Energy Storage ISO Rule Amendments
AESO Written Responses to Comments Version 2.0 ISO Rules

General Comments	
Stakeholder Comments	**AESO Replies**
Capital Power Corporation	
1. Capital Power has some concern that the proposed restructuring of the technical rules as part of the proposed amendments to enable energy storage technologies significantly broadens the scope of the consultation. Capital Power would like to reserve the right to provide comment after the stakeholder session in January when more clarity is provided to market participants on the transition from Division 502 to Division 503, and more clarity and review of the ADV and VER blocks are provided, including specific examples.	1. As explained at Stakeholder Session 3 ("Session 3") the AESO restructured Division 502 to integrate forms of foreseeable energy storage. This includes synchronous energy storage, batteries, and hybrid configurations. Creating technology-specific rules for all the permutations and combinations of energy storage configurations became complex and convoluted within the current structure of Division 502. The AESO's solution was to restructure Division 502 to organize technical requirements according to subject matter as opposed to technology. While restructuring moved existing requirements under new ISO rule titles and unearthed some issues with existing requirements applicable to technologies other than energy storage, it did not, in the AESO's view, expand the scope of this initiative. The substantive revisions: (i) integrate new requirements for energy storage; (ii) amend existing requirements for energy storage to the extent necessary; and (iii) address administrative amendments (per the AUC Rule 017 definition) in ISO rules containing substantive changes for energy storage.
ENMAX Corporation	
2. It is clear from the draft rules that the AESO is striving for greater consistency in how requirements are expressed, and in ENMAX's view the AESO has made significant strides in that direction. Here, ENMAX offers a few suggestions for further consistency improvements. • The rules as drafted use several different forms for size limits.	2. The AESO appreciates ENMAX's comment. If an ISO rule contained changes necessary for the integration of energy storage, the AESO also took the opportunity to make administrative amendments to enhance consistency and clarity across the ISO rules. Many of these administrative amendments were also suggested by Stakeholders.

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For example, 306.5-1(a) uses “5 MW or higher,” 505.3-1(a) uses “5 MW or greater,” 503.15- 25(2) uses “25 MVA or larger,” 304.8, Appendix 1, Category 2 uses “300 MW or more,” 503.16-1(1)(a) uses “greater than or equal to 5 MW,” and 505.3-4(a) uses “equal to or greater than 5 MW.” ENMAX suggests that the rules use a common expression, such as “5 MW or more” or “≥ 5 MW.” • Some rules include references to industrial complexes connected to both the interconnected electric system and either “an electric system within the service area of the City of Medicine Hat” (e.g., 304.3-1(1)(a)(i)) or to “transmission facilities within the City of Medicine Hat (e.g., 304.8-1(d)(iii)). Other rules refer to industrial complexes that are connected to the interconnected electric system but omit any reference to such complexes within Medicine Hat (e.g., 304.9-1(a)(ii) and 503.1-1(a)). Was this intentional? On a related note, the applicability specification in section 503.20-1(a) is of a different form than most. • Some rules make reference to the stator winding of energy storage resources (e.g., 205.4-8(a) and 503.3-2(1)(a)). Whenever references are made to a stator winding or stator current limiters, it should be made clear that they are only applicable to synchronous energy storage devices, as the AESO does in Section 503.13-3(2)(a). • Replacing all occurrences of “+/-“ with “±”, consistent with the tables in Section 304.9, will make the rules easier to read.	Regarding size limits, the AESO’s drafting principles is to use “greater/less than…” or “greater/less than or equal to…”. The AESO did another sweep of the ISO rules containing substantive changes for energy storage and modified wording to enhance consistency. Regarding industrial complexes, it is intentional to refer to industrial complexes that are connected to the interconnected electric system but omit references to such complexes within Medicine Hat in some ISO rules. The applicability of Section 503.20 is intended to align with the existing “testing applicability” provisions from subsection 9 of Sections 502.6 and 502.16. As further noted below, the AESO has clarified within the relevant rules that references to stator winding terminals apply to synchronous energy storage resources. The AESO replaced tolerance symbols with “±” within ISO rules that are within this initiative.
Section 103.4, *Power Pool Financial Settlement*	
TransAlta Corporation 3. ***The AESO should provide example calculations of the application of Adjustment for Load on the Margin in increasing and decreasing system margin price scenarios.***	3. Adjustment for Load on the Margin (“ALM”) examples were provided at the ALM Stakeholder session on April 13, 2021. The Stakeholder Session presentation is available on the AESO website.

TransAlta recommends that examples of the application of the calculation for Adjustment for Load on the Margin, one showing how the calculation is applied when system marginal price is increasing and another showing the calculation when system marginal price is decreasing, as well as how the Allocation of Charges for Adjustment for a Load on the Margin would be applied. We understand that the formulae included in the proposed amendments reflects the Adjustment to Load on the Margin in the stakeholder update provided on June 30, 2021; however, we wish to confirm that the AESO's application of that calculation is commonly understood. More specifically, we seek to ensure that our interpretations of variables B, C and D are the same as the AESO's view of how it would be applied. Furthermore, TransAlta recommends that the AESO develop a complementary information document that includes example calculations of the Adjustment to Load of the Margin.	Variables B, C and D are defined in subsection 12(2) of Section 103.4. As part of the rule implementation the AESO will update the Information Documents associated with settlement to include Adjustment to Load on the Margin.
Section 201.7, *Dispatches*	
ENMAX Corporation 4. Section 5 appears to no longer address the dispatch acknowledgement time for interchange transactions.	4. Interchange transactions are scheduled and do not receive dispatch instruction. Therefore, they are unable to acknowledge receipt of a dispatch. The AESO notes that the changes to subsection 5(a) have been moved to the ISO Rules Red Tape Administrative Amendments filing and will therefore be removed from the Energy Storage ISO Rule Amendments.

TransAlta Corporation 5. ***Clarify the requirements for acknowledgment of receipt of dispatch for interchange transactions*** TransAlta would like to better understand why the requirement to acknowledge receipt of a dispatch "within five (5) minutes for an interchange transactions" has been proposed to be removed. We do not object to the removal of this requirement but we would like to more fully understand why this is no longer applicable.	5. Please see AESO Reply #4.
Section 202.2, *Short-Term Adequacy and Supply Shortfall*	
Capital Power Corporation 6. The proposed revisions to subsection 2 make it more difficult to read. Capital Power suggests retaining the previous construction of an 'if, then' statement. **ENMAX Corporation** 7. Section 2: • Add a comma in "The ISO must, if it forecasts…". • Section 2 could be simplified by revising it to: The ISO must, if it forecasts that the interconnected electric system will experience a state of supply shortfall based on a short term adequacy assessment conducted pursuant to subsection 3 of section 202.6 of the ISO rules, Adequacy of Supply, manage the state of supply shortfall in accordance with the provisions set out in subsections 3, 4 and 5 below. Subsection 3(4): • 3(4) could also be simplified by revising it to: The AESO must, once the short term adequacy assessment conducted pursuant to subsection 3 of section 202.6 of the ISO rules, Adequacy of Supply, indicates that the supply shortfall condition no longer exists, cancel directives that instructed long lead time assets to start.	6. The AESO reverted the language of subsection 2 back to an "if-then" statement for readability. 7. Regarding subsection 2, please see AESO Reply #6. The AESO prefers to maintain the existing language of subsection 3(4) at this time. The AESO notes that, on October 26, 2022, the Alberta Utilities Commission approved amendments to Section 202.6, which resulted in streamlining of Section 202.6 and the transferal of information to an information document (ID #2012-006R, *Adequacy, Supply Shortfall and Energy Emergency Alerts*).

• If the AESO believes it must continue to refer specifically to the condition in which firm load plus the minimum regulating reserve requirement exceeds the available supply and curtailable demand, the reference could be included in subsection 3 of 202.6. This change would put all short-term adequacy assessment procedures in one section of the ISO rules.	
TransAlta Corporation	
8. ***Clarify how the AESO determines what is "curtailable demand" versus other demand/load*** TransAlta asks the AESO to further clarify what "curtailable demand" is and how the AESO differentiates between "curtailable demand" from other loads.	8. Curtailable demand includes demand that is bid into the merit order and demand opportunity service.
Section 202.3, *Issuing Dispatches for Equal Prices*	
ENMAX Corporation	
9. It is not clear from subsection 2(4) what the ISO will/must do to accommodate inflexible blocks and minimize the dispatch of operating blocks higher in the merit order. For example, to fully "accommodate" a 30 MW inflexible block when an additional 20 MW of supply is required, the ISO could: (i) dispatch the 30 MW inflexible block and curtail 10 MW from lower in the merit order; (ii) skip the 30 MW block and dispatch 20 MW from one or more blocks higher in the merit order; or (iii) dispatch the 30 MW block and push the output of regulating-reserve units down by 10 MW. (There may be other options.) The price consequences of each action are different.	9. The AESO has revised subsection 2 to reflect the dispatch methodology for equally-priced operating blocks.
TransAlta Corporation	
10. TransAlta does not have any concerns with the proposed draft. However, the proposed draft has a typographical error in paragraph 2(3) where "identical" is spelled "identicial".	10. The AESO agrees with TransAlta's editorial change to subsection 2.

Section 202.4, *Managing Long Lead Time Assets*	
TransCanada Energy Ltd. (TCE) 11. This stakeholder comment matrix does not include a comment section for Section 202.4, Managing Long Lead Time Assets. As such, our comments on that ISO rule are included in this section. Subsection 8(2) of that rule contains an incomplete sentence that no longer indicates the consequence if certain conditions are met.	11. In Version 1.0, subsection 8(2) of Section 202.4 was amended to exclude long lead time energy storage resources from eligibility for incremental generation costs. The AESO later identified that this was an error and removed it in Version 2.0. In the process, "*is not eligible to receive payment for incremental generation cost*" was inadvertently deleted from the bottom the subsection. This will be brought back in Version 3.0. Section 202.4 does not contain any other substantive revisions for energy storage (remaining changes were administrative) and has been removed from the scope of this initiative.
Section 202.5, *Supply Surplus*	
ENMAX Corporation 12. Suggest Section 2 be modified to read: • 2(1) The ISO may curtail next hour import interchange transactions to balance system supply and system load if, during a current hour, the ISO forecasts that the interconnected electric system will experience a state of supply surplus in the next hour, as evidenced by the in merit electricity supply consisting of only multiple $0 offers. [The statement that "the supply of electricity available from these offers exceeds the system load" appears to be redundant, since the in merit supply is all that is needed to supply the load.] • 2(2) The ISO must, if it determines that a state of supply surplus is imminent in the current hour or already exists, balance system supply and system load using the following procedures, as required and in the following sequence, and subject to subsection 2(3): • 2(4) The ISO may alter the procedural sequence set out in subsections 2(2) and 3, if, during a current hour, the ISO determines	12. The AESO agrees with ENMAX's changes to improve the language of subsection 2 and has updated Section 202.5 accordingly.

