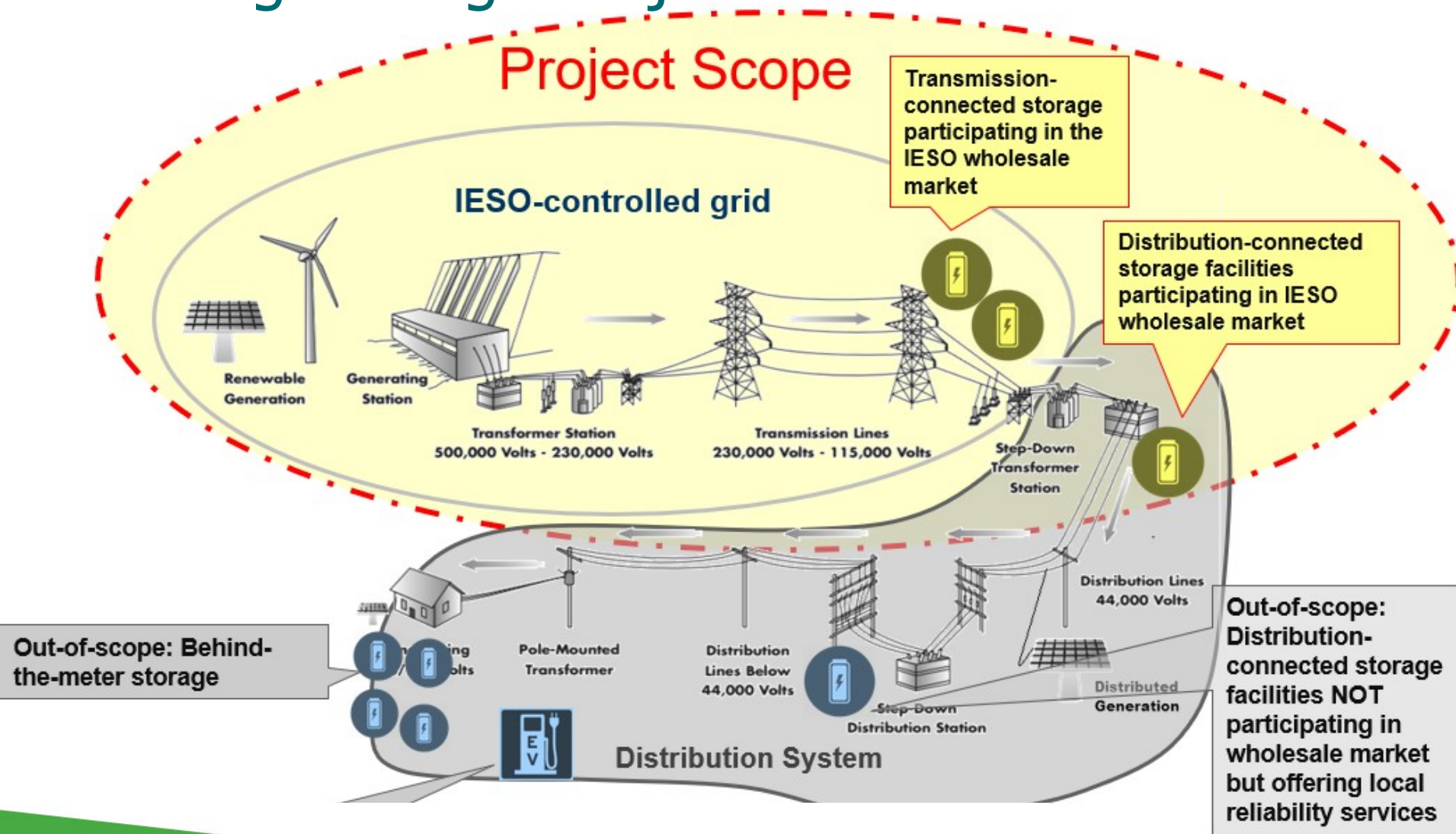
3. Inventory of IESO Tool/Process Changes

- Develop list of tools/processes that will require updating to enable design questions addressed in the project

4. Schedule for Market Updates

- Develop schedule to roll out changes that reflects dependencies on/timing of other initiatives

Storage Design Project – Facilities Involved



Next Steps

- Today – initial schedule details for market updates, draft interim rule and manual changes and uplift proposal
- Stakeholder feedback on today's proposals is due July 15
- July/August – complete set of long-term design proposals
- July/August – additional details on schedule for market updates

ESAG – June, 2020

INITIAL SCHEDULE DETAILS FOR MARKET UPDATES

Schedule for Market Updates

- A schedule for rolling out the market updates identified through the SDP is a key deliverable for the project
- In today's presentation the IESO is providing:
 - Details on implementation timelines for the interim design (see timeline slide in draft Market Rule and Manual changes)
 - A decision on the relationship between the enduring storage vision and the Market Renewal Program (MRP)
- In forthcoming SDP meetings, the IESO will provide additional schedule details regarding longer-term market changes

Market Renewal and the SDP

- In May, the IESO made a determination that the enduring storage design will not be included within the scope of the MRP
- The key driver for the decision was the risk that a material expansion in scope would pose to MRP timelines, costs, and benefits
 - The MRP Energy Stream represents a significant investment, with costs estimated at \$170 million
 - The MRP Energy Stream is also expected to deliver at least \$800 million in net financial benefits to Ontario consumers over the first 10 years of implementation
 - The IESO continues to target an in-service date for MRP of Q1, 2023; including storage integration within MRP would adversely impact the IESO's ability to meet that timeline and heighten the risk of increased costs and deferred benefits

Implications of MRP Scope Decision

- The IESO continues to believe that integrating energy storage is an important initiative for the IESO and the sector
- The interim design produced through SDP will need to be adapted to reflect the MRP design prior to the MRP in-service date
- A decision on how and when the IESO will move forward with the enduring design is still required
- Depending on timing for implementing the enduring design, the IESO may also seek opportunities to implement elements of the long-term design in advance of the full solution

