Introduction

On June 9, 2022, the following Stakeholders provided initial comments on the first draft of the Energy Storage ISO Rule Amendments:

- AltaLink Management Limited ("AltaLink")
- ATCO Electric Ltd. ("ATCO Electric")
- ATCO Energy Infrastructure ("ATCO Energy")
- Canadian Renewable Energy Association ("CanREA")
- Capital Power Corporation ("Capital Power")
- Energy Storage Canada ("ESC")
- ENMAX Corporation ("ENMAX")
- TC Energy
- TransAlta Corporation ("TransAlta")

This document is intended to provide responses to comments that, in the AESO's view, could be effectively addressed in writing. The AESO's responses are categorized under three headings below: (i) general comments, (ii) comments on ISO rules, and (iii) comments on definitions. Stakeholder comments of a similar nature were grouped together with the relevant parties noted in the middle column of each table. Stakeholders may search their name to fast track to the AESO's responses to their comments.

General Comments

Comment Summary	Stakeholder(s)	AESO Response
Utility-owned storage		
Recommendation to create separate definitions for "transmission storage" and "distribution storage" to distinguish these from storage that participates in electricity markets.	ATCO Electric AltaLink	The AESO agrees that there are three types of energy storage resources contemplated in the Bill 22 amendments: 1. Energy storage that participates in the electricity markets, which is approved by the Alberta Utilities Commission ("AUC") pursuant to section 13.01 of the *Hydro and Electric Energy Act* ("HEEA"); 2. Energy storage owned by transmission facility owners following AUC approval through a NID ("TFO-owned storage"); and

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		3. Energy storage owned by distribution facility owners following AUC approval pursuant to section 25.1 of the HEEA ("DFO-owned storage"). The AESO agrees that the 300-series and 500-series ISO rules need to be clarified to reconcile overlap between the definitions of "energy storage resource" with "transmission facility" and "electric distribution system". The AESO plans to address this by: • revising the definition "energy storage resource" to refer *only* to an energy storage resource approved by the AUC pursuant to section 13.01 of the HEEA. • subsuming TFO-owned storage and DFO-storage under the definitions of "transmission facility" and "electric distribution system", respectively. With this approach in mind, the AESO is in the process of re-evaluating the ISO rules to identify any gaps in technical rule requirements for TFO-owned storage.
Technology-agnostic ISO rules and terminology		
Recommendation to condense technical ISO rules into a single technology-agnostic rule at some point.	AltaLink	The AESO agrees that there is merit in condensing the technology-specific technical ISO rules into fewer technology-agnostic rules. The AESO is planning to restructure Sections 502.1, 502.13, 502.14 and 502.16 to implement the transition from "aggregated generating facility" to "aggregated facility" in a more technology-agnostic manner. Opportunities to improve other technical ISO rules will be explored as part of future grid reliability initiatives.
Recommendations for adoption of more technology-agnostic terminology throughout the ISO rules.	ATCO Energy CanREA	In some areas of the Energy Storage ISO Rule Amendments, specific technologies are referenced on purpose. However, the AESO agrees to review the Energy Storage ISO Rule Amendments and re-evaluate opportunities to adopt more technology-agnostic verbiage.

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Alignment of definitions across ISO rules and Alberta Reliability Standards		
Recommendation to review proposed amendments to terms and definitions with the Alberta Reliability Standards (ARS) Discussion Group.	Capital Power ENMAX	The AESO acknowledges the importance of aligning terms and definitions across all AESO authoritative documents and appreciates this recommendation. The AESO confirms that the scope of this initiative is to incorporate energy storage into the ISO rules and the definitions for the ISO rules. Additional work will be required to incorporate energy storage into the ARS through the formal ARS consultation process. The AESO will discuss plans and proposals for kicking off this work with the ARS Discussion Group.
Fast frequency response service		
Clarification of the purpose and scope of ISO rule changes for fast frequency response ("FFR") service.	AltaLink ATCO Electric	The purpose of the FFR rule changes is to support the technology-agnostic provision of FFR service. Current FFR services are load shed service for imports ("LSSi") and the services procured under the FFR pilot procurement competition ("FFR Pilot"): • LSSi is a transmission system reliability product currently provided by load customers that agree to be quickly taken offline following the sudden loss of imports coming across the interties. • The AESO recently launched the FFR Pilot, targeted at procuring a transmission system reliability product that provides the same service as LSSi, but from any new technology capable of meeting the FFR eligibility and technical requirements. The FFR requirements for pilot participants are based on the requirements for LSSi which have been adapted for new technologies, such as energy storage. Under the FFR Pilot, service providers agree to provide a change in real power output, either through an increase in real power production or a reduction in real power consumption, following the sudden loss of imports coming across the interties. The AESO has coordinated with the Market Surveillance Administrator regarding enabling provision of

