

Energy Storage Roadmap Questions and Answers (Q&As)

On Aug. 7, 2019 the Alberta Electric System Operator (AESO) held an Energy Storage Roadmap and Flexibility Roadmap information session at the Sheraton Eau Claire Hotel in Calgary, Alberta. Following the session, the AESO put out a request for information to seek input from stakeholders regarding the Energy Storage Roadmap. Stakeholders were asked to submit their feedback on the following questions:

1. After reviewing the Energy Storage Roadmap, do you have any comments or feedback? Have you identified specific gaps, and if so what are they?
2. If working groups were appropriate, what are the one or two topics they should address?
3. Are you aware of any recent energy storage research/resources/information that would provide the AESO more insight on this topic? If yes, please provide or explain.

The AESO thanks all those who submitted their feedback and a summary of this feedback can be found [here](#).

With respect to question one above, stakeholder input included questions regarding the Energy Storage Roadmap that the AESO has addressed in the table below. Any input with respect to question two above will be considered in further development and implementation of the Energy Storage Roadmap and will not be addressed here. Responses by stakeholders to question three included references to information and no questions, as such there is no content to be addressed here.

Below you will find the stakeholder questions as they were written. Opinions are the writers' own and content has not been vetted for accuracy. Comments have not been edited for spelling, grammar, sentence structure or otherwise. Comments have only been edited to ensure anonymity.

Category	Stakeholder Question	AESO Response
Data Requirements	1. What are the expected requirements for data sharing between DFOs, TFOs, AUC and the AESO? (i.e.: Real-time data, modelling data, billing data).	Data sharing requirements will be explored by the appropriate work streams as the work progresses and parties are engaged accordingly.
Data Requirements	2. Define the appropriate visibility and dispatch requirements from DFO/TFO SCADA systems or when the AESO anticipates these requirements. Will these be incorporated into the roadmap?	It is important for the AESO to have appropriate visibility and dispatch requirements for assets. However, specific requirements will be explored by the appropriate work streams as the work progresses and parties are engaged accordingly.

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Hybrid Assets	3. While hybrid asset operation is considered in the near-term implementation plan, it is recommended that further emphasis on the benefits, drawback, barriers and opportunities for hybrid AESO market participants, to include full and detailed consideration of hybrid assets in all Roadmap activities at this time rather than having to repeat the process again in the future.	The integration of hybrid assets within the energy and ancillary services markets is being considered as part of the short- and long-term Energy Storage Roadmap.
Hybrid Assets	4. It will be more effective and efficient to include full and detailed consideration of hybrid assets in all Roadmap activities at this time rather than having to repeat the process again in the future.	The integration of hybrid assets within the energy and ancillary services markets is being considered as part of the short- and long-term Energy Storage Roadmap work.
ISO Rules and Standards	5. What is meant by a 'one ask' approach versus a 'case by case' approach? Can the AESO provide more clarity on this approach and the rationale for selecting this option.	The integration of energy storage systems into the Alberta Interconnected Electric System (AIES) is anticipated to require the development of new or amended Authoritative Documents. To accomplish this, the AESO could follow a 'case by case' approach by developing new and amended Authoritative Documents as soon as a need to amend a specific Authoritative Document is identified, or the AESO could follow a 'one ask' approach, which would involve comprehensively proposing and amending all Authoritative Documents required to integrate energy storage according to the same timeline and development process.
ISO Rules and Standards	6. With regard to FERC Order 841, what is the rationale for the RTO/ISO markets that do not exceed 100 kW in bullet 4 (page 4)? What is the rationale for a 100 kW limitation?	The AESO is not aware, at this time, of the specific rationale relied upon by the U.S. Federal Energy Regulatory Commission (FERC) for the 100 kW limitation.
ISO Rules and Standards	7. Does the AESO intend to engage the AUC to ensure limited disconnects between the proposed ISO rules/process and AUC rules – permitting, etc.	The AESO will engage the Alberta Utilities Commission (AUC), as appropriate, to coordinate AESO and AUC processes.
ISO Rules and Standards	8. Require further clarity on if/how any outcomes of other current processes such as the AESOs Energy market evolution (scarcity/shortage pricing) and the AUC Distribution Inquiry may influence/overlap with the storage roadmap.	The AESO recognizes certain initiatives may impact the outcome of other initiatives and is applying a collaborative and cross-functional approach to the design and implementation of these initiatives. The AESO encourages stakeholders to participate in any stakeholder engagement on the AESO's market initiatives, to understand the impact to their business.