ESAG – June, 2020

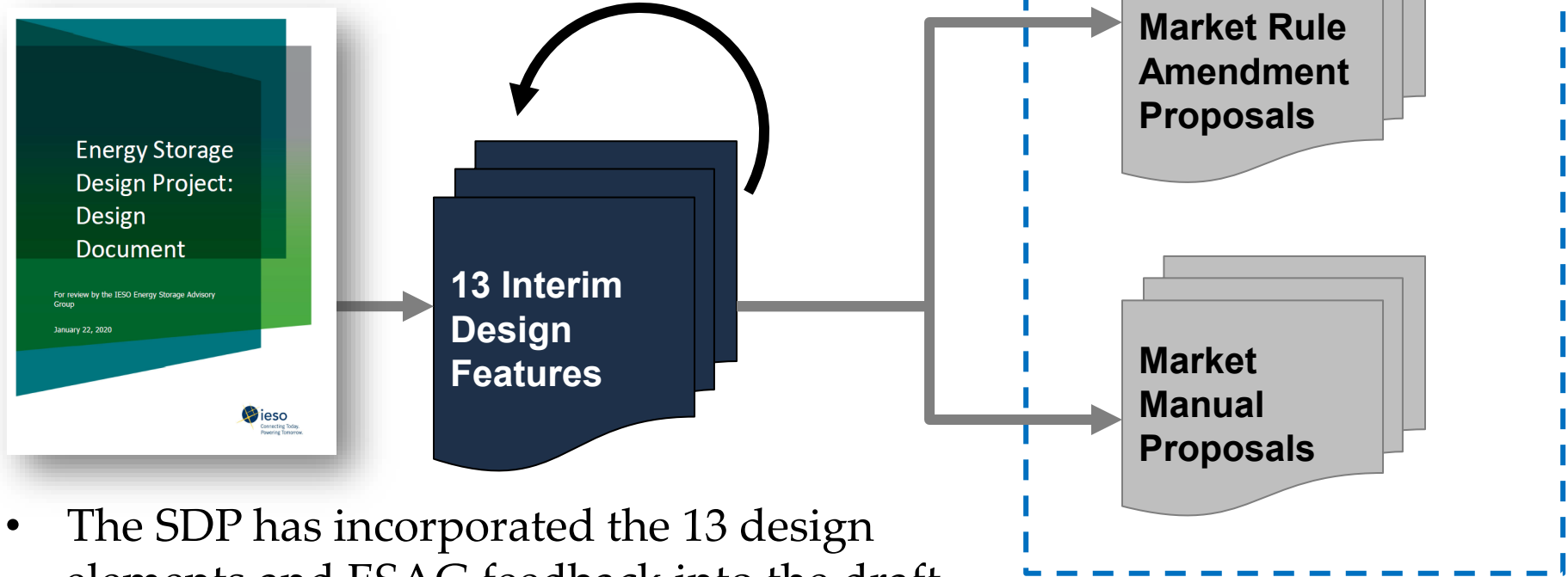
INTERIM DESIGN: DRAFT MARKET RULE AND MANUAL CHANGES

Purpose

- The Storage Design Project (SDP) has put forth draft redlines of Market Rules and Market Manuals for stakeholder review that clarify storage participation requirements in the IESO-Administered Markets and Ancillary Services for the interim period
- The purpose of this presentation is to serve as a guide that will assist stakeholders in navigating the proposed storage design redlines in order to provide feedback

Interim Design Features to Draft Market Rules and Manuals

ESAG feedback



- The SDP has incorporated the 13 design elements and ESAG feedback into the draft Market Rules and Manuals
- Redlines are “draft” and give-stakeholders an opportunity to view the IESO’s proposals in advance of the formal [Baseline Process](#)

Note: timelines provided below

ESAG – June 2020

DRAFT MARKET RULE AND MANUAL REDLINES ON THE ESAG WEBPAGE

Market Rules and Manuals Presented on the ESAG Stakeholder Page

- The redlines presented on the [ESAG Webpage](#) are limited to storage-related updates and are not concurrent with other active stakeholder engagements
- The redlines presented on the ESAG Stakeholder webpage were derived from most recent versions of the Rules and Manuals from the [IESO Library](#)
 - Baseline 43.1, effective June 3, 2020
- Certain redlined Market Manuals were derived from the [IESO Pending Changes](#) page as these versions will be effective by June 29th (see description on ESAG webpage for a full list)
- Necessary “true-ups” will be done to Rules and Manuals for the SDP to reflect changes in other engagements at the effective date

Where the Redlines Are Located

Sector Participants > Engagement Initiatives > Energy Storage Advisory Group

Active Engagements

The IESO is committed to an open, two-way dialogue with stakeholders and communities to help understand their views about proposed changes that may affect them.

IN THIS SECTION...

Status of Active Engagements

June 24-26, 2020 Meetings

May 20-21, 2020 Meetings

Development of an IESO Competitive Transmission Procurement Process

Energy Storage Advisory Group

Formalizing the Integrated Bulk System Planning Process

Improving Accessibility of Operating Reserve

Innovation and Sector Evolution White Paper Series

Capacity Auction

Energy Efficiency Auction Pilot

Energy Payments for Economic Activation of DR Resources

Expanding Participation in Operating Reserve and Energy

IESO Bill Presentment Review

Regional Electricity Planning - Kitchener-Waterloo-Cambridge-Guelph

Regional Electricity Planning - East Lake Superior

Regional Electricity Planning - Greater Bruce/Huron

Regional Electricity Planning - Peterborough-Kingston

Resource Adequacy Engagement

Transmission Rights Market

Energy Storage Advisory Group

The Energy Storage Advisory Group will perform an advisory role to 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 market. The IESO will look to the advisory group to carry out the following activities:

- Identify potential obstacles to the fair competition for energy storage resources and propose mitigating strategies, where appropriate. This support includes reviewing a list of identified obstacles for completeness, and reviewing criteria and principles to help guide the identification of obstacles to the fair competition of storage and creation of mitigating strategies. This review was the immediate focus of the Storage Advisory Group.
- Provide input to the IESO's work plan and/or list of priorities to address storage related issues and opportunities within the current IESO-administered markets, including tools and operational arrangements.
- Advise, consult and coordinate discussions on issues which may affect storage participation in the existing IESO-administered markets.

All comments, enquiries and requests for membership in this group can be directed to engagement@ieso.ca

On December 19, 2018, the IESO released its report, [Removing Obstacles for Storage Resources in Ontario](#), which recommends solutions to address the primary barriers preventing the fair competition of energy storage resources.

Related Information

[Energy Storage Advisory Group Membership](#) - June 25, 2018

[Terms of Reference \(draft\)](#) - April 5, 2018

Schedule of Activities

Date	Activities	Expected Actions
June 24, 2020	Webinar: Energy Storage Design Project	Registration URL


Storage Design Project: Guide to the Draft Market Manual Amendments

In order to facilitate the integration of energy storage resources into IESO-administered markets, changes are required to both Market Rules and Market Manuals. This document serves as a guide to the draft Market Manual amendments for the interim design being developed through the energy storage design project. Full details on the accompanying stakeholder engagement process are available on the Energy Storage Advisory Group webpage.