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		the service from new technology (other than load) within the current ISO Rules for the duration of the pilot. Learnings from the FFR Pilot will support longer-term implementation of a technology-neutral FFR service. To facilitate the transition to a technology-agnostic FFR service, the AESO is proposing: (i) a new technology-agnostic defined term "fast frequency response service"; and (ii) to replace references to LSSi with this new defined term throughout the ISO rules. In addition, the AESO is proposing changes to the ISO rules that provide clarity on the requirements for the concurrent provision of energy, FFR, and other ancillary services. The AESO is not proposing or introducing any new FFR services as part of the energy storage initiative. The development and procurement of any new FFR services will be driven by the determination of a system reliability need. If it is determined that there is a system reliability need that requires a new FFR service, the AESO will undertake the necessary work to assess the problem, identify and evaluate solutions, and implement a competitive procurement, as appropriate. The AESO is proposing the FFR rule changes with the intent of minimizing the need for ISO rule amendments in the future, should new services be introduced. However, the AESO recognizes that if the existing FFR services are modified or new FFR services are developed in the future, additional ISO rule amendments may be required.
Recommendations to: (i) include FFR technical and performance requirements in ISO rules instead of contracts; and (ii) explore future procurement of FFR through a market mechanism.	ATCO Energy AltaLink ESC	At this time, FFR will remain a contracted service with the technical and performance requirements stated within the associated service agreements as posted on the AESO's website.
Import/Export Assets		
Clarification of "import asset" and "export asset" versus intra-Alberta assets.	Capital Power ENMAX	Import and export assets are specific asset types assigned to energy marketers looking to transact on the interties. Import and export assets are

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		not linked to intra-Alberta physical resources. The market participation mechanisms for import and export are unique to those asset classes. Because of market seams issues between Alberta and neighboring jurisdictions, the market rules for importing and exporting are different. For that reason, several rules (e.g., Section 203.6) and definitions (e.g., "acceptable operating reason") exclude or separately call out the intertie transactions.
Clarification on the explicit exclusion of import assets from several definitions.	TransAlta	The change from "generating source asset" to "source asset" across the ISO rules and definitions is intended to facilitate the integration of energy storage by making the term technology neutral. "Import asset" has been explicitly carved out in several instances because, by definition, an "import asset" is a "source asset". Where this exclusion has occurred: (i) there is separate treatment for import assets (see response above); or (ii) the concept referred to does not apply to import assets. For example: - "available capability" – the change from "generating source asset" to "source asset" created overlap between parts (i) and (ii). To reconcile this overlap, import asset was carved out of part (i) so the available capacity for an import asset is only defined under part (ii) - "incremental generation costs", "long-lead time asset", "operational deviation" and "transmission must-run" are concepts that do not apply to import assets. Please also refer to slide 16 of the *AESO's Energy Storage ISO Rule Amendment Webinar Presentation*.

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ISO Rules Comments

Comment Summary	Stakeholder(s)	AESO Response
Section 103.4, *Power Pool Financial Settlement*		
Clarification on eligibility of energy storage resources for Adjustment for Load on the Margin ("ALM").	ENMAX TransAlta	All dispatchable sink assets, which include load and energy storage equal to or greater than 1 MW, are eligible for ALM. The AESO will evaluate the sink asset's dispatch performance to determine compliance. If the load or energy storage decreases consumption by the amount of the dispatch, the ALM payment will be awarded in accordance with Section 103.4.
Section 202.2, *Short-Term Adequacy and Supply Shortfall*		
Recommendation to revise subsection 3(2)(a) to state "instructing available source assets, including long lead time assets but excluding import assets, to deliver energy".	ENMAX	The AESO agrees with this recommendation and will revise Section 202.2 accordingly.
Section 202.3, *Issuing Dispatches for Equal Prices*		
Clarification regarding the implications of the amendments to subsection 2 regarding equally-priced operating blocks.	TransAlta Capital Power	Under subsection 2(3), if there are equally-priced bid and offer blocks in the merit order, the AESO will continue to serve the load bids by dispatching the offers first. The AESO considers that this is a preferred treatment compared to pro-rata dispatch of all equally-priced bid and offer blocks.
Recommendation to clarify the language of subsection 2 to reflect the priority actions when managing equally-priced bids/offers.	Capital Power	New subsections 2(2) and 2(3) were drafted to mirror the existing language of subsection 2(1). However, the AESO will review this ISO rule to determine if the language can be improved to clarify the order of dispatch priority. The AESO also welcomes drafting recommendations from Stakeholders on ways to improve the rule language.
Section 202.4, *Managing Long Lead Time Assets*		
Clarification on why long lead time assets with associated energy storage are excluded from receiving incremental payment under subsection 8(2).	TransAlta	The addition of subsection 8(2)(d) was an error. The AESO will remove it from Section 202.4.