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ISO Rules and Standards	9. The AESO should identify how storage as a unique asset type will function in the wholesale market to ensure that the integration of energy storage supports a FEOC market.	The AESO will identify how energy storage, as a unique asset type, could function in the wholesale market as part of the Energy Storage Roadmap initiative activities. In doing so, one of the many factors that will be considered is ensuring that the integration of energy storage supports a fair, efficient and openly competitive (FEOC) market.
ISO Rules and Standards	10. The issues in scope in the Phase 1 short-term implementation plan have the possibility to adversely impact projects in the AESO Connection Process, which are likely to be already on-line or in a phase of late-stage construction at the time that the AESO has completed its Phase 1 implementation. We are concerned that the AESO's timelines for completing the consultation are too long to accommodate projects that are already pursuing regulatory permitting. The AESO should consider transition mechanisms such as options to grandfathering projects to minimize any potential negative impacts to projects that are underway.	In the short-term, the AESO intends to enable active storage connection projects within the bounds of the existing legislative and Authoritative Document framework. The "grandfathering" of such projects, if and when a new framework is adopted to further enable storage, could be inappropriate as it may limit the ability of storage to fully participate within a new legislative and Authoritative Document framework. The AESO considers that robust consultation and consideration is required to ensure a successful long-term solution.
Market Design	11. How will the AESO deal with energy storage aggregators which could impact the transmission system but have multiple energy storage sites small enough not to require infrastructure upgrades? (Currently AESO has no visibility of such projects)	<p>Small storage assets that are geographically diverse are not expected to have a significant impact on the bulk transmission system; however, they may impact electricity consumption patterns. The AESO is reviewing the impact of an increased amount of distributed energy resources (DER) on the AIES, which includes the potential for increased visibility of these assets.</p> <p>Aggregation to participate in the energy and ancillary services market will be considered within the market evolution work on market participation levels and aggregation.</p>
Market Design	12. Should a battery be eligible to participate in both the wires and energy markets? o How does the AESO intend to address non-wires solutions in a FEOC market?	This is unknown at this time. The AESO is reviewing wires and non-wires solutions for energy storage as part of the long-term Energy Storage Roadmap work.
Market Design	13. It might be helpful to explicitly clarify how energy storage systems seeking connection under the Small Scale Generation Regulation as well as for Distribution Connected Generation less than 5 MW will be treated. These could be standalone energy storage systems, or connected in conjunction with renewable or non-renewable generation, depending on the project.	The AESO acknowledges this comment.

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Market Design	14. The pivot in policy direction by the government of Alberta and the abandonment of the capacity market requires an immediate review and identification of any short-term implementation requirements for energy storage in the energy-only market design.	The AESO acknowledges this comment.
Market Design	15. The cancellation of a capacity market in Alberta and instead maintaining the energy-only market requires a short-term review of any immediate barriers as they pertain to energy storage resources. Specifically, the Energy Storage Roadmap should review objectives for energy storage given the shift in policy direction from the government of Alberta this summer.	The AESO acknowledges this comment.
Market Design	16. In the long-term implementation plan the energy storage roadmap should investigate how rate-regulated energy storage would participate in wholesale electricity markets.	The AESO will consider if and how rate-regulated energy storage could participate in the market as part of the long-term Energy Storage Roadmap work.
Market Design	17. To ensure fair and open competition, the AESO Roadmap should consider the qualification and participation of rate-regulated assets in the AESO electricity market.	The AESO will consider if and how rate-regulated energy storage could participate in the market as part of the long-term Energy Storage Roadmap work.
Market Design	18. It would be helpful if the AESO could identify the specific aspects of Order 841 that may be applicable to Alberta. For example, an analysis of the extent to which our current market design and rules comply with the requirements of FERC Order 841 would provide valuable context and guidance for market participants on the possible direction of energy storage integration in Alberta.	The FERC Order No. 841 does not apply to Alberta. However, the AESO will be reviewing the order and incorporating elements of the order as appropriate to Alberta.
Market Design	19. The AESO should outline how the initiatives in its Flexibility Roadmap may influence or interact with the items in its Energy Storage Roadmap. If any of the items do interact, they should be addressed concurrently.	The AESO recognizes certain initiatives may impact the outcome of other initiatives and is applying a collaborative and cross-functional approach to the design and implementation of these initiatives. The AESO encourages stakeholders to participate in any stakeholder engagement on the AESO's market initiatives, to understand the impact to their business.