Generally, the following Market Manual amendments have been derived from the latest published versions that were obtained from the [Market Rule and Manual Library](#) as of June 3, 2020. In some cases (as identified below), the SDFP has amended versions that are currently undergoing the [IESO Redlines Process](#) located on the Pending Change webpage. These amendments are scheduled to be effective as of June 29, 2020.

The following table provides a list of the effected Market Manuals with a link to the amended version for each and an indication of which version of the redlines were based on.

Document	Version Based On	Link to Redlines
1.3 - Identity Management Operations Guide	Latest Market Rule & Manual Library Version	Link
1.4 - Connection Assessment and Approval, (formerly known as MM 2.10)	Pending Changes Version for Baseline 43.1	Link
1.5 - Market Registration Procedures (formerly known as MM 1.2)	Pending Changes Version for Baseline 43.1	Link
1.6 - Performance Validation (formerly known as MM 2.20)	Pending Changes Version for Baseline 43.1	Link
2.8 - Reliability Assessments Information Requirements	Latest Market Rule & Manual Library Version	Link
2.11 - Reliability Outlook and Related Information Requirements	Latest Market Rule & Manual Library Version	Link
2.12 - Treatment of Local Market Power	Latest Market Rule & Manual Library Version	Link
3.4 - Measurement Error Correction	Latest Market Rule & Manual Library Version	Link
3.5 - Site Specific Loss Adjustments Procedure	Latest Market Rule & Manual Library Version	Link

 Connecting Today. Powering Tomorrow.

Storage Design Project: Guide to the Draft Market Rule Amendments

Chapter Edit

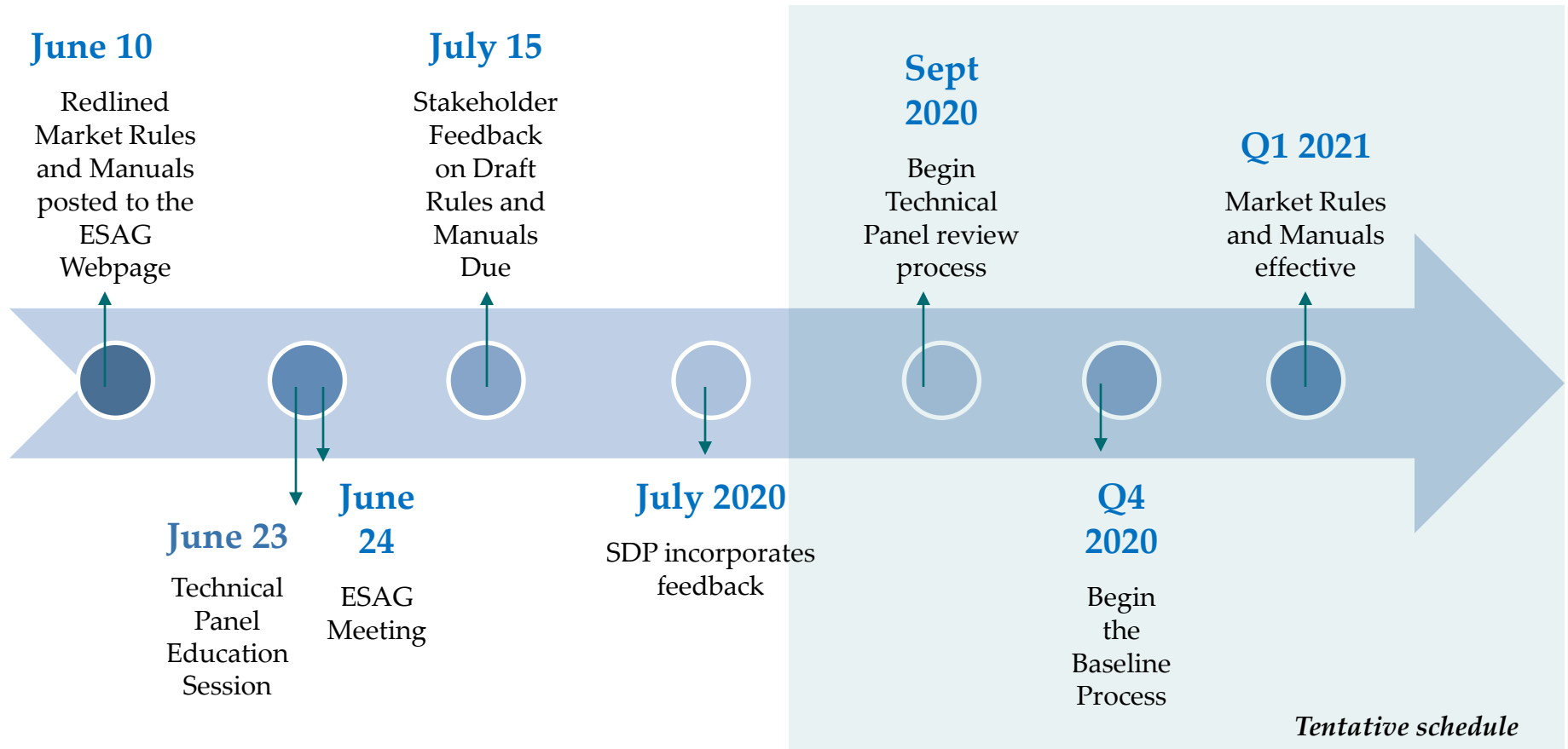
Chapter	Section	Topic	Description
Chapter 2	2.1	Classes of Market Participants	Addition to market participant class to include electricity storage participants.
Chapter 2 - Appendix 2.2	6.1	Technical Requirements	Applies technical and performance requirements to electricity storage facilities.
	1.1	Voice Communications	Apply requirements related to voice communication to electricity storage.
	1.2	Monitoring and Control	Apply requirements related to monitoring and control to electricity storage for Registration and IT requirements.
	1.5	Reclassification of Facilities	To outline rights for reclassifying facilities by size for the purposes of Chapter 2 Appendix and portions of Chapter 3.
Chapter 3	2.2	Application of dispute resolution	All changes related to extending the rights related to compensation for outages rejected by the IESO to electricity storage participants.
Chapter 4	2.5		
	2.6		
Chapter 4	1.1	Introduction	Add embedded electricity storage participants who may not be market participants to the requirements in the chapter.
	3.1	Performance standards and obligations of market participants	Set out requirements to adhere to data and performance requirements in appendices 4.1 through to 4.4, including