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Recommendation to delete subsection 3 as it is obsolete.	ENMAX	The AESO agrees with this recommendation and proposes removing subsection 3 in upcoming administrative amendment filing focused on reducing red tape.
Section 202.5, *Supply Surplus*		
Clarification regarding subsection 2(2)(f) in the situation where there are more MW than needed.	ENMAX	This subject is out of scope for this initiative.
Clarification regarding whether subsection 2(2)(g) should include directives for an energy storage resource to charge to absorb supply surplus.	ENMAX	In the event of supply surplus, the AESO may direct a source asset in the market to stop delivering energy (i.e., dispatch "off"). As mentioned below under Section 203.5, the AESO will not direct a sink asset that has submitted a bid to consume because the AESO does not direct loads or energy storage to use more energy.
Recommendation to allow energy storage resources to adjust bids within 2 hours of the start of the settlement interval to allow energy storage to consume supply surplus.	ESC	Bids are set up the same as offers in ETS. Under Section 203.3, bid *volumes* can be adjusted within 2 hours of the start of the settlement interval, but bid *prices* cannot.
Section 202.6, *Adequacy of Supply*		
Recommendation to pluralize "energy storage resource" in subsection 2(a).	ENMAX	The AESO agrees with the recommended change to the existing version of Section 202.6 and will incorporate it in the Energy Storage ISO Rule Amendments. However, the AESO notes that it has filed its application to amend Section 202.6 with the AUC. Should the AUC approve the AESO's application, this revision will not be required.
Section 203.1, *Offers and Bids for Energy*		
Clarification regarding the removal of subsection 3(2)(a).	TransAlta	In the event a smaller-sized energy storage or generating unit wants to receive a price signal and be dispatched, this amendment facilitates that.
Section 203.5, *Consumption Requirements for Bids*		
Clarification of bidding obligations.	ENMAX ESC	Section 3.2 of the *Long-term Energy Storage Market Participation Draft Recommendation Paper* sets out the design for bidding. Sink assets,

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		irrespective of size, are not required to bid. It is optional/voluntary for a sink asset to submit a bid, but operating block sizes must be entered into the Energy Trading System ("ETS") in 1 MW increments (i.e., no fractions). Using an energy storage resource as an example, if a pool participant chooses to bid the charging component (i.e., the sink asset), the bid is tied to a different asset identifier than the asset identifier for the discharging component of the energy storage resource (i.e., the source asset). The two asset identifiers are, however, linked in the ETS. If the pool participant decided to submit a bid for the sink asset, the sink asset: • must be able to respond to dispatches from the AESO System Controllers in accordance with the ISO rules; • is required to meet ADaMs requirements in order to respond to dispatches; and • will be eligible for ALM under Section 103.4, *Power Pool Financial Settlement.* The AESO will not require the energy storage resource to consume more energy when their bid block is dispatched "on" (i.e., when system marginal price is less than or equal to the bid block price). Rather, the dispatch "on" is an option or permission or to use more energy. The dispatch is not measured against allowable dispatch variance for compliance purposes, but if the energy storage resource elects to not consume, it may have an impact on ALM payment.
Clarification of the 10-minute dispatch response requirement for bids versus offers.	ENMAX	The AESO agrees that the 10 minutes for a sink asset to show directional movement towards the dispatch is missing from Section 203.5. The AESO intends to treat offers and bids consistently in this regard and will revise Section 203.5 accordingly.
Clarification of exceptions to non-compliance.	ENMAX ESC	The AESO agrees that subsections 6(1)(a), (c) and (d) of Section 203.4 should apply to bids being dispatched "off" (i.e., a dispatch to use less energy) and will revise Section 203.5 accordingly to reflect this.