that real time operating conditions are such that following that procedural sequence would put the ISO in contravention of any reliability standard.	
Section 202.6, *Adequacy of Supply*	
TransCanada Energy Ltd. (TCE) 13. At subsection 7(1)(b), the AESO has proposed to amend the ISO rule by allowing for back-up energy storage in addition to back-up generation. However, at subsection 7(1)(c), the AESO allows for only portable emergency generation. TCE recommends the AESO amend subsection 7(1)(c) to also allow for portable emergency energy storage as it may one day become available.	13. The AESO agrees with TCE's recommendation and has added "emergency portable energy storage" to subsection 7(1)(c).
Section 203.1, *Offers and Bids for Energy*	
Capital Power Corporation 14. Capital Power recommends the AESO clarify how offers involving a **variable energy resource quantity** can or must be structured. For example, it appears from the AESO's September 13, 2022, presentation that the variable energy resource quantity is not restricted to a set block, or blocks, and that it can be intermingled with the controllable portion of MW's from the partially controllable resource, but this is only inferred from the presentation. This information could be provided expressly in the rules or in an Information Document. To that end, it would be helpful for the AESO to issue an Information Document summarizing the key rules and how to interpret them. This way market participants are not left reviewing previous consultation materials (e.g., Sep 13, 2022 presentation or Feb 17, 2021 recommendation paper) to determine what was and wasn't adopted from these consultations. Another example of this is the rules respecting submitting an acceptable operating reason and the state of charge of the battery, and how long a market participant can be use this as an AOR once it begins charging from 0%.	14. The AESO confirms variable energy resource quantity is not restricted to a set block, or blocks. Acceptable operating reason (AOR) no longer applies when the state of charge (SoC) is not 0%. If SoC is 0%, the offer must be restated such that the pool asset is out of merit if the pool participant wishes to charge the energy storage resource. The AOR is there in the event the battery cannot physically comply with the dispatch instruction. Management of SoC and alignment with the market submissions is the responsibility of the pool participant. SoC will not be made available publicly for commercial reasons. After the fact merit orders will continue to be made available for market participant analysis.

In Capital Power's view, it will be important that partially controllable resources be required to abide by the 'must offer must comply' and submit price/quantity pairs to the AESO per standard practices. The market should have some form of visibility to the state of charge for storage resources / partially-controllable resources. Although outside the scope of this consultation, Capital Power would like clarity and confirmation from the AESO on what information will be made available in ETS for partially-controllable resources.	
Section 203.3, *Energy Restatements*	
TransCanada Energy Ltd. (TCE) 15. In four instances the AESO proposes to remove the word "reasonably" from this rule. In each case, the current version of the rule requires market participants to provide information to the AESO "as soon as reasonably practicable". The removal of "reasonably" suggests that the AESO would now require market participants to provide the information as soon as possible whether or not it is reasonable. TCE submits that this itself would be unreasonable and recommends that this proposed change be struck.	15. Canadian courts have confirmed the equivalency of "as soon as reasonably practicable" and "as soon as practicable". Both phrases are interpreted as "within a reasonably prompt time". In contrast, "as soon as possible" connotes an immediate action.
Capital Power Corporation 16. It is unclear why the word 'reasonably' was proposed to be removed from subsections 4(2), 5(1), 7(2). With this removal, Capital Power notes that this would create an inconsistency between these clauses and 203.1, subsection 6(2).	16. Please see AESO Reply #15. The AESO has removed "reasonably" from subsection 6(2) of Section 203.1 for consistency.
Section 203.4, *Delivery Requirements for Energy*	
Capital Power Corporation 17. The proposed edits to subsection 6(1) reduce clarity, particularly because it breaks up the 'must' and 'not'. We suggest the first line of that subsection reverts to the original version.	17. The AESO has reverted subsection 6(1) back to the original language.

Section 203.5, *Consumption Requirements for Bids*	
ENMAX Corporation 18. Subsection 3(1) seems to suggest that a pool participant must reduce the consumption of a sink asset that is the subject of a dispatch and is already ramping. Presumably, ramping to a different consumption level starts with a dispatch. We therefore suggest the following: 3(1) A pool participant must reduce the consumption of a sink asset that is the subject of a dispatch towards the MW level indicated in that dispatch within 10 minutes of, but not prior to, the time specified in the dispatch. Also suggest the following for subsection 3(2): (2) A pool participant that modifies energy consumption associated with a bid that is subject to a dispatch must reach the MW level indicated in the dispatch in a time that is: (a) not longer than the time calculated as follows: (i) divide the change in dispatch MW by the ramp rate the pool participant submits; (ii) add 40% of the time calculated in subsection 2(a)(i) or 5 minutes, whichever is greater; and (b) not shorter than the time calculated as follows: (i) divide the change in dispatch MW by the ramp rate the pool participant submits; and (ii) subtract 40% of the time calculated in subsection 2(b)(i) or 5 minutes, whichever is greater.	18. The AESO agrees with ENMAX's recommendations to improve the language of subsection 3(1). For consistency, the AESO has mirrored the revisions in subsection 4(1) of Section 203.4 as well. The AESO agrees with ENMAX's editorial changes to subsection 3(2) and has revised the Section 203.5.
TransAlta Corporation 19. ***Clarify what the requirements for automatic governor or governor system for sink assets (other than energy storage)***	19. The additions to Subsection 4 were made in response to Stakeholder comments on version 2.0 to align exceptions to non-compliance. See *AESO Written Responses to Initial Stakeholder*

TransAlta would like to understand the additions to subsection 4. More specifically, we ask the AESO to clarify where sink assets have frequency response requirements including any requirement for an automatic governor or governor system.	*Feedback.* Frequency response and governor requirements for facilities that have associated sink assets are specified in Section 503.6, *Frequency and Speed Governing*.
Section 205.4, *Regulating Reserve Technical Requirements and Performance Standards*	
AltaLink Management	
20. AltaLink commends the AESO for endeavoring to make ISO Rules more technology agnostic. As "stator winding terminals" is applicable to only specific generation technology types, AltaLink recommends that the AESO consider rewording the clause 8(a) to be more technology agnostic to ensure it applies to all types of generating units which may choose to supply Regulating Reserve.	20. The AESO has revised subsection 8(a) to refer to "synchronous energy storage resource".
ENMAX Corporation	
21. We suggest changing "inverter based technology" to "inverter based resource" in 8(c). See also our comment above regarding stator windings and energy storage resources.	21. The AESO agrees with ENMAX's recommendation and has revised subsection 8(c) to "inverter based resource".
TransAlta Corporation	
22. *Explain what changes were made to Appendix 1* TransAlta asks the AESO to clarify what changes, if any, were made to the graph in Appendix 1. We are unclear why the graph was replaced in the blacklined version and if there were any changes made to the new version.	22. As explained at Session 3, the Appendix 1 graph change was not properly represented in the Version 2.0 blackline. The graph be updated in the Version 3.0 release to correctly align with the tabulated values.
Enfinite	
23. Enfinite submits that under Section 8(a), that the AESO should consider further clarifying the measurement point for frequency on energy storage resources. A stator winding terminal is not applicable to certain energy storage resources. Consider collector bus or point of interconnection as a more encompassing performance measurement. Alternatively, consider adding "if applicable" to this Section.	23. Please see AESO Reply #20.

Section 205.5, *Spinning Reserve Technical Requirements and Performance Standards*	
AltaLink Management	
24. AltaLink commends the AESO for endeavoring to make ISO Rules more technology agnostic. As “stator winding terminals” is applicable to only specific generation technology types, AltaLink recommends that the AESO consider rewording the clauses 8(a) and 11(a) to be more technology agnostic to ensure it applies to all types of generating units which may choose to supply Spinning Reserve. Additionally, 11(a) likely should also apply to Energy Storage Resources.	24. The AESO has revised subsection 8(a) and 11(a) to refer to “synchronous energy storage resource”.
ENMAX Corporation	
25. Suggest changing “inverter based technology” to “inverter based resource ” in 8(c) and11(c). See also our comment above regarding stator windings and energy storage resources.	25. The AESO agrees with ENMAX’s recommendation and has revised subsection 8(c) and 11(c) to “inverter based resource”.
TransAlta Corporation	
26. Explain what changes were made to Appendix 1 TransAlta asks the AESO to clarify what changes, if any, were made to the graph in Appendix 1. We are unclear why the graph was replaced in the blacklined version and if there were any changes made to the new version.	26. As explained at Session 3, the Appendix 1 graph change was not properly represented in the Version 2.0 blackline. The graph be updated in the Version 3.0 release to correctly align with the tabulated values.
Enfinite	
27. Enfinite submits that under Section 8(a), that the AESO should consider further clarifying the measurement point for frequency on energy storage resources. A stator winding terminal is not applicable to certain energy storage resources. Consider collector bus or point of interconnection as a more encompassing performance measurement. Alternatively, consider adding “if applicable” to this Section.	27. Please see AESO Reply #24.

Section 205.6, Supplemental Reserve Technical	
AltaLink Management 28. AltaLink commends the AESO for endeavoring to make ISO Rules more technology agnostic. As "stator winding terminals" is applicable to only specific generation technology types, AltaLink recommends that the AESO consider rewording the clause 7(a) to be more technology agnostic to ensure it applies to all types of generating units which may choose to supply Supplemental Reserve.	28. The AESO has revised subsection 7(a) to refer to "synchronous energy storage resource".
Enfinite 29. Enfinite submits that under Section 7(a), that the AESO should consider further clarifying the measurement point for frequency on energy storage resources. A stator winding terminal is not applicable to certain energy storage resources. Consider collector bus or point of interconnection as a more encompassing performance measurement. Alternatively, consider adding "if applicable" to this Section.	29. Please see AESO Reply #28.
ENMAX Corporation 30. Suggest changing "inverter based technology" to "inverter based resource" in 7(c). See also our comment above regarding stator windings and energy storage resources.	30. The AESO agrees with ENMAX's recommendation and has revised subsection 7(c) to "inverter based resource".
Section 304.3, *Wind and Solar Power Ramp Up Management*	
TransAlta Corporation 31. ***Utilize language that is consistent with the definition of aggregated facility*** The proposed language refers to "containing wind or solar". This language is not the same as the language used in the proposed definition of an aggregated facility, which refers to such facilities as an "aggregation of 2 or more generating units or energy storage resources". The AESO should consider reducing the introduction of new terms that may be intended to be synonymous but may also be	31. Under the revised ISO rules, an aggregated facility can be made up more than one technology. "Containing wind or solar" is a specialization of aggregated facility, meaning this section of the rule only applies to aggregated facilities that contain wind or solar technologies within the aggregated facility as opposed to other types like pure batteries aggregated facilities. See slide 16 of the AESO's May 9, 2022 Webinar for further reference.

read to be intentionally distinct. For example, applying language like "aggregating wind or solar resources" so as to avoid any confusion about its intent.	
Section 304.7, *Event Reporting*	
TransCanada Energy Ltd. (TCE) 32. TCE recommends that "Energy Storage Resource" be added to the title for Appendix 2.	32. The AESO agrees with TCE's suggested revision to Appendix 2 and has revised Section 304.7 accordingly.
ENMAX Corporation 33. Subsections 2(b) and 4(b) should read: • "no later than 5 business days after the operator…" or "within 5 business days of the operator…" A similar adjustment should be made in 5(b). Event 7(a) in Appendix 1 states, "loss of the ability to remotely monitor or control system elements of the bulk electric system that is connected to the transmission system at 100kv or higher." ENMAX finds the reference to both the "bulk electric system" and the "transmission system energized at 100kv or higher" to be confusing, and possibly redundant or contradictory. We note that Event 2(a) in Appendix 2 refers only to the latter. Also, "100kv" should read "100 kV." ENMAX's interpretation of the wording of Event 1 in Appendix 2 is that it refers to an unexpected outage that affects any combination of two or more generating units, aggregated facilities, or energy storage resources. The outage must have been caused by a common disturbance. In response to an earlier question, the AESO stated that "contrary to the design" means: (i) outside the original safe design limits of the facility; (ii) unexpected; or (iii) non-routine. ENMAX therefore suggests the following wording for Event 1:	33. The AESO agrees with ENMAX's editorial changes to subsections 2(b), 4(b) and 5(b). The AESO agrees that Appendix 1, Event 7(a) is redundant and has removed "transmission system energized at 100kv or higher". Regarding Appendix 2, Event 1, the AESO has clarified that "contrary to the design" is related to the design of the generating units, aggregated facilities or energy storage resources. The AESO is of the view that this description is sufficient for the purposes of the obligation. The AESO can provide additional context in an information document.

