

November 22, 2022

To: The Market Surveillance Administrator, market participants and other interested parties
("Stakeholders")

Re: Letter of Notice of Final Draft Amendments to ISO rules and Definitions to Enable Energy Storage ("Energy Storage ISO Rule Amendments")

The AESO team would like to first thank Stakeholders for their continued participation and flexibility in this initiative. The Stakeholder feedback received through the initial round of written comments, and the discussion at the two sessions in September, significantly contributed to moving the Energy Storage ISO Rule Amendments forward to this next stage.

As stated at the outset of this engagement, the current ISO rules were not developed in contemplation of energy storage, except for a discrete sub-set of technical and operating requirements for battery energy storage. The primary objectives in this initiative have been to:

- 1) solve for the gaps in energy market and ancillary services qualification and participation for energy storage; and
- 2) implement the full suite of technical and operating requirements for foreseeable types of energy storage technologies, including synchronous energy storage types, battery energy storage, and aggregations of energy storage and other technologies (i.e., hybrid facilities).

A high-level summary of the ISO rule amendments made to achieve these objectives is attached to this letter as *Appendix I – Overview of Final Draft Energy Storage ISO Rule Amendments*.

Throughout this engagement, the AESO team has identified reasonable opportunities to: (i) reduce requirements where no longer relevant as part of red tape reduction efforts; (ii) align the language of requirements to a common format that identifies the obligation and the entity responsible for it; and (iii) make other administrative fixes.

It was not within scope of this initiative to address all potential areas of concern with the ISO rules. However, we do appreciate Stakeholders flagging other issues in their written feedback and we will assess whether and how to efficiently address these items in future engagements.

Next Steps

Pursuant to Alberta Utilities Commission Rule 017: *Procedures and Process for Development of ISO Rules and Filing of ISO Rules with the Alberta Utilities Commission* ("AUC Rule 017"), we are now seeking written comments from Stakeholders on the final draft Energy Storage ISO Rule Amendments.

The title "*final draft*" simply indicates that we would like to move to the next stage of the AUC Rule 017 process where the AESO provides written responses to Stakeholder comments prior to filing its application for approval with the Commission. However, we recognize that further engagement and rule revisions may be required before finalizing the ISO rules, especially in recognition of the structural change in the technical and operating Division.

The AESO team is open to conducting another session in early 2023 if Stakeholders indicate in their written feedback that an additional session would be helpful. The focus of the additional session would be on outstanding questions and issues that Stakeholders identify to the AESO in their written comments.

Below is the proposed schedule to accommodate another session, if required:

Target Date	Consultation Step
December 19, 2022	Stakeholder comments on final Energy Storage ISO Rule Amendments due
January 2023 (third/ fourth week)	Additional stakeholder session, if required
February 2023	AESO written responses to Stakeholder comments posted
Q1 2023	Application filed with the Commission

Stakeholder Comments

The AESO is providing three comment matrices to organize feedback on the Energy Storage ISO Rule Amendments:

- *Stakeholder Comment Matrix – Final Proposed Energy Storage ISO Rules*
- *Stakeholder Comment Matrix – Final Proposed Energy Storage Definitions*
- *Stakeholder Comment Matrix – Specific Questions*

As indicated previously, we have been using this engagement to pilot some different tools to communicate the proposed ISO rule changes and their context. To assist Stakeholders with their review of the final draft Energy Storage ISO Rule Amendments, we have also provided the following:

- The **Sankey Diagram for the Transition from Division 502 to Division 503** provides a high-level illustration of the transfer and consolidation of existing requirements in Division 502 to proposed new Division 503, which is now organized based on subject matter.
- The **Table of Concordance for the Transition from Division 502 to Division 503** traces the movement of the technical and operating requirements from the previous Division 502 rules to the Division 503 rules.

The deadline for Stakeholders to provide comments, as noted above, is **December 19, 2022** to rules_comments@aeso.ca. When submitting comments to the AESO, Stakeholders should ensure that comments provided represent all interests within their organization. The AESO will publish all Stakeholder comments received by the deadline.

Related Materials

The following documents can be accessed on the Stakeholder Engagement page on the AESO website:

1. *Stakeholder Comment Matrix – Final Proposed Energy Storage ISO Rules*
2. *Stakeholder Comment Matrix – Final Proposed Energy Storage Definitions*
3. *Stakeholder Comment Matrix – Specific Questions*
4. Consolidated Proposed Final ISO Rule Book (blackline and clean copies)
5. Proposed Final Definitions
6. Sankey Diagram for the Transition from Division 502 to Division 503
7. Table of Concordance for the Transition from Division 502 to Division 503
8. Minutes from September Session 1
9. Minutes from September Session 2

If you have any questions, please submit them to rules_comments@aeso.ca.