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		As mentioned above under Section 203.5, a dispatch "on" to use more energy has no compliance requirements. In this regard, bids do not require the same exceptions for non-compliance as offers.
Clarification of ramp rates for a load bid.	TransAlta	A dispatch "on" is not measured against allowable dispatch variance and not subject to compliance obligations. However, when the AESO issues a dispatch "off" to a load or energy storage resource, the AESO needs to know when the reduction in energy consumption will occur and, ultimately, whether the dispatch or directive was complied with. The ramp rate in subsection 3 of Section 203.5 sets out the time bounds for achieving the MW level in the dispatch. Ramp rates are an attribute of the asset configuration for source and sink assets, not part of the offer or bid submission.
Recommendation to conduct a separate consultation on Section 203.5.	TransAlta	The AESO disagrees that Section 203.5 requires a separate consultation. Section 203.1, *Offers and Bids for Energy* has always permitted optional bidding in the energy market. Energy storage developers expressed interest in optional bidding, and it was recognized that the current ISO rules lacked precise requirements for bids, relative to offers. Options for bidding were discussed and consulted on as part of the *Long-term Energy Storage Market Participation Draft Recommendation Paper*. Section 203.5 was developed following that consultation to clarify the expectations for bid dispatches.
Recommendation to revise subsection 4(a) to "or" instead of "and".	ENMAX	The AESO agrees with this change and will revise Section 203.5 accordingly.
Section 205.8, *Transmission Must-Run*		
Recommendation to include in ISO rules: (i) the process for determining transmission rust-run ("TMR") procurement requirements; and (ii) TMR performance requirements.	AltaLink	This recommendation is out of scope for this initiative.

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Recommendation to report on effectiveness of procured TMR service.	AltaLink	This recommendation is out of scope for this initiative.
Section 301.2, *ISO Directives*		
Recommendation for grammatical change in subsection 4(2).	ENMAX	The AESO agrees with the recommendation and will revise Section 301.2 accordingly.
Section 302.1, *Real Time Transmission Constraint Management*		
Clarification on what happens in an event where two assets have the same price but different constraint effective factors.	ENMAX	This subject is out of scope for this initiative.
Section 304.7, *Event Reporting*		
Clarification on what "contrary to the design of generating units" means in Appendix 2, Event 1 and its applicability.	ENMAX	"Contrary to the design of generating units" as it is used in Appendix 2 refers to instances where the operation is: (i) outside of the original safe design limits of the facility; (ii) unexpected; or (iii) non-routine. The AESO will amend the phrase in Appendix 2, Event 1 to include "aggregated facility" and "energy storage resource", in addition to generating unit.
Clarification on the applicability of the 100 kV requirement in Appendix 1, Event 7(a) and Appendix 2, Event 2(a) and (c).	ENMAX	The addition of energy storage resource in Appendix 1, Event 7(a) was an error. The AESO will remove the reference to energy storage resource in event 7(a).
Recommendation to amend subsection 4 and Appendix 4 to correct grammar and typographical errors.	ENMAX	The AESO agrees with the recommendations and will revise Section 304.7 accordingly.
Section 304.8, *Event Analysis*		
Clarification whether subsection 1(c) should also refer to the "legal owner".	ENMAX	The AESO combined references to "legal owner" and "operator" of the same facility to condense the length of subsection 1. The combination of 1(c) and

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		1(h) was inadvertently missed in this exercise. The AESO will revise Section 304.8 accordingly.
Recommendation to revise Appendix 1(e)(iv) to reference "generating units or energy storage resources".	ENMAX	The AESO agrees with this drafting recommendation and will revise Section 304.8 accordingly.
Section 304.9, *Wind and Solar Aggregated Generating Facility Forecasting* (Draft proposed: *"Wind and Solar Aggregated Facility Forecasting"*)		
Recommendation to revise "wind or solar" to "wind or solar resources"?	ENMAX	The AESO agrees with this drafting recommendation and will revise accordingly.
Recommendation to update wind direction, precipitation, and diffused horizontal irradiance columns in Table 1.	ENMAX	The AESO agrees with the recommendations and will revise Table 1 accordingly.
Recommendation to remove obsolete subsection 3(2).	ENMAX	The AESO agrees with this recommendation and proposes removing subsection 3(2) in an upcoming administrative amendment filing focused on reducing red tape. As part of this filing, the AESO will review the ISO rules for similar provisions that can be phased out.
Recommendation to amend subsection 4(3)(c) to refer to Table 1.	ENMAX	The AESO agrees with this recommendation and is of the view that it is an administrative amendment appropriately within the scope of this initiative. The AESO will therefore add "except as otherwise noted in Table 1" to the end of subsection 4(3)(c).
Section 306.3, *Load Planned Outage Reporting*		
Clarification regarding how revisions to Section 306.3 relate to the integration of energy storage.	TransAlta	The intent is that an energy storage resource that uses energy from the AIES is expected to report a load outage to the AESO where such outage is greater than 40 MW. The AESO will explore ways to revise the applicability section for clarity.