Redlines are located on the [ESAG Webpage](#) on the June 24th entry in two PDF files containing links to the impacted Rules and Manuals

ESAG – June 2020

TIMELINES

Target Interim Market Rule and Manual Timelines from “Draft Redlines” to “In Effect”



ESAG – June 2020

THE DRAFT REDLINES – THE APPROACH

Introduction to the Storage Redlines

- **Market Rules**

- Changes to ten chapters and their appendices
- Edits to over 100 sections of Market Rules

- **Market Manuals**

- Updates to 30 Market Manuals
- Market Manuals provide more detailed descriptions of the requirements for various activities specified in the Market Rules, and include the forms and agreements required by market participants
- The applicable forms and agreements, technical reference documents, training guides etc. have not been updated as a part of these draft redlines
 - They will be updated when storage-related Market Rules come into effect; expected in early 2021

The Approach to the Storage Redlines

Change	Description	Example	Where are they?
Interim Design Features	Market Rules are intended to be replaced with long-term design	Rules required to implement the no-overlap requirement	Dedicated section (Ch. 7, Sec. 21) for interim electricity storage rules
Other Changes	Rules may not require changes for the long-term design	Requirement to coordinate outages	Throughout rules. E.g., where outages currently exist; Ch. 5, Sec. 6.

Market Rule and Market Manual Scoping Principles

To the extent possible, the Storage Design Project (SDP) team has endeavoured to update Market Rules and Market Manuals based on the following principles:

- **Supports Interim Design** – relates to requirements needed to support the interim storage design
- **Clarifies an existing IESO practice** – relates to items that the IESO is already doing with electricity storage, but have yet to be formally documented
- **Includes storage into existing requirements** – relates to the inclusion of electricity storage in standard rules/manuals that are required for all market participants

Examples of Changes to Defined Terms

New terms

- Electricity storage facility
- Electricity storage participant
- Electricity storage unit
- Embedded electricity storage facility
- Lower/upper energy limit
- Remaining duration of service
- Self-scheduling electricity storage facility
- State-of-charge

Revisions to existing terms

- Capacity export request
- Connection applicant
- Connection point
- Constrained on event
- Facility
- Operating reserve
- Station service
- Self-schedule

Changes have been made to both refer to electricity storage and to reflect the unique nature of their operations

New Market Rule Section: Ch.7, Sec, 21

The SDP created a new section in Chapter 7 of the Market Rules that contains the interim design elements. The sections are as follows:

- 21.1 - Purpose of Section
- 21.2 - Market Registration
- 21.3 - Provision of Regulation Service
- 21.4 - Energy Offers and Energy Bids
- 21.5 - Revisions to Dispatch Data
- 21.6 - Provision of Operating Reserve
- 21.7 - Interpretation

Design Element – Market Rule – Market Manual Mapping

MR. Ch. 7 Section	Design Feature Cross Reference	Applicable Market Manual
21.2 & 21.3	Design Feature Self-Scheduling 1 – maintain current capacity limit of 10 MW for- Self-scheduling energy storage resources in the real-time energy market	1.5: Market Registration Procedures
21.2 & 21.3	Design Feature Self-Scheduling 2 – raise current capacity limit of 10 MW for- Self-scheduling energy storage resources providing regulation service only	1.5: Market Registration Procedures
21.2	Design Feature F.R. 1 – Registration of self-scheduling energy storage facilities providing regulation service only	1.5: Market Registration Procedures
21.2	Design Feature F.R. 2 – Registration of self-scheduling energy storage facilities in the real-time energy market	1.5: Market Registration Procedures
21.2	Design Feature F.R. 3 – Registration of dispatchable energy storage facilities	1.5: Market Registration Procedures
21.4	Design Feature SoC 1 – restriction against overlapping or equal bid/offer prices	4.2: Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets 9.2: Submitting Operational and Market Data for the DACP
21.5	Design Feature SoC 2 – addressing potential changes to SoC-limited bids and offers	4.2: Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets

Design Element – Market Rule – Market Manual Mapping

MR. Ch. 7 Section	Design Feature Cross Reference	Applicable Market Manual
21.4	Design Feature DACP 1 – DACP data submission requirements for each class of interim energy storage participation	9.2: Submitting Operational and Market Data for the DACP
21.4	Design Feature DACP 2 – No overlap rule for bids and offers into the DACP for energy storage facilities	9.2: Submitting Operational and Market Data for the DACP
21.6	Design Feature O.R. 1 – no simultaneous offers of operating reserve from the two resources comprising a dispatchable energy storage facility	4.2: Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets
21.6	Design Feature O.R. 2 – operating reserve requirements specific to a dispatchable load resource comprising a dispatchable energy storage facility	4.2: Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets
21.6	Design Feature O.R. 3 – operating reserve requirements specific to a dispatchable generator resource comprising a dispatchable energy storage facility	4.2: Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets
Update to the IESO's Guide to Prudentials.	Design Feature P.S. 1 – Prudential Support Obligation for market participants with energy storage facilities.	No MR/MM updates required.

Redlines By Subject Area – Support the Interim Design, Clarify Existing Process and/or Inclusion in Standard IESO Requirements

Subject Areas	Market Rules	Market Manuals
Connecting	Chapter 4 Chapter 7	1.3: Identity Management Operations Guide 1.4: Connection Assessment and Approval 1.5: Market Registration Procedures 1.6: Performance Validation
Market Administration	Chapter 5 Chapter 7	2.8: Reliability Assessments Information Requirements 2.11: Reliability Outlook and Related Information Requirement 2.12: Treatment of Local Market Power
Metering	Chapter 6	3.4: Measurement Error Correction 3.5: Site Specific Loss Adjustments Procedure 3.6: Conceptual Drawing Review 3.7: Totalization Table Registration Wholesale Revenue Metering Standard- Hardware <i>–former Market Manual</i>
Market Operations	Chapter 5 Chapter 7	4.2: Submission of Dispatch Data in the Real-Time Energy and Operating Reserve Markets 4.3: Real Time Scheduling of the Physical Markets
Settlements	Chapter 9	5.2: Meter Data Processing 5.5: Physical Markets Settlement Statement

The SDP reviewed all manuals - if not listed here it was determined that no changes were needed.