Sincerely,

Jackie Gow

Legal Manager, ISO Rules and Alberta Reliability Standards
Legal and Regulatory Affairs

Appendix I – Overview of Final Draft Energy Storage ISO Rule Amendments

Part 100 of the ISO rules - Administrative

- Divisions 101 and 103 of the ISO rules are administrative requirements that apply to market participants. The definition of “market participant” is amended to refer to any person that “stores” electricity, electric energy, electricity services, or ancillary services.
- Section 103.4, *Power Pool Financial Settlement* is amended to implement Adjustment for Load on the Margin (“ALM”). The AESO engaged stakeholders on the design for ALM in Spring 2021.¹ The revisions to the ISO rules to implement ALM were combined with the Energy Storage ISO Rule Amendment work for efficiency, as both energy storage and load will be eligible for ALM if the pool participant submits as bid and compiles with a corresponding dispatch.
- Section 103.14, *Waivers and Variances* is now amended to refer to the proposed new Division 503 rules, as described in further detail under Part 500 below.

Part 200 of the ISO rules - Market

- Energy storage will have a “sink asset” and a “source asset”, per the amended definitions. If the maximum capability of the source asset is greater than or equal to 5 MW, energy storage must offer into the energy market and comply with the existing energy market rules framework in Divisions 201 through 204.
- Division 205 is amended where necessary to recognize that energy storage may participate in the operating reserve market. Like other technologies, participation will depend on whether the facility meets the eligibility criteria for providing operating reserve.
- Section 203.5, *Consumption Requirements for Bids* is introduced to clarify the obligations for bidding, should energy storage or load choose to submit a bid. Section 3.2 of the *Long-term Energy Storage Market Participation Draft Recommendation Paper* set out the design for bidding.² The AESO also provided a summary of bidding in the *AESO Written Responses to Initial Stakeholder Feedback*.
- The definition of “allowable dispatch variance” (“ADV”) is amended to implement the “Variable Block Volume” – also referred to as “VER block” – design set out in Section 3.1 of the *Long-term Energy Storage Market Participation Draft Recommendation Paper*.³ Where energy storage and variable energy technologies are co-located on the same site and configured to participate in the energy market as a combined, single pool asset, the VER-block design automatically assigns the variable energy portion to the lowest blocks from the bottom up for the purposes of dispatch compliance assessment.

At the September 15th Stakeholder session, the AESO presented an option to replace references to specific technologies in the ADV definition with technology-agnostic terms in order to tie dispatch compliance to a pool asset’s attributes, rather than technology type. In Table 1 below:

- The first row is the technology-agnostic proposal: (i) if a source asset is “controllable” by definition, the dispatch compliance is based on dispatch level alone; (ii) if a source asset is “non-controllable” by definition, the dispatch compliance is based on meteorological conditions;⁴ or (iii) if the source asset is “partially-controllable” by definition, the dispatch

¹ Stakeholders can access the design details for ALM on the AESO website: [Adjustment for Load on the Margin » AESO](#)

² [Long-term-Energy-Storage-Market-Participation-Draft-Recommendation-FINAL-17FEB2021.pdf \(aeso.ca\)](#) (ES Recommendation Paper), PDF 19-25.

³ ES Recommendation Paper, PDF 8-19.

⁴ Same as wind and solar resources today where meteorological (MET) data is converted into a variable energy resource power forecast, which becomes the expected energy delivery from these resources. See ES Recommendation Paper, PDF 9.

compliance is based on a combination of (i) and (ii) where the bottom portion (i.e., the variable energy resource quantity) of the pool assets capability is assessed against meteorological conditions and the remainder against dispatch.

- The second row reflects the original revisions to the existing technology-specific ADV definition. “Variable energy resource quantity” has been clarified.

The AESO supports the technology-agnostic definition because tying ADV to the attributes of a pool asset: (i) decouples energy market concepts from physical electric system connection concepts; and (ii) potentially avoids future amendments to this definition to accommodate new technologies.