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Comment Summary	Stakeholder(s)	AESO Response
Section 502.1, *Aggregated Generating Facilities Technical Requirements* (Draft proposed: *"Wind or Solar Aggregated Facilities Technical Requirements"*)		
Recommendation that subsection 1(1)(a) should refer to "a wind or solar aggregated facility […]".	Capital Power	The AESO is planning to restructure Sections 502.1, 502.13, 502.14 and 502.16 to implement the transition from "aggregated generating facility" to "aggregated facility" in a more technology-agnostic manner. As a result, the added references to wind and solar in Sections 502.1 and 502.16 will be unwound. The AESO plans to explain this further at Session 1.
Clarification whether the reference to "pump mode" in subsection 9(3) remains applicable.	ENMAX	Please see response directly above and the AESO's Session 1 Presentation. Pump mode is a specific reference to pumped hydro; therefore, subsection 9(3) will be moved into Section 502.5. However, to clarify, power system stabilizers may be required for an aggregated facility depending on the size of the aggregation and type of connected resources.
Section 502.3, *Interconnected Electric System Protection Requirements*		
Recommendation to remove the word "either" from subsection 43.	ENMAX	The AESO agrees with this recommendation and will revise Section 502.3 accordingly.
Recommendation to remove the word "have" from subsections 44(a) and (b).	ENMAX	The AESO agrees that grammatical clarifications to these subsections are appropriate and will propose revisions.
Clarification regarding the 18 MW threshold for the maximum authorized real power rating of an energy storage resource directly connected to the transmission system.	AltaLink ESC	The 18 MW threshold is a minimum size that dictates whether the requirements in Section 502.3 apply to a given energy storage resource (i.e., the 18 MW does not impose a size limit on energy storage resources).
Section 502.5, *Generating Unit Technical Requirements* (Draft proposed: *"Generating Unit and Synchronous Energy Storage Resource Technical Requirements"*)		
Clarification regarding whether subsection 3(2) is irrelevant and should be removed.	ENMAX	The "Successor to Prior Requirement Provisions" appear in several of the technical ISO rules. The AESO will evaluate the ongoing relevance of these provisions as they appear in the 500-series rules as part of its red tape reduction initiative.

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Section 502.6, *Generating Unit Operating Requirements* (Draft proposed: *"Generating Unit and Synchronous Energy Storage Resource Operating Requirements"*)		
Clarification whether instances of "generating unit" should be changed to "synchronous generating unit".	ENMAX	The AESO will further assess this recommendation in the context of the further changes to Sections 502.1, 502.13, 502.14, and 502.16.
Section 502.7, *Load Facility Technical Requirements*		
Clarification regarding the exclusion of battery energy storage resources from the applicability of Section 502.7.	AltaLink	The AESO will re-evaluate the applicability of Section 502.7. The original intent was for: (i) Section 502.7 to apply to facilities with synchronous energy storage resources where the facility takes service from the AIES; and (ii) Section 502.13 to apply to battery energy storage resources that take service from the AIES.
Section 502.8, *SCADA Technical and Operating Requirements*		
Clarification regarding the requirement in Appendix 2 for data acquisition of DC power for each collection system feeder, if sharing an inverter with another resource.	Capital Power	When there are multiple technologies behind the same inverter and one of those technologies is a wind or solar resource, the AESO requires power output from each technology type for the purpose of power ramp management. The AESO will revise "resource" to "technology" and will also reconsider the title of Appendix 2.
Recommendation that the AESO specify where "gross real power" and "gross reactive power" are measured in Appendix 5 and 6.	Capital Power	For Appendix 5, Section 205.4, Section 205.5, and Section 205.6 already specify where frequency is measured in response to a directive, which corresponds to where gross real power is measured. The AESO is of the view that the location does not need to be duplicated in Appendix 5. For Appendix 6, the definition of "gross real power" specifies that the measurement for energy storage is located at the low voltage side of the transmission system step-up transformer. Gross reactive power is measured at the same location as gross real power. The AESO proposes to handle more detailed measurement locations through the AESO functional specification as part of the AESO connection process, as required.