• An unexpected outage affecting any combination of 2 or more generating units, aggregated facilities, or energy storage resources having an aggregate gross generation exceeding 500 MW at the time of the outage, that is caused by a common disturbance: (i) whose magnitude exceeds the design limits of one or more of the affected facilities; (ii) that is unexpected; or (iii) that is non-routine. In ENMAX's view, "unexpected" events and "non-routine" events are essentially the same and could be combined.	
TransAlta Corporation	
34. ***Clarify why the term bulk electric system was replaced with its definition and the intent of those changes.*** TransAlta asks the AESO why it has removed references to the "bulk electric system" and chosen to repeat the definition of the "bulk electric system" in the proposed draft. We are unclear what the AESO is attempting to achieve with this new language, as the changes appear to be different with no clear distinction and result in a wordy and repetitive document. In some instances, the AESO appears to be parsing out selected parts of that definition or otherwise referring to the "transmission system" but only those aspects that are "energized at 100 kV or higher". It would be helpful for the AESO to explain the intent of these changes and why it feels that these are necessary at this time (for example, what about the inclusion of energy storage drives this need for change).	34. The definition of "bulk electric system" (BES) is primarily used in Alberta reliability standards. The BES definition for ARS was updated on August 6, 2022, but the ISO rules definition was not. As part of the work to align the ISO rules and ARS, the AESO intends to evaluate overlap between Section 304.7 and EOP-004. As an interim solution, references to "bulk electric system" in Appendices 2, 3 and 4 were replaced with "generating unit, aggregated generating facility or energy storage resource energized at 100 kV or higher" to avoid amending the outdated ISO rules definition for bulk electric system to reference energy storage.

Section 304.8, *Event Analysis*	
ENMAX Corporation 35. Suggest that subsection 2(1) be modified to read: • "The ISO may conduct an event analysis of an event listed in Appendix 1 of Section 304.7 *Event Reporting,*" given that Appendix 1 to Section 304.8 is a list of NERC categories. A similar adjustment should be made in subsection 2(2). Suggest that subsection 2(3) be modified to read: • "The ISO may categorize the event using the highest applicable NERC category" or "The ISO may categorize the event using the highest applicable category listed in Appendix 1." The statement that Category 1 is the lowest and Category 5 is the highest is unnecessary given their definitions in Appendix 1. Under section 6, the ISO may decide to author additional reports. Under 7(1), the ISO may identify the Responsible Entity required to implement each recommendation and the associated implementation dates. Is it not possible that reports completed in accord with Rule 304.8 but not under section 6 could contain recommendations that the ISO can then direct Responsible Entities to implement?	35. Appendix 1 of Section 304.8 contains a list of event categories that that AESO may conduct an event analysis of pursuant to subsection 2(1). The reference is correct. The AESO is of the view that the current language of subsection 2(3) add clarity to the provision. Regarding subsections 6 and 7(1), the AESO would first author an additional report taking into account previous reports from the Responsible Entity before requiring the implementation of recommendations.
Section 304.9, *Wind and Solar Aggregated Facility Forecasting*	
ENMAX Corporation 36. Section 3: • Appears to be obsolete because the wind and solar forecasting requirements had to be met by affected facilities on or before September 1, 2018. In response to an earlier comment by ENMAX, the AESO stated that it proposes to remove subsection 3(2) as part of an upcoming administrative amendment, but it is not clear why 3(1) would not also be removed or why the amendment would not be made along with	36. Regarding subsection 3, the AESO notes that the ISO Rules Red Tape Administrative Amendments filing proposes to remove subsection 3(2) from Section 304.9. Subsection 3(1) is a boilerplate provision that retires all predecessor forecasting requirements. The AESO notes that the ISO Rules Red Tape Administrative Amendments filing proposes to amend subsection 4(2) to refer

the current amendments required to accommodate energy storage resources.

Section 4:

Subsection 4(2):

- In 4(2), “with2” should read “with 2.”
- Subsection 4(2) states that an aggregated facility must be equipped with 2 sets of instruments for each meteorological parameter listed in Table 1, while subsection 4(3)(a) states that a facility must be equipped with one set of instruments per 49 km^2 of surface area. Taken together, do these subsections imply one set of instruments per 49 km^2 but with a minimum of 2 sets? Also, Table 1 lists “Set-1” and “Set-2” instruments for wind resources but “Set-1 per 49 km^2” and “Set-2 for each subsequent 49 km^2” for solar resources. Does this imply a difference in treatment between wind and solar resources? Are the table headings consistent with the requirements set out in the rule?
- In 4(4), “interval” should be “intervals.”

Section 5:

- In 5(4), “a aggregated facilities” should read “an aggregated facility.”

Section 6:

- In 6(1), suggest the following underlined addition: “is suspected to have failed, or is suspected to be providing erroneous data…”
- In 6(4), suggest the following deletion: “legal owner of an wind or solar resources aggregated facility containing wind or solar resources.”

Section 7:

- The comma should be removed after “notwithstanding.”

Section 8

- ENMAX finds subsections 8(1) and 8(2) as written to be confusing. The wording needs some fix-ups, and there appears

only to one set of instruments. Table 1 will also be amended as part of the ISO Rules Red Tape Administrative Amendments filing to only refer to “Set-1”.

The AESO agrees with ENMAX’s editorial changes to subsection 4, 5, 6, 7 and 8, and Table 1.

The AESO has corrected subsection 8 to specify that 8(1) applies to wind and 8(2) applies to solar. The AESO has also corrected subsections 8(4) and 8(5) in the same manner.

The AESO also notes that section 4(2) should only apply to wind, and subsection 4(3) should only apply to solar. These errors have been corrected.

Regarding ENMAX’s comment regarding precision, the AESO agrees there is disconnect between precision and accuracy. The AESO is working with a third-party forecaster to correct this and will update the Section 304.9 at a future time.

to be significant overlap between 8(1) and 8(2).

- Subsection 8(4) refers to “a wind aggregated facility containing wind or solar resources,” while 8(5) refers to “a solar aggregated facility containing wind or solar resources.”
- In 8(4)(d), “in meters per m/s” should be “in m/s.” In 8(4)(e), “in meters per (m/s” should be “in m/s.” In 8(4)(f) and 8(4)(g), we suggest adjusting “the nearest 1 °C and an indicator is required to confirm that…” to “the nearest 1 °C, together with an indicator to confirm whether...” In 8(5) we suggest adding a comma after “must.”

Table 1:

- Wind direction (both cases): range column should be changed to “0 to 359”
- Barometric pressure for wind: “HPa” should be “hPa”
- Relative humidity for wind and solar: change “1.00%” to “1%”
- Precipitation for wind and solar: change “mm/mon” to “mm/min”
- Ambient temperature for solar: “Degree” to “Degrees”
- “Diffused Horizontal Irradiance” to “Diffuse Horizontal Irradiance”

As a general comment, the precision specified by the AESO is often out of touch with the accuracy. For example, with a ±3% accuracy bound on global horizontal irradiance (GHI), a measured value of 3000 could correspond to an actual value as low as 2910 W/m^2 or as high as 3090 W/m^2. Reporting GHI to 0.1 W/m^2 creates an exaggerated sense of the accuracy of the measurement.

Section 306.7, *Mothball Outage Reporting*	
TransAlta Corporation	
37. *Explain the difference between "forecasting" and "assessing" adequacy of supply* TransAlta notes that the AESO has changed paragraph 7(1) to refer to "forecast" instead of "assess" adequacy of supply. TransAlta asks the AESO to clarify what it interprets to be the difference between "assessing" and "forecasting" adequacy of supply. For example, does the AESO intend to undertake a different or fewer activities when it is "forecasting" adequacy of supply rather than "assessing" it? Moreover, we are unclear why the introduction of energy storage in the ISO Rules changes the AESO's activities with respect to adequacy of supply with respect to mothball outage reporting.	37. The change to subsection 7(1) was a part of the approved amendments for Section 202.6, which became effective January 1, 2023. This change was shown in blackline because it was not in effective at the time Version 2.0 was released. As a matter of clarification, the AESO notes that subsection 2 of Section 202.6 pertains to supply adequacy-related forecasts, whereas subsection 3 is about the supply adequacy assessments that are informed by the forecasts produced in accordance with subsection 2.
Section 503.1, *Functional Specification and Legacy Treatment*	
AltaLink Management	
38. This section has been added without any consultation with market participants and as drafted it could have significant impacts on transmission facilities maintenance and capital replacements. AltaLink considers consultation on this portion of the Rule to be deficient. Notwithstanding the requirement for further consultation on this portion of the rule, AltaLink highlights the following issues: **1. Lack of Certainty in Rule Application during project development and construction** - The proposed wording identifies two different points in time within the project cycle – "[when] the legal owner's facility received facility application approval" (Section 3) and "the original date of the commencement of the design" (Section 4(2)(b)(i)) – for changes to bulk transmission lines. This contrasts with the present legacy provisions that are embedded within specific 502 Rules which provide reference to the date of the project's Functional Specification. There are a number of issues with these effective	38. At Session 3, the AESO explained that Section 503.1 resulted as a natural consequence of restructuring from Division 502 to Division 503 (See AESO Reply #1). The AESO's intention with Section 503.1 is to continue with how legacy treatment works today, as described below: • First, legal owners are expected to comply with the requirements that their facility was designed and built to (or upgraded to), unless the ISO rule is specifically drafted to require compliance from all relevant facilities. (s. 3 of Section 503.1). • Second, if a legal owner modifies a part of its facility, whatever is modified should be brought "up to code" (s. 4 of Section 503.1). • Third, if necessary for safety or reliability, the AESO can require compliance with an updated requirement (s. 5 of

date markers:

- For market facilities, there may be multiple facility approval dates. For example, a generation plant may have been approved on a different date from the generating plant's interconnection. Rule requirements based on project approval dates may result in different rules applying to different portions of interconnection and power plant facilities. Additionally, a later amendment to the facility would add further confusion to understanding the facility approval date.
- Transmission line design usually occurs in phases with preliminary design occurring during the early siting stage and detailed design occurring later in the process. As this process is often iterative it is difficult to identify a specific date when design begins and therefore using the "commencement of the design" as a marker proves challenging to manage. Scope changes are common which adds further confusion for this marker.
- For many projects, some design occurs prior to project approval. Accordingly, the language in Section 3 is problematic, as the design requirements may change after project consultation or even after the project has been filed with, but not yet approved by, the Alberta Utilities Commission.
- Functional Specifications may change as projects progress, often after project approval. AltaLink is aware of Functional Specifications being updated weeks prior to the In-Service-Date. At this stage in a project, the facility has already been constructed, making compliance with newly released ISO Rules impractical. In this case, using the current practice of most recent functional specification is also problematic.