Table 1 – ADV Definitions

Technology-agnostic ADV	
“allowable dispatch variance” means:	
(i)	for a source asset that is controllable , as measured from the dispatch quantity: <ul style="list-style-type: none"> (a) plus or minus 5 MW for a source asset with a maximum capability of 200 MW or less; or (b) plus or minus 10 MW for a source asset, with a maximum capability of greater than 200 MW;
(ii)	for each source asset that is non-controllable with a maximum capability of 200MW or less: <ul style="list-style-type: none"> (a) 5 MW greater than the dispatch quantity and 5 MW less than the potential real power capability, if the potential real power capability is less than the dispatch quantity; or (b) plus or minus 5 MW from the dispatch quantity, if the potential real power capability is greater than or equal to the dispatch quantity;
(iii)	for a source asset that is non-controllable with a maximum capability of greater than 200 MW: <ul style="list-style-type: none"> (a) 10 MW greater than the dispatch quantity and 10 MW less than the potential real power capability, if the potential real power capability is less than the dispatch quantity; or (b) plus or minus 10 MW from the dispatch quantity, if the potential real power capability is greater than or equal to the dispatch quantity;
(iv)	for a source asset that is partially-controllable with a maximum capability of 200 MW or less, when the source asset is dispatched within the variable energy resource quantity: <ul style="list-style-type: none"> (a) 5 MW greater than the dispatch quantity and 5 MW less than the potential real power capability, if the potential real power capability is less than the dispatch quantity; or (b) plus or minus 5 MW from the dispatch quantity, if the potential real power capability is greater than or equal to the dispatch quantity;
(v)	for a source asset that is partially-controllable with a maximum capability greater than 200 MW, when the source asset is dispatched within the variable energy resource quantity : <ul style="list-style-type: none"> (a) 10 MW greater than the dispatch quantity and 10 MW less than the potential real power capability, if the potential real power capability is less than the dispatch quantity; or (b) plus or minus 10 MW from the dispatch quantity, if the potential real power capability is greater than or equal to the dispatch quantity;
or	
(v)	for a source asset that is partially-controllable , when the source asset is dispatched outside the variable energy resource quantity : <ul style="list-style-type: none"> (a) plus or minus 5 MW for a source asset with a maximum capability of 200 MW or less; or (b) plus or minus 10 MW for a source asset with a maximum capability of greater than 200 MW.

“**controllable**” means a **pool asset** is able to:

- (i) increase energy production or consumption; and
- (ii) decrease energy production or consumption,

to meet a **dispatch** quantity or **directive** quantity under normal operating conditions, irrespective of solar or wind conditions.

“**non-controllable**” means a **pool asset** is not able to:

- (i) increase energy production or consumption; and
- (ii) decrease energy production or consumption,

to meet a **dispatch** quantity or **directive** quantity under normal operating conditions in all solar or wind conditions.

“**partially-controllable**” means a **pool asset** that contains one or more **controllable** resource and one or more **non-controllable** resources.

“**variable energy resource quantity**” means the portion of the **maximum capability** of a **source asset**, starting from 0 MW, that is deemed to be dependent on solar or wind conditions.

Technology-specific ADV (original May 9, 2022 revision)

“**allowable dispatch variance**” means:

- (i) for each **source asset**, excluding an import asset and a wind or solar **aggregated facility**, as measured from the **dispatch** quantity:
 - (a) plus or minus 5 MW for a **source asset**, with a **maximum capability** of 200 MW or less; or
 - (b) plus or minus 10 MW for a **source asset**, with a **maximum capability** greater than 200 MW;
 - (ii) for each wind or solar **aggregated facility** with a **maximum capability** of 200 MW or less:
 - (a) 5 MW greater than the **dispatch** quantity and 5 MW less than the potential **real power** capability, if the potential **real power** capability is less than the **dispatch** quantity; or
 - (b) plus or minus 5 MW from the **dispatch** quantity, if the potential **real power** capability is greater than or equal to the **dispatch** quantity; and
 - (iii) for each wind or solar **aggregated facility** with a **maximum capability** greater than 200 MW:
 - (a) 10 MW greater than the **dispatch** quantity and 10 MW less than the potential **real power** capability, if the potential **real power** capability is less than the **dispatch** quantity; or
 - (b) plus or minus 10 MW from the **dispatch** quantity, if the potential **real power** capability is greater than or equal to the **dispatch** quantity;
 - (iv) for a single **pool asset** that is an **aggregated facility** containing wind or solar, and an **energy storage resource**, and for which the **ISO** issues a **dispatch** within the variable energy resource quantity:
 - (a) 5 MW greater than the **dispatch** quantity and 5 MW less than the potential **real power** capability, if the potential **real power** capability is less than the **dispatch** quantity; or
 - (b) plus or minus 5 MW from the **dispatch** quantity, if the potential **real power** capability is greater than or equal to the **dispatch** quantity;
- or
- (v) for a single **pool asset** that is an aggregated facility containing wind or solar and an energy storage resource, and for which the **ISO** issues a **dispatch** outside the **variable energy resource quantity**:
 - (a) plus or minus 5 MW from the dispatch quantity for a **source asset**, excluding an import asset, with a **maximum capability** of 200 MW or less; or

- (b) plus or minus 10 MW from the dispatch quantity for a **source asset**, excluding an import asset, with a **maximum capability** of greater than 200 MW.