Redlines By Subject Area – Support the Interim Design, Clarify Existing Process and/or Inclusion in Standard IESO Requirements

Subject Areas	Market Rules	Market Manuals
IT	N/A	Participant Technical Reference Manual
System Operations	Chapter 5 Chapter 7	7.1: IESO-Controlled Grid Operating Procedures 7.2: Near-Term Assessments and Reports 7.3: Outage Management 7.4: IESO-Controlled Grid Operating Policies 7.8: Ontario Power System Restoration Plan
DACP	Chapter 7	9.0: DACP Overview 9.2: Submitting Operational and Market Data for the DACP 9.3: Operation of the DACP 9.4: Real-Time Integration of the DACP
Reliability Compliance	Chapter 4	11.1: Applicability Criteria for Compliance with NERC Reliability Standards and NPCC Criteria IESO Guideline 11.3: Reliability Information Catalogue 11.4: Ontario Bulk Electric System
Capacity Auctions	Chapter 7	12.0: Capacity Auctions – <i>no SDP redlines</i>
Capacity Exports	Chapter 7	13.1: Capacity Export Requests

The SDP reviewed all manuals if not listed here it was determined that no changes were needed.

Summary and Stakeholder Feedback

- Today, the IESO has presented a guide to the Market Rule and Manual redlines that will help supplement stakeholder review
- The IESO is seeking stakeholder feedback on the redlines
 - Please use the feedback form found under the June 24th entry of the [ESAG Webpage](#) and send to engagement@ieso.ca by July 15th
 - IESO will work to consider feedback and incorporate comments as appropriate and post responses on the [ESAG Webpage](#)

ESAG – June 2020

LONG-TERM DESIGN: UPLIFT CHARGES FOR STORAGE FACILITIES

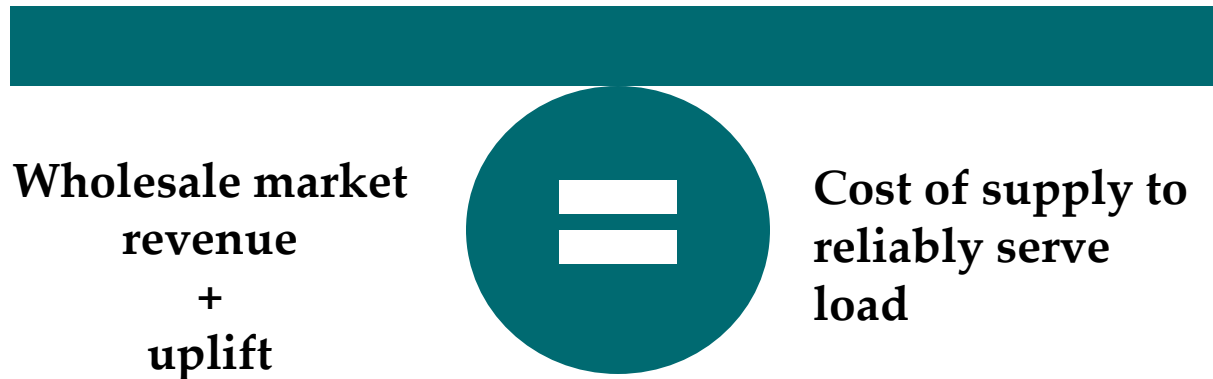
Purpose

- To provide an overview of uplift in Ontario and highlight important considerations for the storage design project, and
- Seek stakeholder feedback on the IESO's proposed approach on uplift treatment for energy storage resources

BACKGROUND ON UPLIFTS

What are Uplifts and why are they Important?

- Uplifts are costs associated with operating the electricity system in a reliable manner that are not captured in the wholesale market price charged to consumers (e.g. HOEP)
- The IESO must remain neutral to all financial clearings through the wholesale electricity market in accordance with the market rules
- Across electricity markets, uplifts are used to recover the cost of reliability services and make whole payments paid to dispatchable resources



Jurisdiction over Uplifts

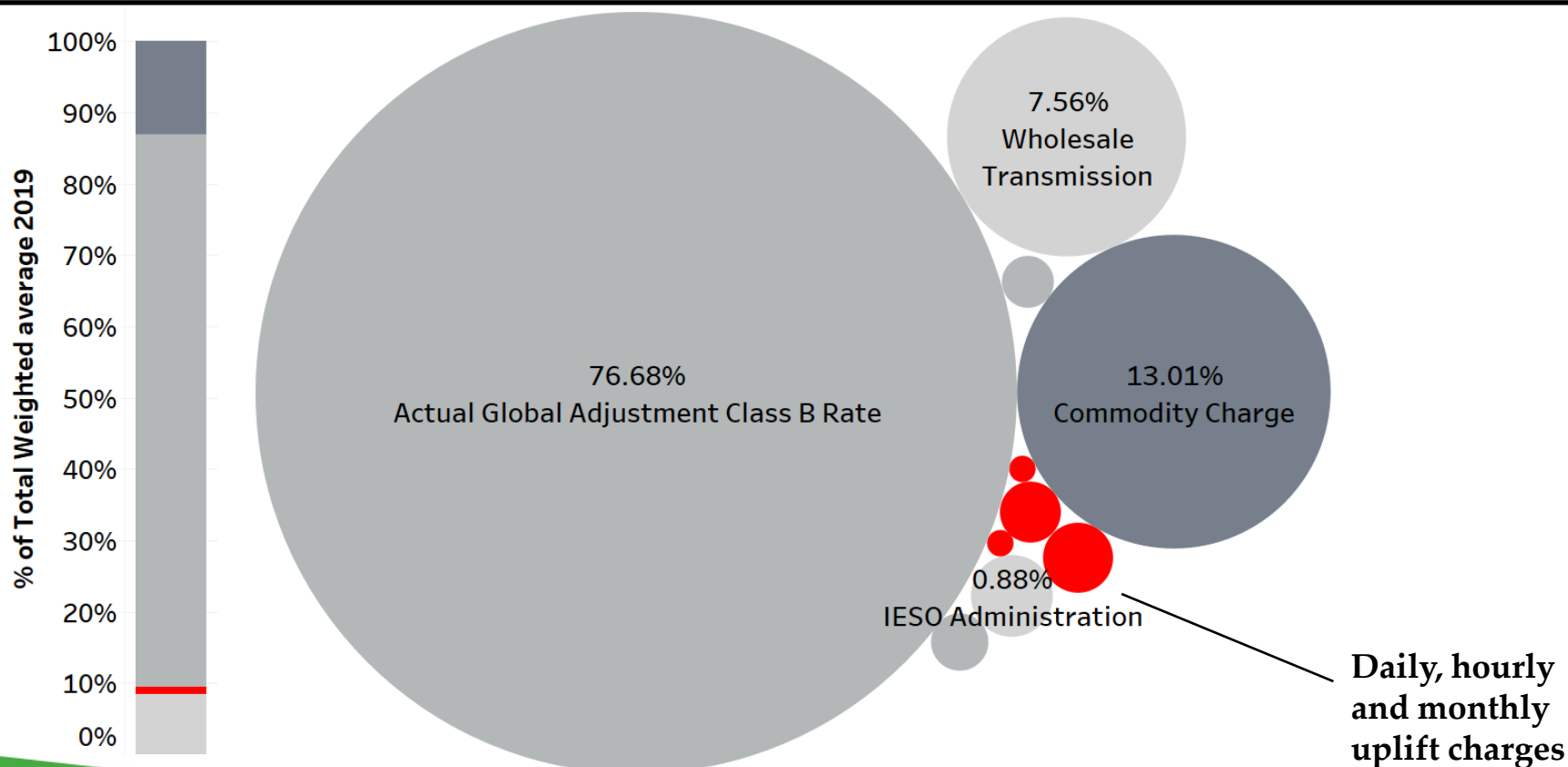
- For the purposes of this slide deck, “uplifts” shall refer to common charges under the jurisdiction of the IESO market rules
- Other common charges to the electricity market are administered by the IESO, but are not under the authority of the IESO or the market rules. These include:
 - Charges under government regulation (e.g. Global Adjustment, Rural and Remote Assistance)
 - Charges under the jurisdiction of the OEB (e.g. IESO Administration Fee)

