Overview of Energy Storage ISO Rule Amendments

May 9, 2022

Agenda

	Topic
1.	Introduction
2.	Scope of ISO rule revisions
3.	ES Terms & Definitions • *Hybrid asset / hybrid facility*
4.	ES Market & Operations Rules
5.	ES Facility Rules
6.	Fast Frequency Response Service Provisions
7.	Adjustment for Load on the Margin Provisions
8.	Feedback & Engagement time

Introduction

AESO Stakeholder Engagement Framework

Purpose of ES Rule Amendments

The AESO is consulting with Stakeholders on the development of the proposed Energy Storage ISO Rule Amendments that will:

- facilitate the integration of energy storage;
- improve the clarity required for market qualification and participation; and
- enable efficient, effective connection, monitoring, and control of energy storage when connected.

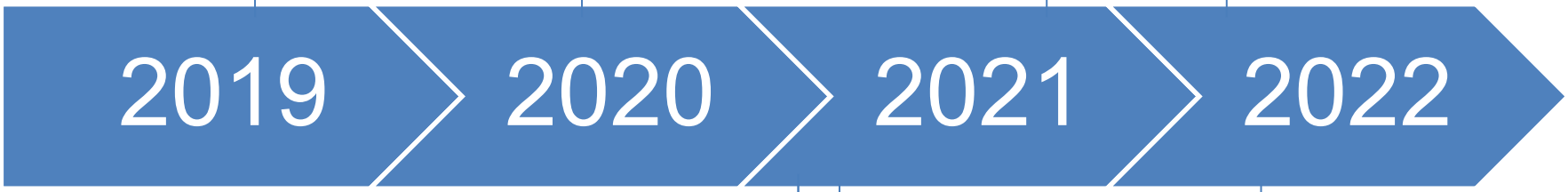
Energy Storage Engagement Steps

Aug 2019
Energy Storage Roadmap released

June 2020
Short-term implementation approach

Nov 2021
Bill 86, *Electricity Statutes Amendment Act, 2021* introduced
[*did not pass second reading*]

Apr 2022
Bill 22, *Electricity Statutes Amendment Act, 2021* introduced



Feb 17, 2021
- ISO rule development kick off
- Long-Term ES Market Participation Draft Recommendation Paper posted

Feb 24, 2021
Stakeholder Session on ES Market Participation Recommendation

Mar 31, 2021
Stakeholder Feedback on the ES Market Participation Recommendation

May 9, 2022
Draft ES ISO Rule Amendments posted

Purpose of Webinar

- This webinar is intended to provide:
  - an overview of the Energy Storage ISO Rule Amendments & tools;
  - context for ISO rule development issues that the AESO is seeking specific stakeholder input on;
  - instructions for the initial round of Stakeholder feedback; and
  - an overview of the engagement process and timeline.

Scope of Energy Storage ISO Rule Amendments

Scope of Energy Storage ISO Rule Amendments

- Substantive changes to:
  - integrate energy storage into the market in accordance with the long-term ES market participation recommendation paper;
  - clarify the technical & operating requirements for energy storage;
  - incorporate technoloogy-agnostic Fast Frequency Response Service, as storage may provide this ancillary service; and
  - incorporate Adjustment for Load on the Margin for sink assets that bid.
- In total:
  - Amendments to 44 existing ISO rules and 43 existing definitions
  - 1 new ISO rule and 2 new definitions

Scope of Energy Storage ISO Rule Amendments

- Some ISO rules that contain substantive changes for energy storage also contain administrative changes to:
  - create consistency in numbering conventions, punctuation, bolding, capitalizations, etc;
  - correct errors such as outdated subsection cross-references or references to old industry associations; and
  - align drafting of “notwithstanding” and “subject to” clauses.
- Administrative changes meet the definition from AUC Rule 017.
- Administrative changes are highlighted grey in the blacklines posted on the AESO website.