“**variable energy resource quantity**” means the portion of the **maximum capability** of a **source asset**, starting from 0 MW, that is deemed to be dependent on solar or wind conditions.

Part 300 – System Reliability and Operations

- Relevant ISO rules within Part 300 are amended to incorporate energy storage into the existing regimes for routine system operations (Division 304) and outage reporting (Division 306).
- Section 304.3, *Wind and Solar Power Ramp Up Management* and Section 304.9, *Wind and Solar Aggregated Facility Forecasting* have been clarified to apply to an “*aggregated facility containing wind or solar*”.

Part 500 - Facilities

- Section 501.10, *Transmission Loss Factors* is amended to apply the existing loss factor methodology to energy storage based on type of system access service.
- Division 502 of the ISO rules has transitioned to Division 503 as part of the work to implement the full suite of technical and operating requirements for foreseeable types of energy storage technologies, including synchronous energy storage types, battery energy storage, and aggregations of energy storage and other technologies (i.e., hybrid facilities).

Earlier in this engagement, Stakeholders expressed their support for using “aggregated facility” in the ISO rules as a common term for any and all combinations of technologies that are co-located on the same site, including: (i) “pure” aggregations of the same technology type; and (ii) “hybrid” aggregations comprised of different technology types. At the September sessions, the AESO clarified the following:

- For the purposes of the ISO rules, the defining factor of an “aggregated facility” is the size of the resources within the fence of the facility because: (i) in several cases, those resources are permitted to share systems or system elements; and (ii) compliance with technical and operating requirements is assessed on the whole facility, rather than on each individual resource.
- In contrast, larger resources require their own dedicated systems and system elements for reliability reasons, and compliance with technical requirements is assessed at the individual resource level.

As illustrated in Table 2 below, the structure of existing Division 502 is split between “technology-based” and “requirement-based” ISO rules. The AESO team conducted a detailed line-by-line analysis of the technology-based rules and identified that close to 60% of existing requirements were common to all technologies and configurations. Maintaining the split between technology-based and requirement-based suddenly became impractical in the face of implementing “aggregated facility” for the following reasons:

- Technical and operating requirements for facilities differ in recognition of: (i) the synchronous nature of generating units and specific types of energy storage; (ii) the asynchronous nature of certain wind, solar or battery technologies; (iii) the variable nature of wind and solar technology; and (iv) the charging capability of energy storage.

- Existing technology-based rules for aggregated facilities apply to “pure” wind and solar⁵ and “pure” battery⁶ aggregated facilities. Maintaining these rules in their existing form required crafting new technology-based rules to fill the gaps in requirements for “hybrid” aggregated facilities. The requirements for a “hybrid” aggregated facility may differ based on the types of technology within the fence (see preceding bullet), therefore maintaining the existing “pure” technology-based rules meant: (i) committing down a path of writing more technology-based rules for all the various technology combinations, those currently contemplated as well as when new forms emerge in the future; (ii) risking confusion in applicability of the “pure” rules versus the “hybrid” rules; and (iii) perpetuating the duplication in technical and operating requirements.