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Market Design	20. The Department of Energy has also tasked the AESO with providing recommendations for energy-only market reforms by July 31, 2020; with this in mind, the AESO should provide clarity as to how its proposed market reforms could impact its Energy Storage Roadmap.	<p>The AESO acknowledges this comment.</p> <p>The AESO encourages stakeholders to participate in any stakeholder engagement on the AESO's market initiatives, to understand the impact to their business.</p>
Market Design	21. We recommend a staged and methodical approach with built in flexibility for implementation, recognizing that technologies and electricity market design will continue to evolve. Furthermore, a staged approach will ensure gaps identified further in the process will be able to be addressed. With respect to specific gaps in the Roadmap as presented, it does not appear to explicitly consider energy storage across the integrated power system. The AESO must have visibility of the entire integrated power system, which includes distribution and behind the fence facilities.	<p>The AESO recognizes that technologies will continue to evolve and through our various initiatives, will work to remove barriers to entry for all foreseeable technology types, to the extent possible.</p> <p>The AESO is considering energy storage across the AIES.</p>
Market Design	22. The definition of energy storage as proposed is broad; however, the scope of the consultation appears to be directed at resources that currently do not participate in the market. For example, hydro resources with reservoirs that consume electricity and are able to store water to produce electricity in a future period of time. Please clarify whether the roadmap was intended to capture these types of existing resources.	<p>Fuel storage (e.g., coal piles at a coal plant) is not, by itself, considered by the AESO to be “energy storage” for purposes of the working definition. Currently, there are no installed energy storage assets participating in the power pool. Pumped hydro projects may be considered to be energy storage for purposes of the working definition.</p>
Settlement	23. Will energy storage sites billing be different from standard billing practices – is the settlement window being looked at as part of the Energy Storage roadmap?	<p>Energy market settlement is still anticipated to be determined by directional metered flows multiplied by pool price. The settlement timeline is not expected to be reviewed as part of the Energy Storage Roadmap work. Further details regarding energy storage billing, if different from current billing practices, will be considered by the appropriate work streams.</p>
Stakeholder Engagement Timing	<p>24. What is the schedule and timing of engagement with DFOs and TFOs – can the AESO provide specific details beyond the overview roadmap provided in the document.</p> <p>o How will this be coordinated? Is this planned as part of the broader Energy Storage Roadmap or will the AESO be working with DFO/TFOs independently of the roadmap process.</p>	<p>At this time, the AESO cannot provide specific details beyond the overview provided in the Energy Storage Roadmap document. The AESO will provide further details regarding consultation to stakeholders once they are available.</p>