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Recommendation that the AESO specify where net real power is measured in Appendix 5.	Capital Power	The AESO agrees with this recommendation and will revise Appendix 5 to specify "net real power at the point of connection".
Recommendation to pluralize "operational maximum state of charge" in Appendix 6.	Capital Power	In the AESO's view, pluralizing "operational maximum state of charge" in Appendix 6 is not necessary. The AESO requires one state of charge for a standalone energy storage resource. However, "operational maximum/minimum state of charge" under Appendix 6 is required for all types of energy storage. Therefore, the AESO will remove the reference to "batteries only".
Recommendation to replace instances of "+/-" with the Unicode character "±" in all of the ISO rules.	ENMAX	The AESO prefers to maintain current format.
Clarification regarding changes for wind speed measurements from "m/s" to "km/h", and the difference between the required units in Section 502.8 from those required under Section 304.9.	ENMAX	Historically, "km/h" is the unit used to denote wind speed data collected by SCADA. Obtaining wind speed measurements in km/h ensures consistency with existing readings derived from SCADA and aligns with the AESO functional specification. Wind speed data under Section 304.9 is collected for forecasting purposes, which has different uses than wind speed measurements obtained through SCADA.
Section 502.13, *Battery Energy Storage Facility Technical Requirements* (Draft proposed: *"Battery Energy Storage Resource Technical Requirements"*)		
Clarification of whether Section 502.13 applies to battery energy storage resources situated within an industrial complex or facility connected to transmission facilities within the City of Medicine Hat.	ENMAX	The AESO agrees that Section 502.13 and Section 502.14 apply to a battery energy storage resource within an industrial complex connected to City of Medicine Hat transmission facilities. The AESO will revisit the applicability of Section 502.13 and 502.14.
Clarification whether the calculation for the ramp limit in subsection 8(2) is needed, as the duration is not specified.	ENMAX	The ramp rate limit in subsection 8(2) is not based on a duration. Rather, it is calculated simply as 10% of the maximum range of the energy storage resource. For example, if:

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		maximum authorized charging power = -100 MW, maximum authorized discharging power = 100 MW then maximum ramp is: (0.10)*(100-(-100)) = 20 MW/min.
Section 502.14, *Battery Energy Storage Facility Operating Requirements* (Draft proposed: *"Battery Energy Storage Resource Operating Requirements"*)		
Clarification of whether Section 502.14 applies to battery energy storage resources situated within an industrial complex or facility connected to transmission facilities within the City of Medicine Hat.	ENMAX	See related response above under Section 502.13.
Section 502.15, *Reporting Facility Modelling Data*		
Clarification whether references to the City of Medicine Hat are needed in the applicability section.	ENMAX	This subject is out of scope for this initiative. The AESO will evaluate the applicability of Section 502.15 to City of Medicine Hat at a future time.
Section 505.3, *Coordinating Energization, Commissioning and WECC Testing Activities* (Draft proposed: *"Coordinating Synchronization, Commissioning, Model and Reactive Power Validation Testing and Ancillary Services Testing"*)		
Clarification whether market participants must continue to complete WECC testing, considering the AESO's proposed amendment of "WECC testing" to "model and reactive power validation testing".	TransAlta	The AESO confirms that the requirements for "WECC testing" still exist and are the same. However, WECC is the name of the reliability organization, whereas the specific testing that market participants are required to undertake in accordance with Section 505.3 is "model and reactive power validation testing". The purpose of this administrative amendment is to reflect this.
Recommendation to recognize DFO coordination within Sections 505.3 and 505.4.	ENMAX	This recommendation is out of scope of this initiative. For further information on this subject, please see the AESO's *DER Roadmap Integration Paper: DER Commissioning and Testing Recommendations*.

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Definitions Comments

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"acceptable operating reason"		
Clarification of whether part (i)(c) of the definition applies to a state of charge constraint.	ESC	The AESO confirms that when state of charge is 0% for an energy storage resource, that is an acceptable operating reason under (i)(c) of the definition. When the relative state of charge is at 0%, the source asset is no longer available and may need to restate available capability. Please see ID #2012-009R, *Restatements* for further information on state of charge restatements.
Recommendation to amend the definition to allow energy storage to restate AC should it not have sufficient charge to discharge at full output.	TransAlta	Please see response to ESC directly above.
"aggregated facility"		
Clarification regarding "energy storage facility" versus "aggregated facility" and how an energy storage resource would fit within an aggregated facility.	Capital Power	An aggregated facility can be: (i) an aggregation of energy storage resources; (ii) an aggregation of generating units; or (iii) an aggregation of energy storage resources and generating units. In all cases, each energy storage resource and generating unit within the aggregation must be; a) less than or equal to 9 MW in size, and b) share a common collector bus. "Energy storage facility" is the equivalent of "power plant" for an energy storage application under the HEEA. The term will not be used in the ISO rules and therefore will be: (i) removed from the CADG; and (ii) replaced in the one instance that appears in Section 501.10. For the purposes of the ISO rules, energy storage that does not meet the definition of aggregated facility is an "energy storage resource". For example, facilities such as large-pumped hydro would be considered an "energy storage resource", and not an "aggregated facility". Please see the AESO's Session 1 Presentation for further explanation of "aggregated facility".