Materiality

Jurisdiction

- Commodity Charge - set by market price
- Government-regulated
- Market Rules-governed uplift
- OEB-regulated

In 2019, market rules-governed uplift charges averaged approximately 1% of total wholesale market charges*



*Source: IESO monthly market update, December, 2019, weighted average rates for 2019

Variability

While generally a small proportion of total market costs, uplifts can vary significantly

- Can be higher if significant out-of-market-actions required to maintain reliability
- Generally correlated to demand (tend to be a bit higher during instances of high demand and vice versa)

Max of Hourly Uplifts	Month											
Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	\$ 2.08	\$42.46	\$ 5.13	\$ 2.79	\$ 8.80	\$ 1.85	\$ 2.69	\$1.87	\$ 1.12	\$3.30	\$ 5.01	\$ 1.92
2	\$ 1.69	\$31.04	\$ 5.25	\$ 1.70	\$ 7.79	\$ 3.98	\$ 2.73	\$1.61	\$ 1.56	\$3.38	\$ 6.11	\$ 1.87
3	\$ 2.02	\$ 2.45	\$ 3.76	\$ 2.20	\$ 7.84	\$ 3.05	\$ 2.38	\$1.46	\$ 1.69	\$3.49	\$ 5.96	\$ 1.50
4	\$ 1.99	\$ 2.82	\$ 3.54	\$ 2.30	\$ 7.82	\$ 1.54	\$ 5.60	\$1.60	\$ 4.42	\$3.45	\$ 6.00	\$ 1.68
5	\$ 1.96	\$ 2.83	\$ 4.55	\$ 2.86	\$ 7.65	\$ 2.32	\$ 5.21	\$1.83	\$ 5.18	\$3.73	\$ 6.85	\$ 1.77
6	\$ 6.14	\$ 3.30	\$49.87	\$ 3.33	\$ 7.54	\$ 2.74	\$ 5.04	\$2.03	\$ 3.49	\$3.93	\$13.81	\$ 2.51
7	\$ 15.79	\$ 4.37	\$ 4.13	\$ 7.88	\$ 7.25	\$ 4.20	\$ 5.95	\$4.09	\$ 2.68	\$5.32	\$ 8.91	\$ 2.66
8	\$ 13.77	\$10.82	\$61.53	\$ 4.15	\$11.37	\$18.55	\$ 4.46	\$2.28	\$ 2.69	\$4.96	\$ 8.31	\$88.21
9	\$ 7.34	\$ 9.31	\$29.12	\$ 4.37	\$ 8.26	\$ 7.45	\$ 4.79	\$2.20	\$ 2.20	\$5.93	\$96.23	\$12.73
10	\$ 9.41	\$ 4.94	\$ 5.75	\$13.04	\$ 7.24	\$ 8.52	\$ 3.48	\$2.88	\$ 3.32	\$6.57	\$11.66	\$45.11
11	\$ 13.26	\$12.84	\$ 7.96	\$63.61	\$ 7.14	\$18.52	\$ 3.66	\$2.96	\$ 5.36	\$4.49	\$14.98	\$18.08
12	\$ 4.07	\$10.85	\$ 5.44	\$63.21	\$13.63	\$23.45	\$ 2.47	\$3.36	\$ 1.99	\$3.57	\$ 7.43	\$ 5.97
13	\$ 5.38	\$ 4.52	\$ 4.98	\$ 3.00	\$11.71	\$ 5.66	\$ 3.03	\$3.76	\$ 3.09	\$4.33	\$ 5.87	\$ 3.48
14	\$ 5.18	\$ 3.85	\$ 5.21	\$ 2.65	\$ 7.99	\$ 3.48	\$ 3.31	\$3.77	\$ 3.07	\$5.13	\$ 6.18	\$ 1.99
15	\$ 5.69	\$ 4.36	\$ 5.37	\$ 3.19	\$10.87	\$ 3.42	\$ 4.17	\$3.61	\$ 3.49	\$4.95	\$ 7.61	\$ 1.93
16	\$ 5.46	\$ 2.94	\$ 4.28	\$ 3.08	\$12.69	\$ 5.01	\$ 5.07	\$3.33	\$ 3.31	\$4.65	\$ 8.53	\$ 1.77
17	\$ 10.10	\$ 3.39	\$ 3.93	\$ 4.48	\$16.92	\$ 5.04	\$ 5.77	\$4.00	\$ 3.98	\$4.33	\$10.58	\$ 2.73
18	\$ 17.15	\$ 5.57	\$ 3.98	\$ 6.30	\$ 7.58	\$ 5.99	\$ 5.00	\$5.44	\$ 8.49	\$5.95	\$ 9.27	\$ 4.33
19	\$ 19.78	\$ 4.33	\$ 4.05	\$ 8.55	\$13.15	\$ 5.62	\$ 5.62	\$4.94	\$11.40	\$6.86	\$ 8.47	\$11.14
20	\$ 8.82	\$ 4.46	\$ 4.15	\$ 6.69	\$ 7.62	\$ 4.88	\$ 4.63	\$2.75	\$ 5.63	\$4.67	\$ 5.54	\$ 4.55
21	\$ 4.87	\$ 7.66	\$ 3.92	\$ 6.68	\$10.79	\$ 4.70	\$ 7.02	\$1.85	\$ 3.36	\$4.79	\$ 4.22	\$ 4.29
22	\$ 4.40	\$ 3.96	\$ 4.19	\$ 4.25	\$ 9.89	\$ 3.58	\$ 8.98	\$2.28	\$ 2.92	\$4.89	\$ 4.38	\$ 2.77
23	\$ 2.31	\$ 2.61	\$ 3.47	\$ 3.30	\$ 8.46	\$ 2.99	\$ 2.95	\$3.47	\$ 2.32	\$3.10	\$ 5.64	\$ 3.42
24	\$ 2.79	\$ 4.41	\$27.54	\$28.77	\$ 9.15	\$40.13	\$43.16	\$1.64	\$ 1.43	\$3.19	\$ 6.17	\$ 2.28