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Tariff Design	<p>25. While the ISO tariff design is considered under the short-term implementation plan, there is a potential that review of the tariff will have a narrow view of only transmission connected energy storage. Instead, it is recommended that the AESO consider in addition to transmission connected, distribution connected storage and behind-the-fence (BTF) storage as part of the Tariff Design review.</p>	<p>The review of the tariff design will consider distribution and behind-the-fence (BTF) related impacts.</p>
Tariff Design	<p>26. The ISO tariff design is a significant barrier and opportunity for energy storage resources. Specifically, energy storage resources can participate in the Alberta electricity sector in many different ways (e.g., transmission connected, distribution connected, hybrid projects, and behind-the-fence (BTF) configurations). It is recommended that the ISO tariff design review for energy storage rate design consider the different configurations.</p>	<p>The AESO's ongoing tariff design review, with specific consideration of energy storage, will consider all points of potential connection.</p>
Tariff Design	<p>27. Clarification is required on the AESO's plan for filing with the AUC for any tariff changes. Specifically, AESO identifies a short term plan with the objective to provide clarity to active connection projects with 2020/2021 planned ISD, but also references filing for the 2021 Tariff proceeding. All market participants must be treated equally with any planned changes. Further clarity on the scope of work of the current transmission advisory group (TAG) as it pertains to storage is requested.</p>	<p>The AESO has been directed to file a compliance filing in respect of its 2018 comprehensive tariff application in January 2020. The compliance filing will not include any proposed changes related to energy storage.</p> <p>The AESO also intends to file a new tariff application in mid-2020, which will propose changes to the recovery of bulk and regional costs under the ISO tariff. The AESO's ongoing tariff consultation regarding bulk and regional cost recovery includes consideration of opportunity services, including standby, interruptible and energy storage rate structures.</p> <p>Updates regarding the scope of the AESO's Tariff Design Advisory Group consultation can be found on the AESO's website.</p>
Tariff Design	<p>28. We request clarity on the timeline for updates to the AESO Tariff. From Appendix 1, it appears that Tariff changes will not be implemented until after the AUC Tariff proceeding in 2022. We are concerned that three years of Tariff uncertainty will reduce investor interest in energy storage projects and impair their development. Further, we request clarity on the overlap among:</p> <ul style="list-style-type: none"> • the current Tariff application, • the ongoing Tariff Advisory Workgroup process, 	<p>See the AESO's response to Question 27 above.</p> <p>The AESO recognizes certain initiatives may impact the outcome of other initiatives and is applying a collaborative and cross-functional approach to the design and implementation of these initiatives. The AESO encourages stakeholders to participate in any stakeholder engagement on the AESO's tariff and other initiatives, to understand the impact to their business.</p>

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	<ul style="list-style-type: none"> • AUC Distribution System Inquiry • and the Storage Roadmap. 	
Transmission Deferral	<p>29. Transmission Deferral – Where in the roadmap process will this fall? What is the process or criteria the AESO will use to identify Transmission Deferral projects / requirements (cost-benefit analysis, market participant/DFO/TFO participation and input).</p> <p>o If Storage is being used as a transmission deferral, will there be a risk evaluation that the storage unit must be available under transmission constraints? Will this be part of the the ancillary services market?</p>	<p>The AESO is planning to explore the role that energy storage can play within the transmission planning process. Additionally, the AESO will be reviewing wires and non-wires solutions for energy storage as part of the long-term Energy Storage Roadmap work.</p>
Transmission Planning	<p>30. In the paper “The Energy Storage Roadmap,” the AESO stated that “Energy storage will be considered as one of the solutions used by the transmission planning work stream when considering the need for new transmission.” However, no clarity was provided as to how this solution reconciles with the Alberta Transmission Regulation 86/2007, which the AESO has historically interpreted as specifying that transmission is the only solution to address congestion.</p>	<p>See the AESO’s response to Question 29 above.</p> <p>The AESO acknowledges this comment.</p> <p>The AESO is reviewing wires and non-wires solutions for energy storage as part of the long-term Energy Storage Roadmap work.</p>
Comment	<p>31. We urge the AESO to clearly define the deliverables at the end of the Phase 1 Tariff Rate Class tasks, to share those with participants and to make it a high priority to commit to those deliverables specifically.</p>	<p>The AESO intends to provide a timely and transparent view of the bulk and regional tariff redesign work, through the Tariff Design Advisory Group as well as industry sessions.</p>
Comment	<p>32. We propose further clarification of the tasks listed under the short-term implementation Tariff Design section as follows. (suggested changes in red). Tariff Design will:</p> <p>a) Complete a jurisdictional review on tariffs for energy storage specific solutions and present a report on the findings including recommendations for the AESO in view of other jurisdictional tariff models.</p> <p>b) Investigate the potential for a separate rate class for energy storage in the 2020 ISO tariff. Present a report showing clearly what is achievable for 2020 and in subsequent years. This should include specifically the decision on whether or not to create a new rate class for storage, the decision to include in the 2020 ISO tariff, as well as guiding principles for determining the actual rates.</p> <p>c) Review application of GUOC to energy storage under current legislation and regulation.</p>	<p>See the AESO’s response to Question 27 above.</p> <p>The AESO acknowledges this comment.</p> <p>The AESO intends to provide a timely and transparent view of the bulk and regional tariff redesign work, through the Tariff Design Advisory Group as well as industry sessions.</p>