To provide a clearly defined project date marker which will not create unnecessary change in the project cycle, AltaLink recommends using the date that the AESO Functional Specification is first marked as being "Final" for the purposes of the TFO providing their Proposal to Provide Service. This is a definitive point in time and is early enough in the project cycle to not introduce unnecessary project changes.

Section 503.1).

At Session 3, the AESO explained the effective time marker in subsection 3 is intended to delineate the "point of no return" for an active project (e.g., the point at which the project would not be expected to be re-designed to comply with updated technical requirements). Stakeholders suggested the effective time marker be tied to something other than AUC facility approval, such as the first version of the functional specification issued by the AESO, the version functional specification included with the Commission update letter, or final investment decision.

In consideration of Stakeholder feedback, the AESO has revised subsection 3 to reference "*the first version of the final functional specification issued by the AESO*" as the point of no return for active projects. The AESO agrees that this is a definitive point in time that and is early enough in the project cycle to not introduce unnecessary project changes.

A second purpose of subsection 3 is to ensure that existing facilities in Alberta receive legacy treatment as technical requirements evolve over time, unless an ISO rule is specifically drafted to require compliance from existing facilities. Considering that there are facilities in Alberta that do not have functional specifications (see slide 29 of the Session 3 presentation), the AESO decided to maintain the reference to facility approval in subsection 3 to properly exempt these legacy facilities from the application of Division 503.

Subsection 3 now reads:

> *A **legal owner** must, unless otherwise specifically stated in an **ISO rule** within Division 503 of the **ISO rules**, remain compliant with the applicable predecessor document to an **ISO rule** within Division 503 if the **legal owner**'s facility received either of the following prior to the effective date of an **ISO rule** within Division 503:*
>
> *(a) a first version of the final functional specification issued by the **ISO**; or*
>
> *(b) approval for the construction and operation of the*

2. Application to Maintenance and Capital Replacement – As currently written, Section 4(1) impacts not only direct assign projects but capital replacement and maintenance projects. Due to the broad nature of the wording, a minor line hardware replacement on a decades old asset may trigger the upgrade of that line to meet the requirements of the current rules. Such a result would cause significant increase in costs to ratepayers and potential impacts to stakeholder if, for example, right-of-way widening is required. The proposed wording represents a major change to the present requirement currently embedded in various 502 Rules which requires no future upgrades unless identified in a subsequent Functional Specification. This change needs significant further consultation with Market Participants so all parties can understand the AESO's concerns and for the AESO to understand the potential ramifications of the AESO's proposed changes on TFOs, other Market Participants and rate payers.	*facility from the relevant regulatory authority with jurisdiction.* The AESO appreciates Stakeholder comments on subsection 4 and acknowledges that the original wording may have not aligned with the intent to maintain the status quo. Subsections 4 is amended to: (i) confirm that subsection 4(1) not does apply to identical or similar (i.e., like-for-like) replacements, or maintenance related activities; (ii) carve out TFOs.
<u>TransAlta Corporation</u>	
39. ***The functional specification subsection should be amended to contain the same language as appears in paragraph 2(2) of Section 502.10*** TransAlta is concerned that the language proposed in subsection 2 removes an important provision in the current ISO rules which substantially alters the proposed ISO rule from its current version. TransAlta recommends that paragraph 2(2) of the Section 502.10 be added to the proposed ISO Rule. More specifically, we ask the AESO to renumber subsection 2 as subsection 2(1) and add a new paragraph in subsection 2 (numbered as paragraph 2(2)) that states: "The functional specification referred to in subsection 2(1) must be generally consistent with the provisions of 503.17, but may contain material variance the ISO approves based upon its discrete analysis of any one or more of the technical, economic, safety, operational and reliability requirements of the interconnected electric system related to the specific facility." ***The legacy treatment subsection should be amended to refer to***	39. The AESO agrees with TransAlta's recommendation and has revised subsection 2 accordingly. For clarifications and explanations of the revisions to subsection 3 and 4, please see AESO Reply #39. As explained at Session 3, the Division 502 rules, former technical and operating standards and old functional documents are considered predecessors to the Division 503 rules. Existing facilities that comply with Division 502, or the prior standards, may continue to do so pursuant to subsection 3 of Section 503.1. Therefore, the AESO does not think it is necessary to refer to Division 502 within Section 503.1, but can provide this guidance in an associated information document. The AESO confirms that changes in ownership does not impact legacy treatment and believes the redraft of subsection 3 resolves the issue. The AESO can provide this guidance in an associated information document.

predecessor ISO Rules in Division 502 and should apply even in circumstances of a changes in legal owner

TransAlta is concerned about language in subsection 3, which only references predecessor documents within Division 503 which only reflect the requirements for new generation and have removed references to the requirements for "existing generating units". As the AESO is aware, the current ISO rules in Division 502 contemplate differences in requirements for "existing generating units" and "new generating units" and the Legacy Treatment section as currently drafted does not refer to compliance with predecessor documents except for those in Division 503, for which there are no predecessor documents because Division 503 is entirely new. Additionally, this legacy treatment should not be impacted by changes in ownership.

To address this concern, TransAlta recommends that language be changed to: "A legal owner must, unless otherwise specifically stated in the ISO rule within Division 503 of the ISO rules, remain compliant with the applicable predecessor document to an ISO Rule within Divisions 503 **or 502** if the facility received facility application approval prior to the effective date of an ISO rule within Division 503. **Changes in ownership including transfers of approvals, permits or licences do not constitute facility application approvals for the purposes of this subsection.**"

Alternatively, the AESO could adopt the following language, which removes any references to facility application approvals: "A legal owner must, unless otherwise specifically stated in the ISO rule within Division 503 of the ISO rules, remain compliant with the applicable predecessor document to an ISO Rule within Divisions 503 **or 502** if the facility **energized and commissioned** prior to the effective date of an ISO rule within Division 503."

The 5 MW threshold for any addition, replacement or upgrade should continue to be applied in the new rules

TransAlta does not support the new language in subsection 4(1), which applies to "any addition, replacement or upgrade to a facility or resource or any supporting system" and would trigger the imposition

of many new requirements for small like-for-like replacements or minor changes in capacity. We ask the AESO to redraft this requirement using the same threshold of 5 MW for any change to a facility as currently included in subsections 3(a)-(b) of section 502.1. In addition, TransAlta asks the AESO to please clarify the following: With respect to subsection 3, please confirm that the "facility application approval" is a reference to the power plant approval and not the transmission line approval.	
Section 503.2, *Maximum Authorized Real Power and Maximum Authorized Charging Power*	
Capital Power Corporation 40. Capital Power requests that subsection 5 be clarified. If an operator must not operate below a maximum, doesn't that mean it can only operate at the maximum (i.e., the minimum equals the maximum)?	40. At Session 3, the AESO clarified that an operator can only operate to maximum MACP, which is inherently a negative value. For example, if MACP is -10 MW, an energy storage operator can operate between 0 MW and -10 MW in charge mode. The AESO will include this guidance in an information document.
ENMAX Corporation 41. Subsections 2(2) and 3(2) should be clarified. • They state that any auxiliary power used in the operation of the facility is to be "excluded" in determining MARP or MACP. The word "exclude" can be interpreted to mean either "deduct" or "ignore," and the two interpretations produce different results. The maximum power consumption at an energy storage facility is: (i) the maximum charging power for the storage device; plus (ii) the maximum auxiliary power that could be used while charging. The AESO should clarify whether the MACP is just (i) or (i) plus (ii). The auxiliary power used by a plant can vary through time. Is it to be assessed under the same "optimal conditions" as the capability and limitations of the facility or under optimal conditions for the auxiliary power itself? If MARP is not the maximum power that could be injected into the grid, and/or MACP is not the maximum power that could be withdrawn from the grid, this should be clearly	41. At Session 3, the AESO clarified that MACP is determined based on the attributes of the energy storage resource or aggregated facility. Auxiliary power is not an attribute, therefore MACP is the maximum charging power for the storage (part (i) in ENMAX's comment). For better clarity, the AESO has changed "exclude" to "ignore" in subsection 2(2) and 3(2). The AESO has also redrafted the definition of MACP to specify the difference in measurement locations for energy storage resources versus aggregated facilities. The assessment point for auxiliary power is irrelevant since it is ignored in the determination. Regarding subsection 4(2), MARP is determined where the generating unit, aggregated facility, or energy storage resource meets reactive power capability. This value can be less than the maximum power capability of the machine.

stated. Further to this point, subsection 4(2) implies that MARP is less than the maximum power that a resource can supply to the transmission system. Given that MARP is to be assessed under optimal conditions, how can this be the case? If a generating unit is to be operated beyond its normal design limits to manage supply shortfall events, the AESO should consider additional compensation for any extra wear and tear or maintenance costs imposed on the plant. Section 3: In 3(3), the comma after "must" should be deleted. Section 5: This section states that the operator of an energy storage resource must not operate the resource "below the maximum authorized charging power." The word "below" could make sense if the MACP is treated as a negative number, below which the facility is not allowed to operate. However, in this case the MACP would be a minimum, not a maximum. For all rules it may be useful to state whether MACP is to be treated as a positive or negative number and to review the rules to make sure all statements (including the use of "maximum" and "minimum") and calculations reflect this. For example, 503.20-1(a)(ii) specifies a range greater than 9 MW between the MACP and the MARP, and a calculation of the range as MARP – MACP requires the latter to be negative to provide a correct result.	Regarding subsection 5, please see AESO Reply #41.The AESO agrees with ENMAX's suggested edit to subsection 3(3).
TransAlta Corporation	
42. ***Clarify why auxiliary power requirements must be subtracted from the maximum authorized charging power in all instances, irrespective of configuration of the energy storage resource*** Considering that existing 502.1 does not contain a requirement to exclude any auxillary power, TransAlta asks the AESO to clarify the requirement contained in 3(2) in which an aggregated facility must exclude auxiliary power in determining the maximum authorized charging power. If the energy storage system is configured to self-supply is auxiliary power requirement and does not have that auxiliary power supplied from the transmission or distribution system, this requirement would limit the maximum authorized charging power	42. Regarding subsection 3(2), please AESO Reply #42. Separately metered auxiliary power should not be included in the determination of MACP because auxiliary power does not contribute to the resources ability to provide reactive power capability. Regarding subsection 5, please see AESO Reply #41. Regarding subsection 2(2), whether an aggregated facility contains or does not contain an energy storage resource, auxiliary power should be ignored in determining MARP.