Examples of Uplifts

- There are many different kinds of uplifts which are charged on an hourly, daily and monthly granularity
- Some of the better known uplifts in Ontario are associated with the following:

Congestion Management Settlement Credit (CMSC)

- Costs incurred by constraining resources to take specific actions to maintain the reliability of the system. CMSC is charged on an annual basis

Cost Guarantees

- Costs incurred to commit generators in; (i) day-ahead , which are charged on a daily basis, and (ii) real-time, which are charged on a monthly basis

Ancillary Service Recovery

- Costs to cover reliability services such as Black Start Capability, Voltage Support, and Regulation Service. These are charged on a monthly basis

How are Uplifts Recovered?

- Uplifts represent the cost to reliably serve load and are thus recovered all resources withdrawing from the grid
- Most uplifts are volumetric and charged pro-rata on the allocated quantity of energy withdrawn (AQEW)

Uplifts –Sample Invoice

Charge Type	Description
100	NET ENERGY MARKET SETTLEMENT FOR GENERATORS AND DISPATCHABLE LOAD
105	CONGESTION MANAGEMENT SETTLEMENT CREDIT FOR ENERGY
148	CLASS B GLOBAL ADJUSTMENT SETTLEMENT AMOUNT
150	NET ENERGY MARKET SETTLEMENT UPLIFT
155	CONGESTION MANAGEMENT SETTLEMENT UPLIFT
169	STATION SERVICE REIMBURSEMENT DEBIT
183	GENERATION COST GUARANTEE RECOVERY DEBIT
186	INTERTIE FAILURE CHARGE REBATE
250	10-MINUTE SPINNING MARKET RESERVE HOURLY UPLIFT
252	10-MINUTE NON-SPINNING MARKET RESERVE HOURLY UPLIFT
254	30-MINUTE OPERATING RESERVE MARKET HOURLY UPLIFT
450	BLACK START CAPABILITY SETTLEMENT DEBIT
451	HOURLY REACTIVE SUPPORT AND VOLTAGE CONTROL SETTLEMENT DEBIT

For example, the CMSC paid out for an hour is charged to all load based on the proportion of total load they consumed

UPLIFT CONSIDERATIONS FOR ENERGY STORAGE RESOURCES

Role of Storage in Wholesale Markets

- Storage resources are unique in that they withdraw energy as “fuel” for the purpose of providing grid services at a later time
- As a result, these withdrawals are different than end-use consumption
- The MWs withdrawn are for the purpose of providing services to end-use consumers

Pass Through Costs

- Unlike other loads, storage participates solely within the closed loop of the electricity market; i.e., no downstream or secondary markets to pass on costs
 - Costs end-use consumers incur in the energy market can be passed on to downstream customers (buyers of steel, widgets, etc.)
- Uplifts levied by the electricity market to storage resources must ultimately be recouped from the same market
 - Across a range of markets and technologies it can be inefficient and counterproductive to levy additional costs (such as uplifts) on fuel as this will need to be recovered somehow
 - Adding uplifts to the costs of charging can increase costs to end-use consumers

Impact of Uplift: Illustrative Example

- Next slide will use an example to illustrate how:
 - Uplifts increase a storage resource's marginal cost
 - Translates into higher costs that must be passed on to consumers
 - This cost increase to the market far outweighs any nominal savings
- The example depicting a change in offers is not meant to be definitive
 - *Less important* to know definitively *how a storage resource manages this cost* increase and how it impacts an individual supplier's economics
 - *More important* to recognize that it *does increase cost* and that the resource must at least recover the cost of this levy – along with its other costs - or exit the market
- Highlights why the exemption treatment supports more efficient market outcomes

Impact of Uplift: Illustrative Example (cont.)

Consumer Load:
10,000MW
ESR Load: 100 MW
Total Uplift Cost:
\$50,000
ESR Marginal Cost:
\$100/mwh

- Scenario 1: Storage exempt from Uplift
 - Uplift cost to consumers is \$5/MWh ($\$50,000 / 10,000 \text{ MW}$)
 - Storage offers at \$100/MWh
 - Market price will be \$100 when storage is marginal

Applying uplifts to storage ends up *increasing* costs to the market. This increase (\$4.95/MWh) far outweighs the nominal uplift savings (\$0.05/MWh)

- Scenario 2: Storage pays uplift
 - Uplift cost to consumers is now \$4.95/MWh ($\$50,000 / (10,000 \text{ MW} + 100 \text{ MW storage load})$)
 - Savings: **\$0.05/MWh**

BUT

- Storage must now recoup this uplift cost
- Now storage offers at **\$104.95/mwh**
- Market clearing price will increase to **\$104.95** when the storage resource is marginal

Spectrum of Uplift Treatment for Storage Resources

Wholesale Load - Pay uplift

- Load portion of storage is treated as wholesale load
- Charged uplift consistent with other wholesale loads for the load portion of their market activity

Exemption - Pay no uplift

- Load portion of storage exempt from uplift
- Exemption on the basis that MWs bought to charge will be sold back to the market