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	<p>It is noted that the task listed in the “Bridging the gap” section (p16) addressing the DTS rate is not specifically addressed in the short term implementation task list. We suggest adding:</p> <p>d) Review the DTS rate as applied to energy storage assets. Determine the AESO’s objective and mandate with respect to DTS rates for storage assets and develop a detailed task list and schedule to facilitate DTS rate changes as needed.</p>	
Comment	<p>33. It is understood that some storage projects are already in the AESO’s connection process. However, we emphasize that it is imperative that high-level policy in this area be developed in advance of the approval of specific storage projects. Specifically, we request that the AESO work with stakeholders, the Department of Energy and the Alberta Utilities Commission to identify any policy or legislative changes required in advance.</p>	<p>The AESO acknowledges this comment.</p> <p>In the short-term, the AESO intends to enable active storage connection projects within the bounds of the existing legislative and Authoritative Document framework.</p> <p>See the AESO’s response to Question 10 above.</p>
Comment	<p>34. Prior to adapting AESO tools and processes for the inclusion of energy storage, the role of energy storage within the regulatory framework should be established.</p>	<p>The AESO acknowledges this comment.</p>
Comment	<p>35. As recognized by the AESO in the Roadmap, energy storage can provide regulated and competitive services. We believe that locational and operational characteristics of an energy storage solution determines whether it provides either a regulated or competitive services.</p>	<p>The AESO acknowledges this comment.</p> <p>The AESO will consider if and how rate regulated energy storage could participate in the market as part of the long-term Energy Storage Roadmap work.</p>
Comment	<p>36. Clarity on policy is required, particularly with respect to energy storage being used as a mechanism for transmission deferral.</p>	<p>The AESO acknowledges this comment.</p> <p>See the AESO’s response to Question 29 above.</p>
Comment	<p>37. Establishing policy should be a high priority component of the Roadmap implementation, and should involve stakeholder consultation. It is preferable to have clarity on policy prior to applications advancing through the approval process with the Alberta Utilities Commission, where intervening in specific applications is costly, adversarial and an inappropriate way for parties to establish common parameters that should be applied equally to all facilities.</p>	<p>The AESO acknowledges this comment.</p> <p>The AESO will engage stakeholders throughout the development and execution of its long-term plan to integrate energy storage.</p>

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Comment	38. The AESO notes in multiple sections of the roadmap the need for robust metering, data, modeling, and analysis to support proper consideration of energy storage. We support the AESO's position and submit that aspects of this work should be explored in a stakeholder workgroup. It should be the expectation that analysis and results that support implementation of the Roadmap or changes to authoritative documents should be transparent and accessible to stakeholders.	The AESO acknowledges this comment.
Comment	39. We request further emphasis on the process to improve collaboration between the AESO and DFOs. While we recognize that DFOs are independent organizations, consistency between the treatment of transmission and distribution connected energy storage projects is important for the fair and equal operation of the electricity market.	The AESO acknowledges this comment.
Correction	40. In the Energy Storage Roadmap Report, on PDF 3, the first point under Value and Benefits is "Energy storage can optimize intermittent generation". I am not sure what is meant by "intermittent generation". Do you mean a thermal facility that can trip unexpectedly and stop producing energy? Some have used the term incorrectly to refer to variable renewable generation. Can you please clarify your meaning and ensure future documentation is likewise clear in the meaning?	The AESO agrees. The term "intermittent generation" in the Energy Storage Roadmap is synonymous with "variable renewable generation".