to a level is lower than the true maximum charging power level of the energy storage resource component of the aggregate facility. This requirement appears to unnecessarily constrain the energy storage resource's ability to charge at its actual maximum charging capability and could impact the flexibility and economic operations of the energy storage resource in the aggregate facility configuration. TransAlta also recommends a few drafting corrections: • With respect to subsection 5, TransAlta believes the drafted language includes a mistake/typo. We suggest the draft be corrected by removing the "not" which appears in red strikethrough: "... containing an energy storage resource must ~~not~~ operate below the..." With respect to subsection 2(2),TransAlta notes that the subsection does not mirror the language in 502.13, subsection 3(2). We suggest that the draft be corrected to: "The legal owner of an aggregated facility containing an energy storage resource must exclude..."	
Section 503.3, *Reactive Power*	
AltaLink Management 43. AltaLink commends the AESO for endeavoring to make ISO Rules more technology agnostic. As "stator winding terminals" is applicable to only specific generation technology types, AltaLink recommends that the AESO consider rewording the clause 2(1)(a) to be more technology agnostic to ensure it applies to all types of generating units. Similarly, the reference to "stator current limiters" in 2(3) should likely be made more technology agnostic.	43. The AESO notes that reactive power is measured at different places for different technologies. If an energy storage resource has a stator winding terminal and does not meet the definition of aggregated facility, then reactive power requirements are determined at the stator winding terminal per subsection 2(1). For additional clarity, subsection 2(1)(a) has been revised to refer to "synchronous" energy storage resources. The AESO assumes Altalink's reference to "stator current limiter"" is referring to subsection 2(3) of Section 503.4, *Voltage Regulation*. The AESO has revised subsection 2(3) of Section 503.4 in the same fashion.

ENMAX Corporation	
44. Section 1: • In 1(c), delete “to” at the end. Section 2: • Subsection 2(2) states that a facility must be capable of operating under the automated action of an automatic voltage regulator or voltage regulating system, 2(3) specifies an operating range from 0.9 pf for supply to 0.95 pf for absorption, and 2(5) allows for reactive power resources to be shared under certain conditions. Does the full reactive power capability of an aggregated facility or energy storage resource need to be under the control of a single master voltage regulating system or automatic voltage regulator? Section 5: • Subsection 5(b)(iv) states that an energy storage resource and a generating unit that share a common point of grid interconnection and that are designed to be operated concurrently may share resources to meet the reactive capability requirement if that capability is based on the sum of the MARP of the generating unit and the MACP of the storage resource. Is this intended to cover both: (i) energy production by the generator while charging the energy storage resource; and (ii) energy production by the generator while discharging the storage device? In the latter case, would the requirement need to be based on the MARPs of both the generator and the storage resource?	44. The AESO agrees with ENMAX’s editorial changes to subsections 1(c). Regarding subsection 2(2), reactive power capability does not need to be under the control of a single master voltage regulating system or automatic voltage regulator for an energy storage resource or aggregated facility. A facility designer may implement different strategies to coordinate the control of reactive power devices. However, a single master voltage regulation system is a method commonly employed. The AESO revisited subsection 2(5) to improve the clarity and intent of the requirement. This subsection is intended to permit the sharing of reactive power resources if the reactive power resources: (i) are designed to be in service at all times; and (ii) are sufficient to meet the total of the individual requirements of subsection 2(3) for resource sharing the common point of connection. The AESO will provide additional guidance on sharing reactive power resources in an Information Document.
Entrust Solutions Group (Kestrel Power Engineering)	
45. 503.3, 2(7): This section is interpreted by Entrust to be in relation to steady-state stability limits often found drawn on synchronous generator capability curves created by the OEM. It must be understood that	45. The AESO agrees that when a generating unit, aggregated facility, or energy storage resource is operating in automatic voltage regulation mode, stability issues occur rarely, if at all. The AESO agrees that the variance process in subsections 2(7) and 2(8) can be removed for this reason.

these OEM curves are drawn assuming the excitation system is operating in manual mode (fixed excitation), ignores saliency and saturation, and assumes an external grid reactance. Charles Concordia showed in his 1944 paper that units operating in automatic voltage regulator mode do not experience that same stability issues as units operating with fixed excitation. (C. Concordia, "Steady-State Stability of Synchronous Machines as Affected by Voltage-Regulator Characteristics," Transactions of the AIEE, vol. 63, no. 5, pp. 215-220, May 1944.) Only stability studies conducted by the ISO or other qualified entities can determine what the actual stability studies for any given unit will be and these will not impact reactive capability. This section is better removed entirely or rewritten to reflect any physical limitation on the generating unit such core end heating which can legitimately impact reactive capability in the under excited region.	If a legal owner foresees capability impacts due to stability or physical limitations, Section 103.14, *Waivers and Variances* provides an avenue to seek a waiver or variance to the requirements of Section 503.3.
Section 503.4, *Voltage Regulation*	
ENMAX Corporation 46. Is this section intended to apply to energy storage resources that do not have stator windings? • If so, 2(1)(e) should be modified to reflect this. Subsection 2(4) specifies that a change in reactive power must achieve 95% of its final value no sooner than 0.1 seconds and no later than 1 second following a step change in voltage. Does this response time specification apply to both the facility's transient/dynamic response to an event and to a manual change to the voltage set point?	46. Section 503.4 is applicable to all types of energy storage (i.e., those with and without with stator windings). Subsection 2(1)(e)(i) has been modified to refer to "synchronous" energy storage. Energy storage resources that do not have stator winding terminals would be controlled at the collector bus as per 2(1)(e)(ii). The AESO confirms that subsection 2(4) applies to transient/dynamic response to an event.

Section 503.5, *Voltage Ride-Through*	
AltaLink Management 47. As the aggregate volume of small generators continues to rise in the power system, AltaLink remains concerned that excusing increasingly large quantities of generation from key requirements such as Voltage Ride Through will contribute to the erosion of overall system performance and reliability. AltaLink requests that the AESO reconsider extending this requirement to encompass more generation including the generators connected to the distribution network. Furthermore, excusing transmission-connected generators from all requirements based on size is inconsistent with the AESO's recommendations for DERs contained in the AESO's posted paper "AESO DER ROADMAP INTEGRATION PAPER: DER Ride-Through Performance Recommendations".	47. Currently, the requirements of existing Division 502 apply to transmission-connected facilities, with the exceptions of SCADA requirements for market reasons. The AESO DER Roadmap Integration paper recommended the adoption of ride-through requirements by DFOs for DCG.
ENMAX Corporation 48. Section 1: • In 1(a), "an" should be "a." • In 1(b)(ii), the word "and" is duplicated. Section 2 • 2(2)(c) refers to "normal clearing time." Which entity determines what the normal clearing time is for the facility/location in question?	48. The AESO agrees with ENMAX's suggested changes to subsection 1. Regarding subsection 2(2), "normal clearing time" is determined by the legal owner of the generating unit, aggregated facility, or energy storage resource for safe operation of the facility for the purposes of Section 503.5.
TransAlta Corporation 49. ***Section 503.5 does not adequately deal with Legacy Treatment*** See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*).	49. Please see AESO Replies #39 and #40.

If the AESO does not change the language as recommended by TransAlta in 27 above, Section 503.5 should specifically include the *Voltage Ride-Through Requirements for Existing Generating Units* that are reflected in subsection 6 of Section 502.5, *Generating Unit Technical Requirements*, including paragraph 3(c) "the amount of time that the voltage of the generating unit remains at 0.15 per unit must be at the least of the normal clearing time for a three (3) phase fault at the specific location where the generating unit is connected to the transmission system". Additionally, Appendix 1 for Section 503.5 should also be revised to include Appendix 1 to Section 502.5, *Voltage Ride-Through Requirements – Existing Generating Units*. These proposed changes would ensure the transition from 502.5 to 503.5 does not alter the requirements which now differ for existing and new assets. More specifically, 502.5 contains different requirements for existing and new assets whereas the proposed section 503.5 only contemplated one treatment for all assets. For example, 503.5 requires the voltage of both existing and new generating assets to remain at 0.0 per unit.	
Section 503.6, *Frequency and Speed Governing*	
AltaLink Management 50. As the aggregate volume of small generators continues to rise in the system, AltaLink remains concerned that excusing increasingly large quantities of generation from key requirements such as Frequency Governing and Frequency Ride Through will contribute to the erosion of overall system performance and reliability. AltaLink requests the AESO to reconsider extending this requirement to encompass more generation including the generators connected to the distribution network. Furthermore, excusing transmission-connected generators from all requirements based on size is inconsistent with the AESO's recommendations for DERs contained in the AESO's posted paper "AESO DER ROADMAP INTEGRATION PAPER: DER Ride-Through Performance Recommendations".	50. Please see AESO Written Reply #49. Regarding subsection 2(1)(ii), the AESO notes that it further revised Section 503.6 to merge the governor design requirements for generating units and synchronous energy storage resources.

AltaLink commends the AESO for endeavoring to make ISO Rules more technology agnostic. As “synchronous machine” specifies a specific generation technology type, AltaLink recommends that the AESO consider rewording the clause 2(1)(ii) to be more technology agnostic to ensure it applies to all types of generating units.

ENMAX Corporation

51. Section 2:

- **In section 2(1)(b), rather than being based on MARP (a very high bar), the droop setting for a generating unit should be based on its active power output.** This point is bolded because it is not simply a clarification.

Section 3:

- In light of section 1(a), section 3(1)(a)(i) appears to be redundant unless it was intended that the word “electrically” be inserted before “connected.”
- Is section 3(1)(b)(ii) to be interpreted such that, if a facility has MARP = 10 MW and MACP = −5 MW, the droop setting would be 3% to 5% of 15 MW?
- Normally, the “difference between A and B” is interpreted as A minus B. Section 3(1)(b)(ii) refers to “the difference between maximum authorized charging power and maximum authorized real power,” while Section 3(1)(h) refers to “the difference between the maximum authorized real power and the maximum authorized charging power.” Are the two referenced values supposed to be the same? Please see also ENMAX’s earlier comment regarding a sign convention for MACP.
- 3(f) and 3(g) appear to have no equivalents in section 2. Is this intentional?

By virtue of the phrase “less than or equal to,” section 3(1)(h) appears to allow an aggregated facility or energy storage resource to operate at a frequency response rate of zero. Also, the difference between MARP and MACP depends on the assumed sign of MACP.

51. Regarding subsection 2(1)(b), the AESO clarified at Session 3 that the standard definition of droop is the amount of speed change that is necessary to cause the prime mover mechanism to move through 100% of its range. MARP defines the 100% range. Basing droop on current active power output would degrade the effective frequency response of resources at low levels of production.