Energy Storage ISO Rule Amendment Map

- The Energy Storage ISO Rule Amendment Map is intended to showcase:
  - what ISO rules changed for what purpose;
  - the ISO rules only impacted by definition changes; and
  - what ISO rules did not change.

ISO Rule	CATEGORY OF REVISIONS					
	Impacted by Definitions	ES Market Requirements	ES Technical Requirements	Fast Frequency Response	Adjustment for Load on the Margin	Administrative Changes
Section 205.5 Spinning Reserve Technical Requirements and Performance Standards	X			X		X
Section 205.6 Supplemental Reserve Technical	X			X		X
Section 205.8 Transmission Must-Run	X	X				X

Consolidated Draft ISO Rule Book

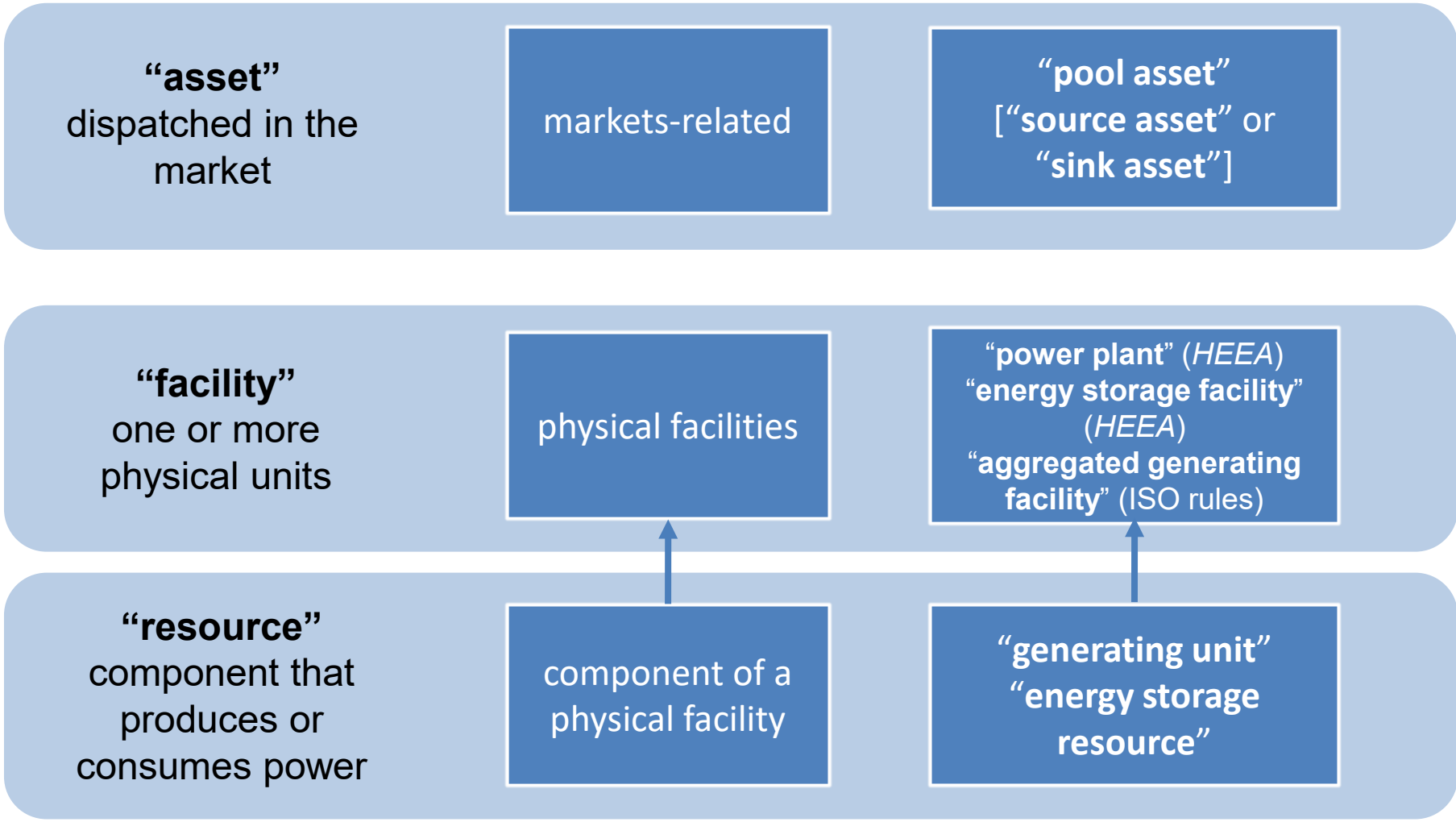
- The Consolidated Amended ISO Rule Book allows Stakeholders to:
  - efficiently search through the whole set of ISO rules; and
  - understand how the amended or new definitions impact ISO rules that either contain or do not contain other substantive changes.