Uplift Treatment in other Jurisdictions

- Based on the electricity as fuel principle, storage resources in neighboring markets will **generally be exempted from uplifts** (capacity, ancillary services, make-wholes)
 - **MISO:** Storage will not be assessed uplift charges based on the principle MWs bought to charge will be sold back to the market when discharging
 - **ISO-NE:** Uplift exemptions currently applied to PGS will be extended to storage
 - **NY-ISO:** Similar to PGS, storage will be modelled as a negative generator (as opposed to load) and avoid paying uplifts in equal treatment with generators

RECOMMENDED APPROACH

Overview

- The following slides provide insight into the IESO's recommended approach and rationale
- Today's conversation is focused on the principled approach without getting into more specific design/implementation details
- Stakeholders are invited to provide feedback and share insights on the recommended approach

Proposal: Fuel Exemption

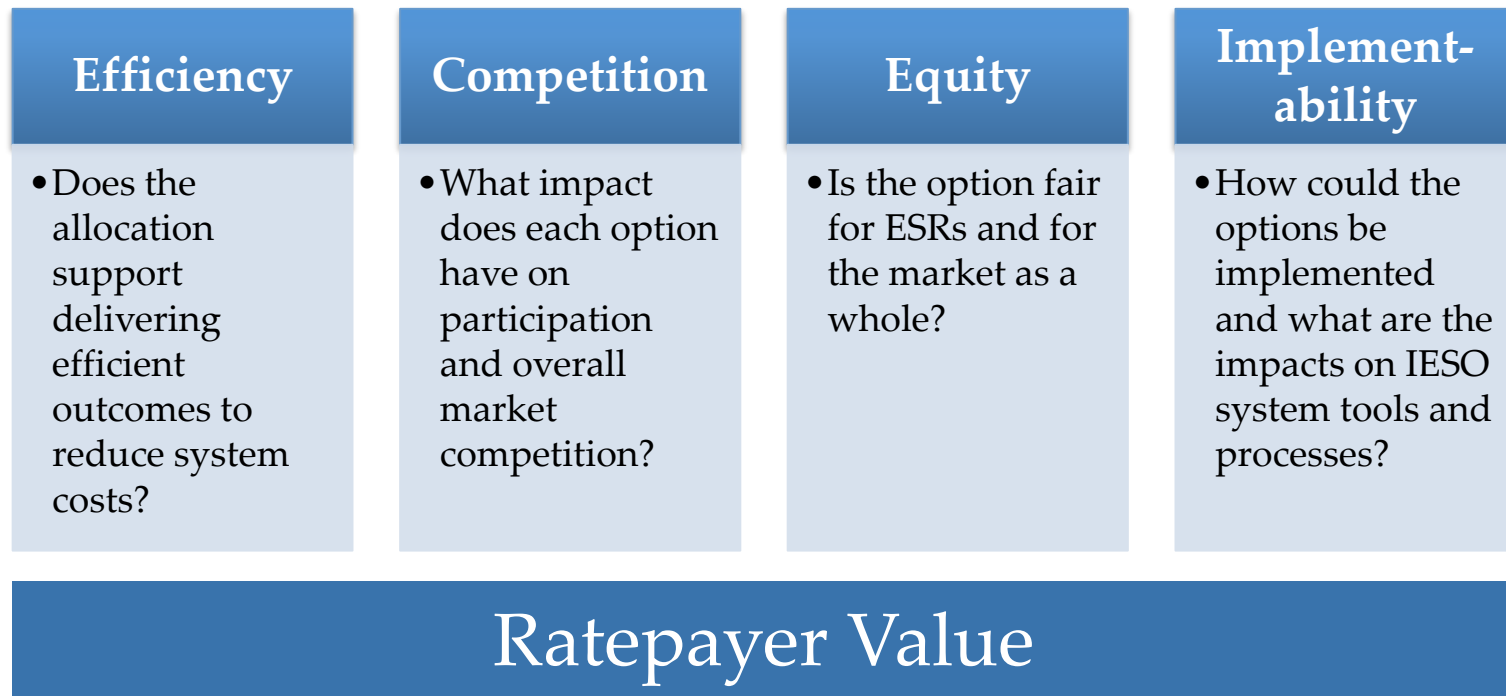
Storage should be exempt from uplift charges on 'fuel'

- MWs withdrawn for the sole purpose of providing services back to the grid should be exempt from uplifts within the purview of the IESO*
- Not a blanket exemption: any other withdrawals for any other purpose (e.g. commercial use of energy, station service, cooling fans, office lighting etc) would continue to be subject to all uplift applied to load

*Does not apply to uplifts or charges that may be administered by but are outside of IESO's purview (e.g. Global Adjustment, transmission charges, etc.)

Principles Considered

- The IESO weighed up a number of principles to assess how storage should be treated for uplift. A key focus was to ensure the approach does not negatively impact end-use consumers.



Considerations: Efficiency

- Applying uplift to storage when charging is akin to a “**fuel tax**” which, in the closed loop of the electricity market will need to be recovered from the electricity market
- Uplift fuel exemptions means the storage resource does not have pass this cost on to the market

Consumers benefit from lower offers that reflect the marginal cost of the energy storage resource

Considerations: Competition

- Fuel exemption ensures storage participation is driven by market price signals rather than after-the-fact uplift costs
 - Market prices and competition incent resources to be as efficient as possible to improve utilization in the energy and ancillary services markets

Consumers are ultimately the beneficiaries of this competitive dynamic

Considerations: Equity

- Generation

- Exemption does not apply to all load (only to fuel)
- Storage continue to pay uplifts on station service and other facility load like generators

- Load

- Storage fuel not like other end-use consumer load
- Exemption only applies to MWs withdrawn for the sole purpose of providing services back to the grid

Storage

- Unique from generation and load – use electrons as fuel
- Warrants considering unique treatment of fuel as separate from both station service and end-use consumption
- Treatment can also be informed by approach taken in other jurisdictions

Considerations: Implementability

- Uplift exemption on fuel is premised on the idea MWs withdrawn are for the sole purpose of providing services back to the grid
- Separate treatment would required on MWs withdrawn for other purposes. Subject to applicable law, this could potentially be achieved through:
 1. Additional metering to segment station service and other, commercial loads
 2. Determining a financial offset to the uplift value of energy withdrawn to ensure only the fuel portion is rebated

Stakeholder Feedback

- The IESO is seeking stakeholder feedback on the recommended approach to uplift charges
 - Please use the feedback form found under the June 24th entry of the [ESAG Webpage](#) and send to engagement@ieso.ca by July 15th
 - IESO will work to consider feedback and incorporate comments as appropriate and post responses on the [ESAG Webpage](#)