Table 2 – Transition from Division 502 to Division 503 of the ISO Rules

Existing Division 502	→	Proposed Division 503
“Technology-based” ISO Rules <i>Rule only applies to a single technology</i>		“Requirement-based” ISO Rules <i>Rule applies to all technologies</i>
<ul style="list-style-type: none"> Generating Unit Technical Requirements (502.5) Generating Unit Operating Requirements (502.6) Aggregated Generating Unit Technical Requirements (502.1) Aggregated Generating Unit Operating Requirements (502.16) Battery Energy Storage Facility Technical Requirements (502.13) Battery Energy Storage Facility Operating Requirements (502.14) Load Facility Technical Requirements (502.7) 		<ul style="list-style-type: none"> Functional Specification and Legacy Treatment (503.1) Maximum Authorized Real Power and Maximum Authorized Charging Power (503.2) Reactive Power (503.3) Voltage Regulation (503.4) Voltage Ride-Through (503.5) Frequency and Speed Governing (503.6) Power System Stabilizer (503.7) Step-Up Transformer (503.8) Auxiliary Systems (503.9) Isolating and Interrupting Devices (503.10) Power Quality (503.11) Grounding and Surge Protection (503.12) Synchrophasor Measurement System (503.13) Sequence of Events Monitoring (503.14) Interconnected Electric System Protection (503.15) SCADA (503.16) Revenue Metering System (503.17) Operation and Maintenance of Facilities (503.18) Reactive Power Verification Testing (503.19) Baseline and Model Validation Testing (503.20) Reporting Facility Modelling Data (503.21)
“Requirement-based” ISO Rules <i>Rule applies to all technologies</i>		
<ul style="list-style-type: none"> Bulk Transmission Line Technical Requirements (502.2) Interconnected Electric System Protection Requirements (502.3) 		

⁵ Section 502.1, *Aggregated Generating Facilities Technical Requirements* and Section 502.16, *Aggregated Generating Facilities Operating Requirements*.

⁶ Section 502.13, *Battery Energy Storage Facility Technical Requirements* and Section 502.14, *Battery Energy Storage Operating Requirements*.

<ul style="list-style-type: none"> • Automated Dispatch & Messaging System Requirements (502.4)⁷ • SCADA Technical & Operating Requirements (502.8) • Synchrophasor Measurement Unit Technical Requirements (502.9) • Revenue Metering System Technical & Operating Requirements (502.10) • Reporting Facility Modelling Data (502.15) 	<ul style="list-style-type: none"> • Bulk Transmission Line Technical Requirements (503.22)
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A key result of the transition from Division 502 to Division 503 is significantly shorter rules that are based on a single technical-subject matter. Ideally, this new structure is more intuitive to understanding where and how technical and operating requirement differ based on configuration and technology type, including those for energy storage. The AESO team is of the view that the structural shift: (i) moves the needle toward more technology-agnostic rules, as recommended by Stakeholders in the June 10th, 2022 feedback; and (ii) will streamline future ISO rule updates for new technologies or technological requirements that are currently not contemplated (e.g., amendments related to a particular topic can be made to one requirement-based ISO rule as opposed to needing to open all technology-based rules).

Shifting the technology-based rule requirements to Division 503 was an exercise in extreme detail. The AESO team took great care to ensure that: (i) any new requirements introduced only applied to energy storage technologies; and (ii) the requirements for generating units, wind and solar aggregated facilities, and load facilities mirror those from Division 502. However, as noted in the *Table of Concordance for the Transition from Division 502 to Division 503*, there were a small handful of instances where new requirements were written for generating units, and wind and solar aggregated facilities, to address inconsistencies in the technology-based rules, but with the understanding that existing facilities are already compliant.

The AESO team would like to emphasize that the intent – as articulated through proposed Section 503.1, *Functional Specification & Legacy Treatment* – is for Division 503 to apply to facilities on a go-forward basis. Existing facilities may continue to comply with Division 502 (which will be archived on the AESO website) until such time that the facility, resource, or systems undergo a change.

- Division 504 and Division 505 are amended to incorporate energy storage into the existing regimes for coordinating testing and payment of the generating unit owner’s contribution.

Removed From Scope

- After further consideration, in light of a likely acceleration of work associated with addressing frequency-related matters, as well as the recent feedback received through the 2023 Budget Development Process and the 2022 Engagement Survey, the AESO has decided to remove the following amendments from the scope of this initiative:
 - Section 303.1, *Fast Frequency Response Service for Imports*;

⁷ The AESO is proposing to move existing Section 502.4 to a 200-series market rule to reflect the revisions in the engagement for COM-001-AB-3 and COM-002-AB-4.

- The “fast frequency response service” and “load shed service” definitions, and replacements of the latter with the former within the draft ISO rules and definitions; and
- Subsection 7 of Section 203.4, *Delivery Requirements for Energy*.
- Section 306.3 has been removed from scope. The amendments to subsections 1 and 2(1) were initially proposed to clarify that Section 306.3 applies to a facility planning an outage that will take 40 MW or more of load offline. However, the AESO would like to take some additional time to consider this rule and its applicability to energy storage.
- Section 202.4, *Managing Long Lead Time Assets* has been removed from scope. Following the removal of subsection 8(2)(d), there are no amendments related to energy storage in the ISO rule.