Energy Storage Terms & Definitions

New and Amended Definitions Overview

- Definitions were revised to align with Bill 22, e.g.:
  - energy storage resource, energy storage facility, generating unit, market participant, transmission facility, electric distribution system.
- Majority of the definition changes are aimed at making the definitions technology agnostic, where applicable, e.g.:
  - pool asset, source asset, sink asset, etc.
- Where definitions need to reference specific technology, “energy storage resource” was added, e.g.:
  - Alberta internal load, maximum authorized real power, etc.
- Certain definitions revised for fast frequency response service, e.g.:
  - fast frequency response service, load shed service, in merit, merit order.

Asset / Facility Terminology – Background

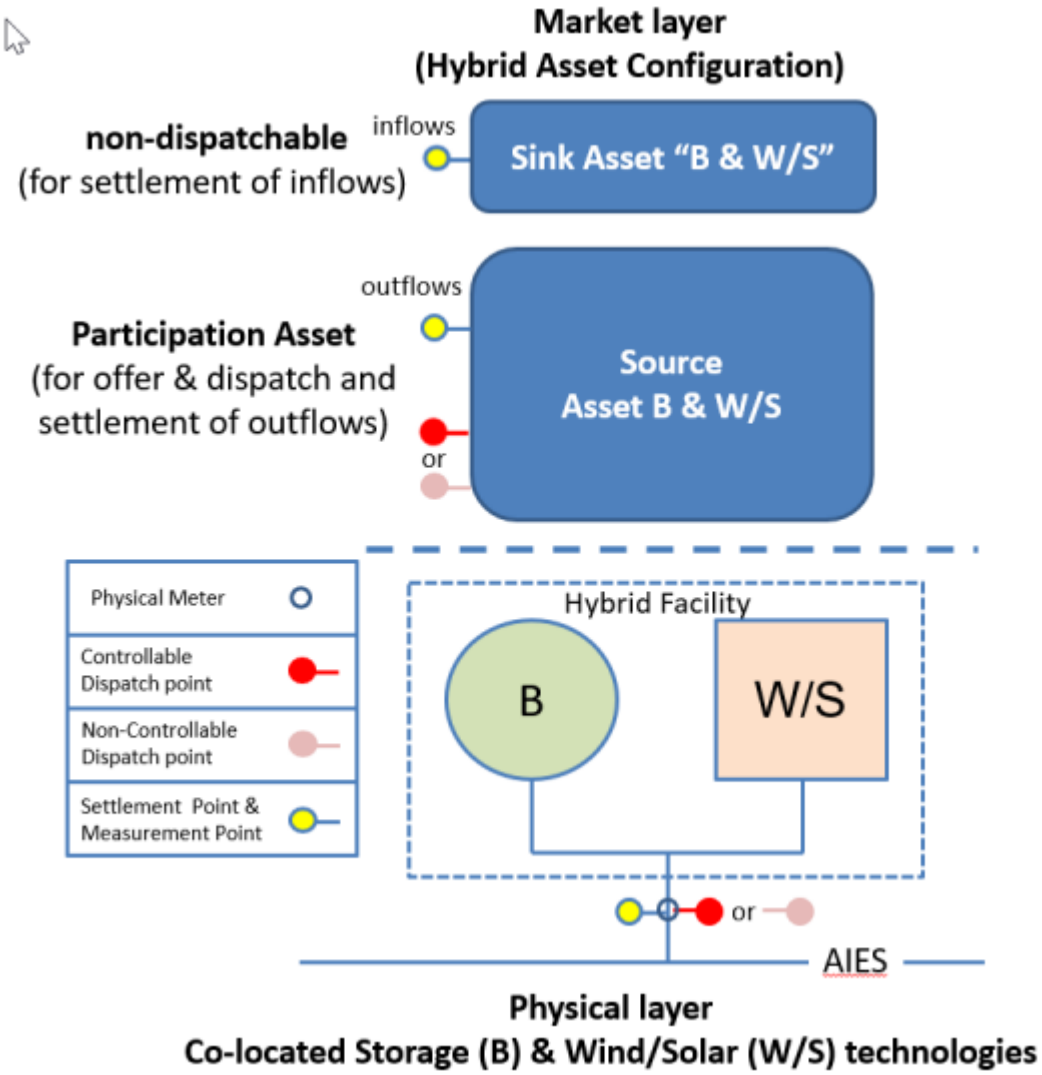


Asset / Facility Terminology – Background

- Applicability of ISO rules & requirements to assets / facilities

Generalizations	A parent term is used to capture all things in the group, e.g.: • *"**pool asset**"* • *"load facility" or "generating facility"*
Exclusionary	A parent term is used to capture all things in the group, with carve out for certain categories, e.g.: • *"**source asset**, excluding an **import asset**,…*
Specific Reference	Specific technologies are referenced or further qualified, e.g.: • *"**generating unit** or **aggregated generating facility**"* • *"battery **energy storage facility**"* • *"wind **aggregated generating facility**"*

Hybrid Asset / Hybrid Facility – Recap



Hybrid Asset / Hybrid Facility – Objective

- Existing definitions for assets, resources & facilities do not contemplate hybrids.
- Ensure the ISO rules and requirements are drafted in a clear manner for:
  - Hybrid asset market participation; and
  - Hybrid facility connection and control.