    In subsection 3(1)(a)(i), the word “electrically” is intentionally used to denote that the governor must be able to be in service while the facility is physically connected to the AIES, versus “having a connection”.

    Subsection 3(1)(b)(ii) has been revised to clarify that droop setting for an aggregated facility is expected to be based is on the greater of MACP or MARP. Based on the example provided, droop setting would be based on MARP of 10 MW.

    For the purposes of subsection 3(1)(h) and sign convention in the power calculations, MACP should be taken as negative. Please also see AESO Reply #41.

    Subsections 3(1)(f) and 3(1)(g) mirror the requirements for governor systems for aggregated facilities in existing Section 502.1.

TransAlta Corporation	
52. ***Remove the requirement for energy storage resources to activate its governor system when consuming real power*** TransAlta does not support the requirement for energy storage resources to have a continuously acting governor system when it is "consuming any real power as measured at the collector bus". No load facilities (resources that consume real power) have requirements to provide any frequency response nor are they required to have any governor system. When an energy storage resource is charging/consuming power, it is acting exactly like any other load on the system and should be treated in the same manner. This is an unfair requirement that amounts to conscription frequency response services from energy storage resources in a discriminatory manner simply because energy storage resources have automated governor response capability. TransAlta recommends that the AESO to amend paragraph 3(1)(a)(ii) to: "is producing any real power as measured at the collector bus". Furthermore, the only time that energy storage resources should provide this frequency response when consuming is when they are dispatched to provide operating reserves. There is no need to include any language in this ISO rule for such instances given that an energy storage resources that are providing regulating or spinning reserves would be subject to the requirements in Section 205.4, *Regulating Reserve Technical Requirements and Performance Standards* or Section 205.5, *Spinning Reserve Technical Requirements and Performance Standards*, which clearly specify these performance requirements.	52. Subsection 2(1)(a)(ii) and 3(1)(a)(ii) require a synchronous energy storage resource and an aggregated facility containing energy storage resources to be *designed* to be continuously in service while consuming real power. The AESO understands that TransAlta and other Stakeholders object to the requirement for energy storage to be frequency responsive while *operating* in consumption mode (i.e., subsection 6 of Section 503.6) based on asymmetry in treatment between technologies and potential cost impacts. At Session 3, Stakeholders expressed a strong solution for AESO to develop a markets-based solution for frequency response. The AESO has taken Stakeholder concerns into consideration and modified subsection 6 to require frequency responsiveness while: (i) operating in discharge mode; or (ii) providing an ancillary service that requires frequency response.
Section 503.7, *Power System Stabilizer*	
ENMAX Corporation	
53. Section 2 • The separation of subsection 2(2) into (a), (b), and (c) is unnecessary. (In 2(3)(a), for example, they are not separated.)	53. The AESO prefers to maintain the existing language of subsection 2(2). The legal owner of the generating unit, aggregated facility, or energy storage, as applicable, defines the limit for effective

Subsection (2)(3)(a) refers to the “design limit for effective power system stabilizer operation.” Who defines that limit?	power system stabilizer operation. The limit is primarily a function of the resource’s capability and equipment.
Entrust Solutions Group (Kestrel Power Engineering)	
54. 503.7, 2(2): The 135 degree criteria listed in this section is derived from the WSCC/WECC paper “Criteria to Determine Excitation System Suitability for Application of PSS in WSCC System” written in 1992. This section does not make it clear that the 135 degrees is to be applied at 1 Hz only. It should also be noted that this criteria is not referenced in NERC Standard VAR-501-WECC-3.1 which governs PSS tuning in WECC and has not been generally applied to any generating units that we are familiar with. The phase lag measured between the voltage reference of the AVR and the generator terminals is dictated by the system impedance, the design of the unit, the nature of the excitation system (brushless vs full static) and the tuning of the AVR. It is possible to tune the AVR on some units such that the phase lag measured at 1 Hz would be greater than 135 degrees rendering it unnecessary to per AESO rules to enable a PSS. This would be contrary to WECC standards under VAR-501-WECC-3.1 and while a unit with these characteristics may not have local-mode issues it can still possibly observe and contribute to damping of inter-area modes. It is our recommendation to remove reference to this suitability criteria. 503.7, 2(3)(d): In NERC Standard VAR-501-WECC-3.1, WECC has relaxed the requirement for phase compensation tuning down to 0.1 Hz and now requires tuning over a range of 0.2 Hz to 1 Hz as this allows lower washout settings in the PSS while still providing damping of the WECC inter-area modes which are located above 0.2 Hz.	54. While the AESO agrees with Entrust’s comments, removing subsection 2(2) at this time would create a gap in power system stabilizer requirements in Alberta because VAR-501-WECC-3.1 requirements are currently split across ISO rules (Division 502) and reliability standards (VAR-501-WECC-AB-1). At Session 3, the AESO recognized that additional work will be required to align and consolidate ISO rule and ARS requirements. When that that work is initiated, the AESO will revisit subsections 2(2) and 2(3) of Section 503.7.

It is recommended that AESO change this rule to match the WECC requirement found in VAR-501-WECC-3.1.	
TransAlta Corporation 55. ***Section 503.7 does not adequately deal with Legacy Treatment*** See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*). If the AESO does not change the language as recommended by TransAlta in 27 above, the AESO should remove paragraph 2(4) or otherwise amend this requirement to (as currently stated in paragraph 10(4) in Section 502.5): "the legal owner of pumped storage generation unit equipped with a power system stabilizer and is capable of operating in the pump mode while electrically connected to the transmission system such that the power system stabilizer does not produce negative damping, then the power system stabilizer must be designed to be in service in the pump mode." TransAlta does not expansion of the requirement, which currently only applies to pumped storage generating units to all synchronous energy storage resources in paragraph 2(4). Additionally, the AESO should the AESO not change the language as recommended by TransAlta in 27 above, the AESO should revise the proposed language and add back paragraphs 10(2)(a)-(b) from Section 502.5 to Section 503.7.	55. Please see AESO Replies #39 and #40 above regarding legacy treatment. As part of the technical rule restructuring, subsection 10(4) of Section 502.5 was redrafted to be more technology agnostic and inclusive of other types of synchronous energy storage that could be directly connected to the transmission system. Practically, subsection 2(4) of Section 503.7 applies pumped hydro and compressed air on a go-forward basis.
Section 503.8, *Step-Up Transformer*	
TransAlta Corporation 56. ***Section 503.8 does not adequately deal with Legacy Treatment*** See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*). If the AESO does not change the language as recommended by TransAlta in 27 above, the AESO should add paragraphs 11(5)(a)-(b) from Section 502.5 to Section 503.8.	56. Please see AESO Replies #39 and #40 above regarding legacy treatment.

Section 503.9, *Auxiliary Systems*	
AltaLink Management	
57. To the specific requirement in 2(1)(c), AltaLink highlights that usually the more onerous contingency for the power system (from a Most Severe Single Contingency (MSSC) perspective) occurs when the steam turbine (not the gas turbine) in a combined-cycle plant is tripped. More specifically, gas turbines may be unable to operate for very long following loss of a steam turbine, unless there are specific design provisions in the plant (such as bypass stacks, dump condensers or oversized demineralized water supply tanks). AltaLink recommends adding this potential condition to the ones identified in the Rule so that developers building a new Combined Cycle Gas Turbine (CCGT) or even some Cogen plants do not inadvertently increase MSSC.	57. At Session 3, the AESO clarified that subsection 2(1)(b) requires a combined cycle plant to be designed such that, after the steam turbine trips, the combustion turbine must remain online for at least 10 minutes before coming offline. The method to comply with this requirement is at the discretion plant designers.
ENMAX Corporation	
58. Regarding Section 2(1)(c), what if the loss of the combustion turbine followed by the tripping of the steam turbine affects MSSC? Will the AESO require a time delay between the loss of the CT and the tripping of the ST?	58. Under subsection 2(1)(c), it is acceptable to have simultaneous tripping when a combustion turbine results in the tripping of a steam turbine of a combined cycle plant. Potential impacts of facility design on MSSC are addressed through the Connection Process.
TransAlta Corporation	
59. ***Section 503.9 does not adequately deal with Legacy Treatment*** See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*). If the AESO does not change the language as recommended by TransAlta in 27 above, the AESO should add a new paragraph below 2(1) that states: "The legal owner of a generating unit without a functional specification but with auxiliary systems that do not comply with the requirements of subsection 2(1) is exempt from complying with subsection 2(1)."	59. Please see AESO Replies #39 and #40 regarding legacy treatment. On a go-forward basis, all generating units, aggregated facilities and energy storage resources will have a functional specification.

Section 503.10, *Isolating and Interrupting Devices*	
AltaLink Management	
60. As a circuit breaker will never be exactly at the point of connection, AltaLink suggests replacing "at the point of connection" with "near the point of connection" in clause 2(2). Also, AltaLink suggests adding the requirement for the various forms of generation to have at least one fault interrupting device between the generation facility and the transmission system.	60. The AESO agrees with the wording change from "at the point of connection" to "near the point of connection" in subsection 2(2). The AESO is of the view that AltaLink's recommendation to add a requirement to have at least one fault interrupting device between generation facilities and the transmission system may restrict connection design options.
ENMAX Corporation	
61. Section 2(1)(b) requires that the legal owner of a facility design it for an expected fault level that includes a margin for future anticipated fault levels as the AESO approves in the functional specification. What margin is expected by the AESO? Will that margin vary from project to project and, if so, based on what criteria?	61. Yes, margins are case specific and are determined during the Connection Process between the AESO, the legal owner, and the TFO.
Section 503.11, *Power Quality*	
TransAlta Corporation	
62. ***Section 503.11 does not adequately deal with Legacy Treatment*** See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*). If the AESO does not change the language as recommended by TransAlta in 27 above, paragraph 2(a)(i) of Section 503.11 should add the following: "or the version of *International Electrotechnical Commission 61000-3-7, Electromagnetic compatibility (EMC) – Part 3-7: Limits - Assessment of emission limits for the connection of fluctuating installations to MV, HV and EHV power systems* that was in effect as of the date the ISO first approved the functional specification for the generating unit, aggregated facility, or energy storage resource or for generating units without a functional specification was in effect as of September 19, 2006."	62. Please see AESO Replies #39 and #40 regarding legacy treatment.

Section 503.12, *Grounding and Surge Protection*	
AltaLink Management	
63. AltaLink recommends strengthening the wording in clause 2(1) to require all forms of generation connected to the transmission system to be effectively grounded rather than just be able to operate within an effectively grounded transmission system. As Alberta's high voltage transmission system must always remain effectively grounded, it is essential each source of supply connected to it is effectively grounded to avoid off- normal situations where a portion of the high voltage transmission system loses its ground reference. (Note: Medium voltage portions of the transmission system are designed to operate ungrounded or high-impedance grounded. As such, it is necessary to clarify that it is only the high-voltage portion of the transmission system has this requirement.) As such situations will damage high voltage transmission equipment, render protection inoperable, and jeopardize public safety, ungrounded operation absolutely must be avoided. AltaLink suggest changing "…the generating unit, aggregated facility, or energy storage resource to operate within a transmission system that operates as an effectively grounded system" with "…the generating unit, aggregated facility, or energy storage resource is seen as an effective grounded source from the high voltage transmission system". AltaLink further recommends that a definition of effective grounding be provided in the Rule. (e.g., The ANSI/IEEE standards state that a system, or a portion of it, is effectively grounded when the ratio of zero-sequence reactance to positive-sequence reactance is not greater than three ($X_o/X1 \leq 3$), and the ratio of zero-sequence resistance to positive-sequence reactance is not greater than one ($R_o/X1 \leq 1$) for any condition of operation and any amount of connected generator capacity.)	63. The AESO considers AltaLink's recommendation as beyond the scope of requirements to integrate energy storage. The AESO will consider these recommendations as part of future technical rule consultations.
ENMAX Corporation	
64. In 3(1)(a), add a comma after "density level."	64. The AESO agrees with ENMAX's editorial change to subsection 3(1)(a).