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Comment Summary	Stakeholder(s)	AESO Response
Clarification of the 9 MW size threshold and the waivers & variance process for allowance of aggregations of resources greater than 9 MW	CanREA Capital Power ESC Enfinite TransAlta	The 9 MW restriction does not limit the size of the *total* aggregated facility, but rather the size of each *individual* element comprising the aggregated facility. The reasons for the 9 MW limit are as follows: - It is reasonable that wind and solar (or possibly even small-footprint generation or individual energy storage resources) would not exceed 9 MW (10 MVA). - Units under 9 MW (10 MVA) do not require a governor. The aggregated facility rules provide a framework for a collection of small power producing resources in a geographically localized area to optimize common control and power elements to meet technical requirements. If a collection of small generating units and energy storage resources need to comply individually with technical requirements, this would be more onerous for market participants rather than complying with aggregated requirements. A facility that has a maximum capability of 200 MW and that is comprised of a number of small units (all less than 9 MW each), is within the bounds of the aggregated facility definition. A facility comprising a combination of small generating units (under 9 MW) and a large energy storage resource (greater than 9 MW; ***e.g,*** pumped hydro) does not meet the definition of aggregated facility. Typically, this configuration would be “co-located” resources on the same site. In circumstances where the ISO rules insufficiently apply to this type of facility, the waivers and variances process can be leveraged.
Recommendation to remove the 9 MW limit as applicable to energy storage.	ATCO Energy	The AESO is of the view that the 9 MW limit should apply to energy storage resources within an aggregated facility. Typically, energy storage resources over 9 MW, such as pumped hydro and compressed air, should be frequency responsive and have a dedicated governor.
Clarification on the adoption of “Option 2” definition of “hybrid facility”.	TransAlta	Please refer to slides 24-25 of the AESO’s Energy Storage ISO Rule Amendment Webinar Presentation.

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Comment Summary	Stakeholder(s)	AESO Response
"Alberta internal load"		
Clarification whether an energy storage resource that is part of an aggregated facility will be counted twice under Alberta internal load.	ATCO Energy	The AESO confirms that energy storage resources that are part of an aggregated facility will not be counted twice under Alberta internal load.
Clarification surrounding the inclusion of energy storage resource in the definition.	TransAlta	The definition of Alberta internal load was modified to include the electric energy produced by energy storage resources.
"allowable dispatch variance"		
Clarification of what the proposed changes to the definition are intended to achieve and impacts on real-time operations.	TransAlta	The AESO will provide further clarity regarding "allowable dispatch variance" as it pertains to energy storage at Session 1.
Recommendation to re-consider the drafting of subsections (iv) and (v) to provide better clarify, including defining "variable energy resource"	TransAlta AltaLink	The AESO will review options for addressing the ADV definition at Session 1. Please see the AESO's Session 1 Presentation.
"automatic generation control"		
Recommendation to revise definition to be more technology agnostic.	AltaLink ATCO Energy Capital Power	The AESO considers "automatic generation control" to be a generally accepted term that is used in other balancing authorities. To remain aligned with these entities, the AESO recommends maintaining the term "automatic generation control".
Clarification on whether "electrical energy producing and consuming resources" includes generating units and load.	Enfinite	The AESO confirms that the definition applies to energy storage resources and generating units. The AESO will change the definition to read "electrical energy producing or consuming resources. From a rule drafting perspective "or" means "and/or".

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Comment Summary	Stakeholder(s)	AESO Response
"automatic voltage regulator"		
Recommendation to remove "excitation" from the definition.	AltaLink	The AESO agrees that the term "excitation" applies to synchronous technologies as suggested and excludes other types of technologies. The AESO will revise the definition accordingly.
"black start capability"		
Recommendation to revise the definition to include other technologies.	ATCO Energy Capital Power ESC TransAlta	The AESO will replace "generating resource" with "generating unit or energy storage resource" in the definition.
"commissioning"		
Clarification on how DERs fit within the scope of this definition.	AltaLink	Section 505.3 of the ISO rules, *Coordinating Synchronization, Commissioning WECC Testing and Ancillary Services Testing* applies to generating units or energy storage resources over 5 MW connected to an electric distribution system. The definition of commissioning is used in the context of this ISO rule.
"control centre"		
Clarification on how the definition applies to aggregated facilities with energy storage resources.	Capital Power	Please see the AESO's clarification of the "aggregated facility" definition above.
Recommendation to define "operating personnel" and "reliability tasks".	Capital Power	Please see the AESO's Proposed new ID #2022-001, *Operating Personnel Communications Protocol* (posted as part of the consultation on COM-001-AB-3 and COM-002-AB-4) for further guidance. Please also see the AESO's response above regarding future work to align of ISO rules and ARS definitions.
"energy storage facility"		
Clarification of the use of "energy storage facility" in the ISO rules.	Capital Power	Please see the AESO's clarification of the "aggregated facility" definition above. "Energy storage facility" will not be used in the ISO rules and will be removed from the CADG.