Hybrid Asset / Hybrid Facility – ISO Rule Implementation

- Amended "**aggregated generating facility**" to "**aggregated facility**" to apply to the aggregation of generating units, energy storage resources, or combination thereof:

*"**aggregated ~~generating~~ facility**" means, unless the **ISO** otherwise designates, an aggregation of 2 or more **generating units** or **energy storage resources**, or any combination of the two of them, including any associated **reactive power** resources , where:*

*(i) each **generating unit** or **energy storage resource** is rated less than 9 MW;*

*(ii) all **generating units** and **energy storage resources** are situated in the same proximate location and have a common **collector bus** or multiple **collector buses** that can be operated as common **collector bus**; and*

*(iii) the **aggregated facility** is connected to the **interconnected electric system** or the electrical system in the service area of the City of Medicine Hat.*

- By extension, an "aggregated facility" includes a hybrid facility, as well as aggregations of the same fuel type

Hybrid Asset / Hybrid Facility – ISO Rule Implementation

Market Rules (200- & 300- series)

- To implement the variable energy resource (VER) block volume design from the Long Term, Energy Storage. Recommendation Paper, “allowable dispatch variance” is amended to include dispatch tolerances for pool assets that are aggregated facilities containing VER + energy storage resources that are commonly controlled.

Facility Rules (500- series)

- No unique technical requirements applicable to a hybrid facility today.
- An aggregated facility must comply with the tech-specific rules for the underlying technologies within the facility.
- Sections 502.1 & 502.16 are retitled to apply only to wind or solar.