Section 503.13, *Synchrophasor Measurement System*	
AltaLink Management 65. AltaLink commends the AESO for endeavoring to make ISO Rules more technology agnostic. As such, we suspect clause 3(2) may have been inadvertently overlooked as it does not necessarily cover all generator technology types.	65. The AESO agrees with AltaLink's comment and has revised subsection 3(2) to properly denote where synchrophasor measurement systems must record based on technology type.
ENMAX Corporation 66. Section 3: • In 3(4), remove "a" from "a common voltage and current channels." Section 4: • C.37.118.2-2011 should be italicized. Section 5: • Could be simplified by writing "The ISO must provide a legal owner with C.37.118.2-2011-compliant synchrophasor…" Section 6: • 6(1) states that the legal owner must collect and continuously store synchrophasor measurement data for one year unless the data is being streamed. 6(2) states that the owner must, as determined by the ISO, stream the data to the ISO. What are the criteria to be used to determine whether the ISO will decide to require streaming? How do the responsibilities of the legal owner and the ISO change, if at all, as a result of that decision?	66. The AESO agrees with ENMAX's editorial changes to subsection 3(4) and 4. Regarding subsection 5, the AESO prefers to maintain the full reference to the IEEE standard within the provision. Regarding subsection 6, whether streaming of synchrophasor measurement data is required is determined as part of the AESO Connection Process and is specified in the functional specification (see ID#2012-028R). The assessment is primarily based on technical feasibility. Responsibilities of the legal owner are defined in the rule based on whether streaming is required or not.
TransAlta Corporation 67. ***The applicability section should be revised to specify that Section 503.16 only applies to facilities that are implementing a synchrophasor measurement unit***	67. The AESO agrees with TransAlta's recommendation and has revised the applicability section accordingly. Please see AESO Replies #39 and #40 regarding legacy treatment.

The current rule, Section 502.9, makes clear in the applicability section that the standard only applies to legal owners of generating units and aggregated facilities that are implementing a synchrophasor measurement unit. This is because there are facilities that were built before these requirements were applied. We do not support the imposition of new requirement on existing facilities, nor do we think that this was the AESO intent. To address this concern, TransAlta recommends that the AESO revise the applicability to include: "the legal owner of … implementing a synchrophasor measurement unit." ***Section 503.13 does not adequately deal* with *Legacy Treatment*** See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*). If the AESO does not change the language as recommended by TransAlta in 27 above, Section 503.13 should specifically include subsection 2 and 3 of Section 502.8, *SCADA Technical and Operating Requirements*, to ensure that Division 503 includes the same provisions that clarify the different requirements that apply to facilities that were energized and commissions on or after April 7, 2017.	
Section 503.15, *Interconnected Electric System Protection*	
ENMAX Corporation 68. In section 3(2)(b), delete the comma after "include."	68. The AESO agrees with ENMAX's editorial change to subsection 3(2)(b).
Entrust Solutions Group (Kestrel Power Engineering) 69. 503.15, 41: While not related to our usual area of interest, this rule would seem to prevent units from operating in synchronous condenser mode. Synchronous condensers draw very little power from the grid but the wording of this rule does not account for this.	69. Subsection 41 mirrors the existing requirement applicable to generating units. The AESO will revisit this subsection in an upcoming review of interconnected protection system requirements.

TransAlta Corporation 70. ***Clarify the intent of the use "each" as opposed to "the" in subsection 34*** TransAlta is unclear why the AESO has proposed the replace of the language "The legal owner" with "Each legal owner" in subsection 34. This appears to be inconsistent with the other amendments the AESO has proposed where it replaced references to "each" with "the". We would like the AESO to clarify the intent of this change. For example, is the AESO contemplating that for jointly owned facilities that it is requiring each owner of the facility to have separate compliance requirements for the same facility?	70. The replacement of "The legal owner" with "Each legal owner" in subsection 34 was an error. Subsection 34 has been reverted back to the original language.
Section 503.16, *SCADA*	
ENMAX Corporation 71. General: • The reading of this rule would be simplified if "supervisory control and data acquisition" were replaced by "SCADA," which is the title of Section 503.16 and which could, if the AESO thinks it necessary, be defined in the heading immediately above section 2(1) by adding "(SCADA)" at the end. • ENMAX did not review Appendices 1 through 6 in detail. Section 1: • 1(1) can be renumbered as 1. Section 2: • In 2(1), change "provide" to "meet." • 2(4)(e) would be clearer if it stated, "the substation supplies local site load having normally energized equipment rated at 5 MVA or more that is offered for ancillary services or is included in a remedial action scheme." • In 2(4)(f) we suggest, "the substation supplies local site load	71. The AESO prefers to maintain the existing references to "supervisory control and data acquisition" within Section 503.16 at this time. The AESO agrees with ENMAX's editorial changes to subsections 1, 2, 4(3) and 4(4), 5, and 6 and has revised Section 503.16 accordingly. Regarding subsection 4(10) and 4(11), subsection 4(11) does require automatic adjustment for daylight saving time. The AESO made minor tweaks to better clarify this.

with normally energized equipment rated 10 MVA or more."

Section 4:

- In 4(3), the word "appropriate" is not required
- In 4(4), "each data" should be "each datum."
- 4(10) and 4(11) could be clearer. Section 4(10) states that the legal owner must use "coordinated universal time [UTC] as the base time" but then defines the base time to be UTC minus 7 hours. Then section 4(11) states that the clock must be able to automatically adjust for seasonal changes to daylight saving time, but such an adjustment switches the clock between UTC−6 and UTC−7. Would it be reasonable to state that "a global positioning system clock must report UTC–7 hours when Mountain Standard Time is in effect and UTC–6 hours when Mountain Daylight Time is in effect?" Or is it intended that all times be provided in standard time?

Section 5:

- In 5(8), the last word should be "centres."
- In 5(9), delete "a" before "load facility." Also, add a comma after "being."

Section 6

- 6(3) might better read, "A legal owner must provide the ISO, in writing and as soon as practicable following or as part of the notification pursuant to subsection 6(1), with the following:"
- 6(3)(d) can be simplified to read, "if the legal owner determines that there was no SCADA data unavailability or data error, a notification to this effect."
- For 6(4) we suggest, "The legal owner must notify the ISO, as soon as practicable and in writing, of any revisions…"

TransAlta Corporation

72. ***Section 503.16 does not adequately deal with Legacy Treatment***

72. Please see AESO Reply #39 and #40 regarding legacy treatment.

See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*). If the AESO does not change the language as recommended by TransAlta in 27 above, Section 503.16 should specifically include subsection 2 and 3 of Section 502.8, *SCADA Technical and Operating Requirements*, to ensure that Division 503 includes the same provisions that clarify the different requirements that apply to facilities that were energized and commissions on or after April 7, 2017.	
Section 503.17, *Revenue Metering System*	
ENMAX Corporation 73. Section 2 • In 2(2)(b), "measurement of" should be inserted before "metered demand." Section 7: • In 7(1), the comma after the first "adjustments" should be moved to follow the second one. • In 7(4), the word "performed" can be deleted. Given subsection 5(3), 6(1)(b) could be simplified by replacing it and Table 1 with: • (b) for meters in the > 20 MW class, not more than 2 years from the previous in- situ test; and • (c) for meters in the ≥ 5 MW class, not more than 4 years from the previous in-situ test.	73. The AESO agrees with ENMAX's editorial changes to subsections 2(2)(b) and 5 (stated as subsection 7) and have revised Section 503.17 accordingly. The AESO prefers to maintain existing Table 1 in subsection 6.
TransAlta Corporation 74. ***The functional specification subsection in proposed ISO Rule Section 503.1 should be amended to contain the same language***	74. The AESO agrees with TransAlta's recommendation and has amended subsection 2 of Section 503.1 accordingly.

as appears in paragraph 2(2) of Section 502.10 See TransAlta comments to 27 above (Section 503.1, *Functional Specification and Legacy Treatment*).	
Section 503.18, *Operation and Maintenance of Facilities*	
ENMAX Corporation 75. In 2(4), add a comma after "the original expected date and time."	75. The AESO agrees with ENMAX's editorial changes to subsection 2(4).
TransAlta Corporation 76. ***The exceptions in the current ISO Rules should continue to apply to the Operation and Maintenance requirements and specifically mentioned in the proposed ISO rule*** TransAlta notes that the current requirements to operate and maintain for generating units and aggregated generating facilities do not apply to excitation systems, voltage regulating systems, or power system stabilizers but in the proposed draft these exceptions are not referenced in the proposed rule. We are concerned that the AESO has expanded the requirements beyond the current ISO rules and ask the AESO to reintroduce the exception language and state in the before proposed paragraph 2(1): "Subsection 2 does not apply to (a) excitation systems; (b) automatic voltage regulators or voltage regulating systems; or (c) power system stabilizers".	76. At Session 3, the AESO explained that the previous exemption to operate and maintain excitation systems, voltage regulating systems, and power system stabilizers in accordance with Section 502.6 was in place to prevent overlap with VAR-002-AB-4.1 (R1). The AESO revisited this provision following Session 3 and agrees with TransAlta's recommendation to reintroduce the exemption into Section 503.18 to avoid the duplication with ARS, until the work to align the ISO rules and ARS is initiated.
Section 503.19, *Reactive Power Verification Testing*	
ENMAX Corporation 77. Section 2: • Delete the period at the end of 2(1)(b). • Subsection 2(4)(b) should read, "share reactive power resources." • Subsection 2(2) requires gross reactive power between 0.9 pf supply and 0.95 pf absorption. Can some of that range be	77. The AESO agrees with ENMAX's editorial changes to subsection 2(1)(b) and 2(4)(b). Regarding subsection 2(2), shunt reactive devices may be used to improve the reactive power capability of the facility. There is no duration requirement.

provided by manually controlled shunt devices, or does the entire range have to be under the control of a voltage regulating system or automatic voltage regulator? Also, is there a duration requirement for the test (e.g., hold 0.9 pf for x minutes)?	
TransAlta Corporation	
78. ***The model validation and reactive power verification reporting requirements should be revised to reflect the current requirements in the rules*** Paragraph 4(2)(c) includes two changes that result in an expanded requirement or lack of clarity in the reporting requirements in this ISO rule: First, the AESO's proposed language now imposes a new requirement for reporting for decreases in maximum real power or maximum authorized charging whereas under the current rules the reporting requirement only applies to increases. We ask the AESO to clarify why it has made this change or otherwise remove the requirement for reporting for any decreases to keep the requirements the same as currently apply. Second, the AESO removes reference to "in-service date" for any increase or decrease to maximum real power or maximum authorized charging and only refers to the requirement that the ISO approves the change. The timing (in-service date) is an important reference in the rule because it explains what date of completion means in the context of the reporting requirements. Without this specificity in the rules, it is unclear how compliance would be assessed. We ask the AESO to reinsert "in-service date in the rule language. To address both of these concerns, TransAlta recommends that the AESO makes the following revision: "the in-service date of any increase to the maximum authorized real power or maximum authorized charging power of a generating unit, aggregated facility, or energy storage resource".	78. The AESO agrees with TransAlta's recommendation and has revised subsection 4(2)(c) accordingly.