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Comment Summary	Stakeholder(s)	AESO Response
"energy storage resource"		
Recommendation to revise the definition to "facility that may be necessary…", as not all storage technologies require fuel and fuel handling equipment.	CanREA	The definition of "energy storage resource" is derived from the amendments to the *Electric Utilities Act*. In the AESO's view, the current language of the definition already implies that the listed equipment may or may not be "necessary for the safe, reliable, and economic operation of the energy storage resource".
"fast frequency response service"		
Recommendation to adopt a definition/acronym for "FFRi" to identify FFR used for imports.	Capital Power	In the AESO's view, it is not necessary to define "fast frequency response for imports" for the ISO rules. The requirements that are specific to FFR for imports are limited to those under Section 303.1 of the ISO rules, which has been drafted to specifically apply to FFR for imports. If new FFR services are added in the future the AESO will assess whether additional ISO rule amendments are required to identify specific requirements for different types of services.
Recommendation to include "transmission reliability service" in the FFR service definition.	Enfinite	The fast frequency response service definition was drafted broadly to capture a wide range of potential FFR services in the future.
"gross real power"		
Clarification on how "gross real power" would be measured for an energy storage resource that is part of an aggregated facility.	Capital Power	Gross real power measurements for energy storage resources are provided on the low voltage side of the transmission step-up transformer to allow different types of energy conversion processes to be measured (e.g. synchronous and inverter based). The AESO will elaborate further on this subject during Session 1.
- "in merit"		
Clarification on what in-merit means for bids.	Capital Power	In-merit offer blocks are offer blocks priced at or below the current system marginal price. In-merit bid blocks are bid blocks priced at or above to the current system marginal price.

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"incremental generation costs"		
Recommendation to correct grammar at part (iii).	TransAlta	The AESO agrees with this recommendation and will revisit part (iii) of the definition.
"legal owner"		
Recommendation to recognize "energy storage facility" within the definition.	Capital Power	Please see the AESO's clarification of the "aggregated facility" definition above.
"loss factor"		
Clarification on the applicability of loss factors to energy storage resources.	ESC	Loss factors will apply to energy storage resources based on the ISO tariff rate used. The definition of "loss factor" states that loss factors are determined in accordance with Section 501.10. Subsections 1(b)(i) and (iv) of Section 501.10 specify that loss factors apply, respectively, to: (i) energy supplied to the transmission system through system access service provided under Rate STS of the ISO tariff; and (ii) energy withdrawn from the transmission system through system access service provided under Rate DOS.
Clarification of "generating facility" as it is used in the definition.	ATCO Energy TransAlta	The AESO will replace "generating facility" with "generating unit" and "aggregated facility" in this definition.
"maximum authorized charging/discharging power"		
Clarification regarding the applicability of the definition to only battery energy storage.	AltaLink ATCO Energy CanREA ESC TransAlta	Under the existing ISO rules, these defined terms are only used in Sections 502.13 and 502.14 in relation to battery energy storage. Battery energy storage provides reactive power support in both charging and discharging modes. However, the AESO agrees that charging and discharging could apply to other types of storage and will further amend the technical ISO rules amendments to account for this. The following further amendments to the definitions will include: - deleting "maximum authorized discharging power" definition to reconcile the overlap with "maximum authorized real power"; and

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Comment Summary	Stakeholder(s)	AESO Response
		- adopting the term “maximum authorized charging power” where necessary in the ISO rules to apply to all forms of energy storage. The AESO will also discuss this topic during Session 1.
Recommendation to define “battery”.	Capital Power	The AESO is of the view that battery is a commonly understood term and does not require a formal definition.
“maximum authorized real power”		
Clarification regarding the reference to battery energy storage / recommendation for a more technology-agnostic definition.	AltaLink ATCO Energy CanREA ESC	Please see the “maximum authorized charging/discharging power” definition response above.
Recommendation to define “battery”.	Capital Power	The AESO is of the view that battery is a commonly understood term and does not require a formal definition.
“operator”		
Recommendation to recognize “energy storage facility” within the definition.	Capital Power	Please see the “aggregated facility” definition responses above. “Energy storage facility” is no longer used in the ISO rules and will be removed from the CADG.
“pool asset”		
Recommendation to replace “one” with “1” for drafting consistency.	TransAlta	Per ISO rule drafting principles, numbers are used for all numeric references except “one”.
“scheduled generator outage”		
Recommendation to rename the definition to be more technology agnostic.	ATCO Energy Capital Power	The definition of “scheduled generator outage” is not used in the ISO rules or ARS and will be removed from the CADG.

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