Hybrid Facility – Implementation of Facility Rules

Generating unit & synchronous energy storage	Wind or solar farm	Battery energy storage	Aggregated facility
Section 502.5 Section 502.6 other 500-series that reference GU or ESR	Section 502.1 Section 502.16 other 500-series that reference wind or solar	Section 502.13 Section 502.14 other 500-series that reference ESR	any combo of multiple resources (same or different technology) Relevant tech-specific rules other 500-series that reference aggregated facility

Hybrid Facility – Implementation Issues

- The definition of “aggregated facility” creates two issues:

1. Compliance issue

- Technology-specific rules in the 500-series apply to resources (i.e., the parts of a facility).
- Aggregated facilities comprised of different fuel types may not be able to directly comply with applicable technology specific rules because: (a) technologies that are co-located & commonly controlled need to work in concert to meet facility requirements; and (b) requirements for different co-located technologies may conflict.

2. Size threshold issue

- Generating units and energy storage resources within an aggregated facility must be rated less than 9MW.
- Raising or removing the 9MW threshold requires further analysis.

Hybrid Facility – Option 1

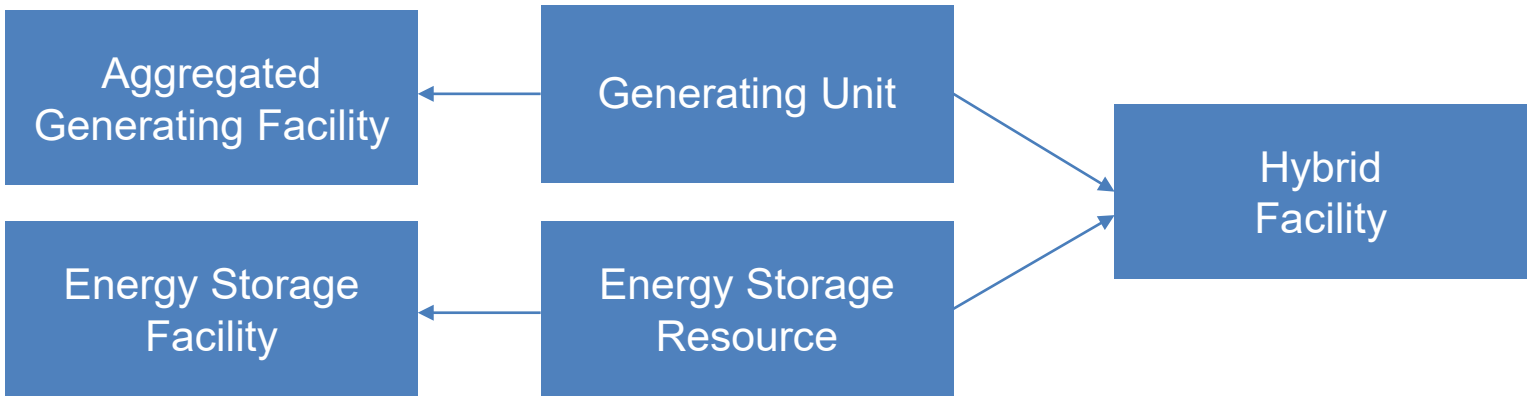
- Option 1: proceed with “aggregated facility”
  - Address the compliance issue through a new ISO rule

    Sample draft language:

    *The **ISO** must, when assessing the compliance of a facility that comprised of co-located, commonly-controlled technologies that are different fuel types with a requirement in any Section in Division 502, Technical Requirements of Part 500, Facilities of the **ISO rules**, assess whether the facility complies with the requirements, as applicable.*
  - Use waiver & variance as interim solution to accommodate aggregations of resources, where a resource may be greater than 9MW

Hybrid Facility – Option 2

- Option 2: keep “aggregated generating facility” and adopt new definition of “hybrid facility”, where:



- Implementation:
  - Write new ISO rules applicable to “hybrid facility” and incorporate “hybrid facility” into existing rules were necessary

Hybrid Facility – Options Analysis

Option 1: Define "Aggregated Facility"	Option 2: Define "Hybrid Facility"
Pools together "aggregated generating facility" and "hybrid facility" under one term	**Separate and distinct concepts for "aggregated generating facility" and "hybrid facility"**

• Provides flexibility to:
  • introduce future tech-specific rules as needed;
  • easily allow for aggregations of things we don't know about yet;
  • adopt a definition of "hybrid facility" as a subset of "aggregated facility" should it be needed in the future.
• Compliance issue will be clarified through a separate ISO rule.
• Evaluate size threshold issue and update the definition of AF accordingly.
	• Less future proof in that the rules for hybrid facilities that we write today will assume that all configurations of generating units and energy storage resources have the same characteristics and requirements, regardless of the technology within the facility.
	• Anticipated to create more red tape considering permutations of variable & non-variable energy resources and energy storage resources.
	• Solves the Compliance issue (requirements will apply to facility level, not resource level)
	• The size threshold issue still needs to be evaluated to permit aggregations of larger generating units of different fuels.

Energy Storage Market & Operating Rules

Market Rules Overview (200-series)

- Removed technology specific references (generator, load) where possible ensuring the market responsibilities for source and sink assets include energy storage resources.
  - Source and sink assets are virtual entities used for market participation that loosely couple to the physical facility
  - Energy storage has both a source and sink asset
- Some existing market rules are not technology agnostic, so energy storage resource was inserted next to aggregated facility & generating unit, where applicable.

Market Rules Overview (200-series)

- Unique allowable dispatch variance requirements for VER/storage that are single market assets.
  - Implementation of VER block concept within ADV definition
- Section 203.5 is a new rule added to enable bid dispatch compliance.
  - May bid
  - Must comply when bid dispatched off (price is above bid price)
- Commissioning requirements for energy storage:
  - After the long-term recommendation paper, the AESO subsequently determined that it is not necessary for sites with both inflows and outflows to submit 2 offer blocks

Operations Rules Overview (300-Series)

- Inserted “energy storage resource” next to generating unit & aggregated facility, where applicable.
- Energy storage outage reporting:
  - Retitled Section 306.5 to “Source Asset Outage Reporting and Coordination” to account for energy storage.
  - Energy storage may also be subject to load outage reporting in Section 306.3 if the outage is greater than 40MW.
- References to “bulk electric system” in Section 304.7 and Section 304.8 replaced with references to facilities “directly connected to the transmission system and energized at a 100kV or higher”.
  - Incorporates energy storage without having to amend outdated ISO rules definition of “bulk electric system”.

Energy Storage Facility Rules

Facility Rules Overview (500-series)

- Objectives:
  - Incorporate energy storage resources into existing facility rules
    - Facility technical & operating rules already exist for battery energy storage (Sections 502.13 & 502.14)
    - Ensure ISO rules reflected other types of energy storage technologies
  - Recognize the uniqueness of energy storage resources to the greatest extent possible

Facility Rules Overview (500-series)

- Inserted “energy storage resource” next to generating unit & aggregated facility, where applicable.
- Revised “battery energy storage facility” to “battery energy storage resource”.
- Grouped energy storage that uses synchronous machine technology with generating units in Section 502.5 & Section 502.6 because technical and operating requirements are the same.

Facility Rules Overview (500-series)

- Amended Section 502.8 to include SCADA requirements for all energy storage.
  - Specific battery state of charge SCADA requirements included in same table
- Accounted for energy storage ownership by a regulated utility contemplated in accordance with Bill 22, where applicable.