Section 503.20, *Baseline and Model Validation Testing*	
ENMAX Corporation 79. Section 2: • Could be clarified by inserting the word "synchronous" before "energy storage resource." Section 3: • In 3(1)(a), "convertor" should be "converter" to be consistent with 503.22-17(3). • The alignment of the subsections in 3(2) is off. • In 3(4), add a comma after "Verification Testing." Section 4: • In 4(2)(g), "is made" can be deleted. • In 4(5) add a comma after "Verification Testing." Section 5: • In 5(2)(a), "the" can be deleted to be consistent with (b) and (c). • For consistency, change 5(3) to read, "The legal owner of an aggregated facility must, when the ISO provides written notice to the legal owner that the modeled response…" Note that Section 503.20 uses both "modeled" and "modelled." Section 6: • In 6(3), "stating" could be deleted. Sections 5 and 6: • Both sections deal with model revalidation. Can models be revalidated through the analysis of real-world events, such as the facility's response to an over- or under- frequency event? Could such a validation negate the need for a separate revalidation within the 5-year window?	79. The AESO has redrafted subsection 2 to exclude the application of Section 503.20 to all types of facilities that are connected to the in-plant distribution system of an industrial complex with 2 or more voltage transformations between the facility and the transmission system. The AESO agrees with all of ENMAX's editorial changes to for Section 503.20. Regarding subsections 5 and 6, models cannot be revalidated through the analysis of real-world events under current testing requirements, which require the specific submission of a defined test report.

• Subsections 5(6)(a) and 6(6)(a) could be changed to read "for no more than one year if there is a planned change to equipment within that year." Section 7: • Subsection 7(2) could state, "The legal owner must submit an additional testing report to the ISO, in the form specified by the ISO, no later than…"	
Section 503.21, *Reporting Facility Modelling Data*	
ENMAX Corporation 80. Section 1 appears not to include legal owners of facilities within Medicine Hat.	80. The applicability of Section 503.21 mirrors the applicability of existing Section 502.15. The AESO will evaluate the applicability of Section 502.15 to City of Medicine Hat at a future time as part of a separate initiative.
Section 503.22, *Bulk Transmission Line Technical Requirements*	
ENMAX Corporation 81. Section 2: • Suggest changes to 2(1): "The design, construction and operational specifications for any new bulk transmission line must meet or exceed the ~~most recently~~ ~~published edition and~~ applicable provisions and requirements as set out in the most recently published edition of all federal and Alberta provincial …" Section 3: • In 3(1) and elsewhere, the numbers expressed as words should be deleted. • It appears to ENMAX that: (i) in light of section 4, subsection 3(2) could be deleted; • (ii) in light of section 5, subsection 3(3) could be deleted. Section 4:	81. The AESO will be initiating a fresh engagement on bulk transmission line technical requirements in Spring 2023 and will consider ENMAX's comments on Section 503.22 as part of that initiative.

• In 4(1), delete the comma after “loadings.” Section 5: • There may be a duplication or conflict between 5(3) and 5(1)/5(2). Section 6: • In 6(1), use “vertical loading ~~that represents~~ produced by in-cloud or rime ice.” • Section 6(2) states that, for 138 kV and 144 kV lines, a 50-year-return vertical loading must be used in the design, except that this loading will not be applied to the design of the overall structure. Given that section 3(1) specifies a 50 year return for 138 kV and 144 kV lines, what is the return period for 138 kV and 144 kV structure design if not 50 years? • In 6(3), “minus twenty (-20) degrees Celsius” can be replaced by “-20 °C.” • In 6(4), delete “of.” Section 7: • In 7(3)(a), “zero (0) degrees Celsius” can be replaced by “0 °C.” Section 7(2)(a) appears to be incomplete in that it does not specify *what* longitudinal strength is required. Presumably the longitudinal strength must be sufficient to withstand the loading conditions set out in Section 7(3), but that section states that the its requirements are in addition to those of 7(2)(a).	
Section 504.3, *Coordinating Energization, Commissioning and Ancillary Services Testing*	
ENMAX Corporation 82. Section 4: • In 4(a), replace “approves as being able to be implemented” with “approves as implementable.” Section 5: • In 5(h), consistency would be enhanced by replacing “energy	82. The AESO agrees with ENMAX’s editorial changes to subsection 4(a). Regarding subsection 5(h), please see reply #9 of the *AESO Written Replies – Energy Storage Definitions*.

storage that has" with "an energy storage resource that has." **TransAlta Corporation** 83. ***Clarify if this ISO Rule applies to energy storage resources that charge behind- the-fence*** TransAlta requests the AESO to explain whether energy storage resources that operate in consumption mode but charge behind the fence are captured in the applicability of this ISO Rule.	83. The AESO removed energy storage resources from the applicability of Section 504.3 to remove overlap and avoid confusion with Section 505.3. Energization, commissioning and ancillary services testing requirements for energy storage resources that participate in the electricity markets are now covered by Section 505.3 for both charge and discharge modes. Energy storage resources that charge behind the fence are subject to Division 505 testing requirements if they have a rating greater than 5 MW.
Section 504.4, *Coordinating Operational Testing*	
ENMAX Corporation 84. In section 3(1)(a), replaced "identified" with "identifies," consistent with 504.3-5(a). In 3(1)(h), consistency would be enhanced by replacing "energy storage that has" with "an energy storage resource that has." **TransAlta Corporation** 85. ***Clarify if this ISO Rule applies to energy storage resources that charge behind- the-fence*** TransAlta requests the AESO to explain whether energy storage resources that operate in consumption mode but charge behind the fence are captured in the applicability of this ISO Rule.	84. The AESO agrees with ENMAX's editorial changes to subsection 3(1)(a). Regarding subsection 3(1)(h), please see reply #9 of the *AESO Written Replies – Energy Storage Definitions*. 85. The AESO removed energy storage resources from the applicability of Section 504.4 to remove overlap and avoid confusion with Section 505.4. Coordinating operational requirements for energy storage resources across both charge and discharge modes are now covered by Section 505.4. Energy storage resources that charge behind the fence are subject to Division 505 testing requirements if they have a rating greater than 5 MW.

Section 505.2, *Performance Criteria for Refund of GUOC*	
ENMAX Corporation 86. The title block contains "Division 505 Legal Owners of Generating Facilities." Should that be changed?	86. The AESO confirms that it will revise the title of Division 505 to as part of implementation.
Section 505.3, *Coordinating Synchronization, Commissioning, Model and Reactive Power Validation Testing, and Ancillary Services Testing*	
ENMAX Corporation 87. Section 1: • In section 1(a), "and which such generating unit…" could be written as "where the generating unit…" A similar change could be made to 1(b). Section 2: • In 2(2), "onehour" should be "one hour." • In 2(3), "synchronize them" should be "synchronize it." • In 2(3)(a), "ISO:which the ISO approves as being able to be implemented" should be "ISO, which the ISO approves as being implementable." (This replacement could also be made elsewhere in the rules.) Section 4: • Regarding Section 4(d), is it intended to include legal owners of generating units, energy storage resources, or aggregated facilities less than 5 MW for which conditions (i) to (viii) apply? Regarding the second reference to energy storage resources in 4(d), it appears to refer to energy storage resources of less than 5 MW (since ≥ 5 MW resources are included by 4(c)) whose owners do not own any major transmission or load facilities. Was this the intent?	87. The AESO agrees with ENMAX's editorial changes to subsections 1 and 2. Section 505.3 applies to generating units, energy storage resources, or aggregated facilities that are greater than or equal to 5 MW. Therefore, subsection 4 does not apply to generating units, energy storage resources, or aggregated facilities less than 5 MW. In addition, subsection 4(d) duplicates subsection 5 of Section 504.3 and, in the AESO's view, is unnecessary. Accordingly, the AESO has amended subsection 4 to align with the applicability of Section 505.3 and eliminate overlap with Section 504.3. Regarding subsection 4(d), AESO has removed this subsection as it is covered in Section 504.3 for owners of generating units that also own transmission facilities or transmission-connected load facility containing the enumerated equipment.

TransAlta Corporation 88. ***Clarify why WECC Testing is being removed and what the testing requirements are for energy storage operating in consumption mode*** TransAlta does not understand why the AESO has proposed changes beyond amendments to add reference to "energy storage and aggregated facility" in subsection 4. We ask the AESO to clarify what specific model and reactive power validation testing requirements differences there are with the introduction of "energy storage that is operating in consumption mode" and the inclusion of "alternating current terminal closest to each inverter-based technology". Understanding these new or different testing requirements will help us understand the purpose behind the changes proposed by the AESO. TransAlta is also unclear why the AESO is removing all references to WECC in this ISO Rule. We are concerned that without specific reference to WECC testing, which are testing requirements that market participants are very familiar with, the ISO Rule is being drafted in a way that results in confusion as to what those requirements are and the process for reporting and certifying those results.	88. As noted at Session 3, references to "WECC testing" were removed from Section 505.3 to provide to better describe the testing. WECC is the name of the reliability organization, whereas the specific testing is "model and reactive power validation testing". Regarding 4(d), please see AESO Reply #88.
Section 505.4, *Coordinating Operational Testing*	
ENMAX Corporation 89. • Section 505.3-1(a) includes generating units, aggregated facilities, and energy storage resources "with a rating of 5 MW or greater," while 505.4-1(a) includes those facilities "with a rating greater than 5 MW." For consistency the same rating range should be used. Section 3: • In 3(1), "aggregated facility" should be included with the second reference to generating units and energy storage resources.	89. The AESO agrees that Section 505.4 applies to facilities "with a rating of 5 MW or greater" and has revised subsections 1(a)(i) and 1(b)(i) accordingly. The AESO agrees with ENMAX's revisions to subsections 3(1) and 3(3). The AESO agrees with ENMAX's observation for subsection 3(2) and has removed "on the day of". The following have also been revised in the same manner for consistency: - Section 504.3 subsections 2(2) and 3(2);

• Section 3(2) technically makes it impossible to commence testing between 00:00 and 01:00 on any given day. • In 3(3), the second “may” is redundant.	- Section 504.4, subsection 2(2); and - Section 505.3, subsection 2(2) and 6(2).