Fast Frequency Response Service Provisions

FFR Provisions Overview

- Fast Frequency Response (FFR) service is a fast-acting transmission reliability service that will facilitate the arrest of, and recovery from, frequency decay caused by events such as the sudden loss of imports from the Alberta-B.C. Intertie and the Montana-Alberta Tie Line.
- Energy storage roadmap identified opportunity to test FFR from new technologies, including storage.
- ISO rules do not contemplate source assets providing FFR.
  - This service is currently provided by load through Load Shed Service for imports (LSSi).

FFR Provisions Overview

- Rule & definition changes were aimed at facilitating technology-agnostic FFR:
  - New definition of FFR drafted to capture a wide range of potential frequency response products in the future.
  - Replaced “load shed service” with “fast frequency response service” in ISO rules.
    - Revised “load shed service” definition is referenced in current LSSi contracts and will remain in the Consolidated Authoritative Document Glossary until the contracts expire.

FFR Provisions Overview

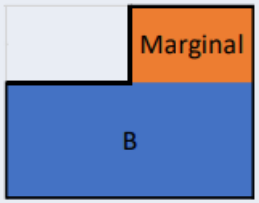
- Concurrent energy and OR requirements were moved from Section 205.2 to Section 203.4 and expanded to include FFR
- New subsections in Section 205.5 and Section 205.6 address cumulative response for spinning reserve, supplemental reserve, and other ancillary services, which includes FFR
- Redundancies with LSSi and FFR contractual obligations were removed from Section 303.1
- Table in Appendix 5 of Section 502.8 was revised to incorporate SCADA requirements for FFR providers

Adjustment for Load on the Margin

Adjustment for Load on the Margin Provisions Overview

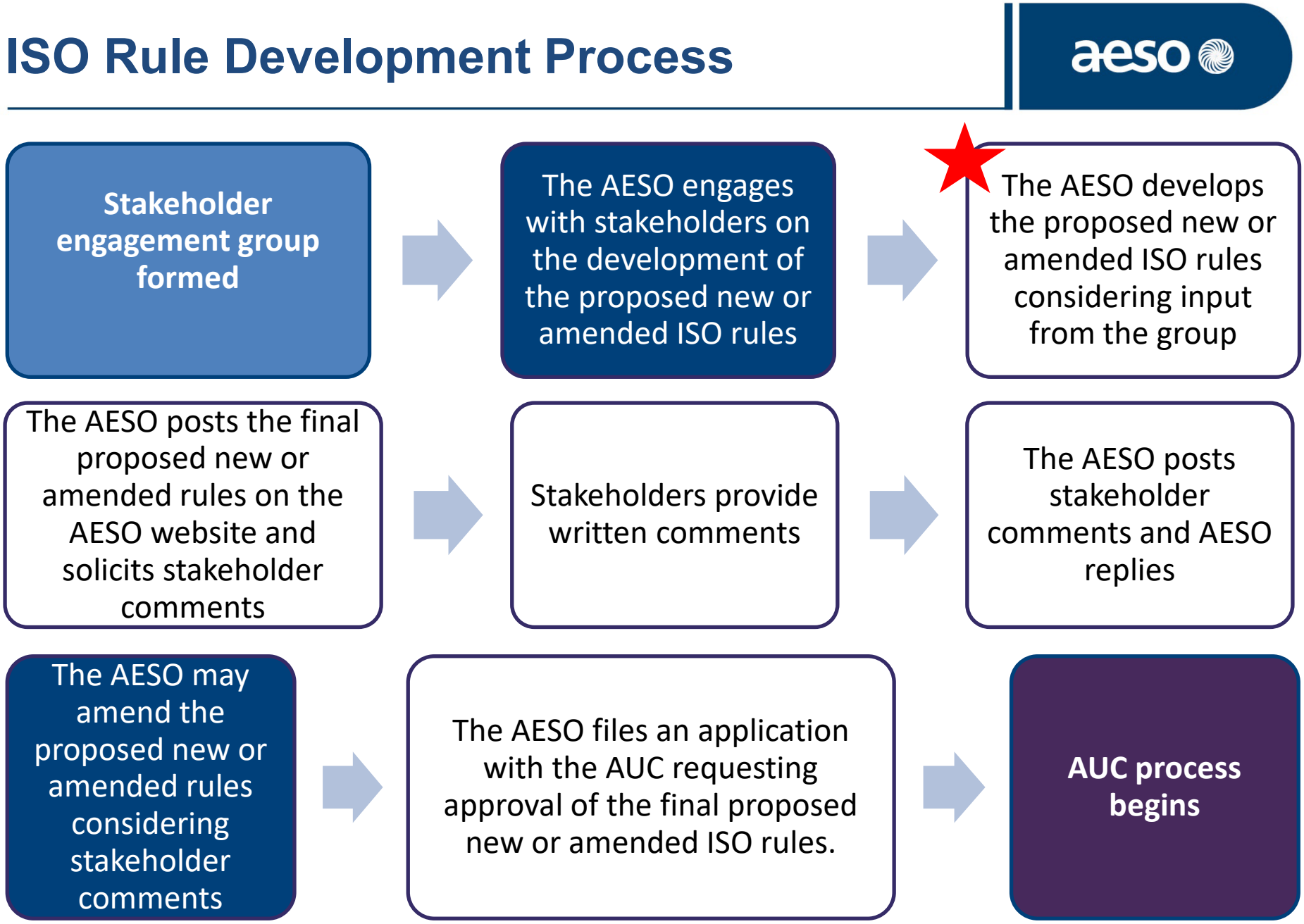
- Adjustment for Load on the Margin (ALM) creates an equivalency to payment to suppliers on the Margin (PSM).
- ALM is a true-up to bid approach, that ensures load does not pay any more than the bid price for dispatched energy consumed. The adjustments equal the difference between pool price and bid price, multiplied by volume of energy consumed in the dispatched bid block.
- Cost of ALM is charged pro-rata to all load consuming in the hour ALM is paid.
- Amended Section 103.4 to include ALM formula.

Adjustment for Load on the Margin Provisions Overview

PSM	ALM	Changes
If (A-B) <= (C-B) Use (A-B) * (D – PP)	If (A-B) <= (C-B) Use (A-B) * (PP – D)	• Changed order of subtraction for prices to account for bid
If (A-B) > (C-B) Use (C-B) * (D– PP)	If (A-B) > (C-B) Use (C-B) * (PP – D)	• Changed order of subtraction for prices to account for bid
A: Metered volume B: Dispatched blocks below marginal block C: All dispatched blocks (marginal block + B) D: Block offer price PP: Pool Price	A: Metered volume B: Dispatched blocks above marginal block C: All dispatched blocks (marginal block + B) D: Block bid price PP: Pool Price	• Substituted bid for offer price • Substituted above for below to account for order of dispatch
		

Next Steps

ISO Rule Development Process



Comment Matrices

- 3 comment matrices:

Document	Description
Stakeholder Comment Matrix – Draft Proposed New and Amended ISO Rules	• Comments on the new or amended content of each individual rule, including questions and suggestions to improve clarity
Stakeholder Comment Matrix – Draft New and Amended Definitions	• Comments on each proposed new or amended definition, including questions and suggestions to improve clarity
Stakeholder Comment Matrix – Proposed Energy Storage ISO Rule Amendments Specific Questions	• AESO is seeking specific stakeholder feedback on key issues

Engagement Timeline

Dates	Consultation Step
June 9, 2022	Initial Stakeholder feedback on draft Energy Storage ISO Rule Amendments due
June – August 2022	*Break*
September 2022	Virtual (or hybrid) Stakeholder sessions **targeting second or third week of Sept.*
October – December 2022	AUC Rule 017 ISO rule comment process on final proposed Energy Storage ISO Rule Amendments

Thank You