

**Energy Storage Engagement and  
Progress Update Session**  
February 24, 2021

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- All attendees join the webinar in listen-only mode and the host will have attendee cameras disabled and microphones muted
- When asking or typing in a question, please state
  - **The organization you work for and your first and last name**
- Two ways to ask questions if you are accessing the webinar using your computer or smartphone
  - If you would like to ask a question during the Q&A portion, click the icon to raise your hand and the host will see that you have raised your hand. The host will unmute your microphone, you in turn will need to unmute your microphone and then you can ask your question. Your name will appear on the screen but your camera will remain turned off.
  - You can also ask questions by typing them into the Q&A window. Click the “Q&A” button next to “Raise Hand.” You’re able to up-vote questions that have been already asked.

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  - Hover your cursor over the bottom area of the Zoom app and the Controls will appear.
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  - Click “Lower Hand” to lower it if needed.
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- Using a Smartphone
  - Tap “Raise Hand.” The host will be notified that you’ve raised your hand.
  - Tap “Lower Hand” to lower it if needed.
  - You can also ask questions by tapping the “Q&A” button and typing them in. You’re able to up-vote questions that have been already asked.

- If you are accessing the webinar via conference call
  - If you would like to ask a question during the Q&A portion, on your phone's dial pad, hit \*9 and the host will see that you have raised your hand. The host will unmute your microphone, you in turn will need to unmute your microphone by hitting \*6 and then you can ask your question. Your number will appear on the screen.
- Phone controls for attendees
  - To raise your hand, on your phone's dial pad, hit \*9. The host will be notified that you've raised your hand.
  - To toggle between mute and unmute, on your phone's dial pad, hit \*6.

- The participation of everyone here is critical to the engagement process. To ensure everyone has the opportunity to participate, we ask you to:
  - Listen to understand others' perspectives
  - Disagree respectfully
  - Balance airtime fairly
  - Keep an open mind

# Welcome & Introductions



## *OUR ENGAGEMENT PRINCIPLES*

**Inclusive and Accessible**

**Strategic and Coordinated**

**Transparent and Timely**

**Customized and Meaningful**

Time	Agenda item
9:00 – 9:10	Welcome and introduction
9:10 – 9:40	Energy Storage Roadmap Update
9:40 – 9:45	Break
9:45 – 11:45 am	<p>Review of Long-term Energy Storage Market Participation Recommendation</p> <ul style="list-style-type: none"><li>- Review of issues and options presented in recommendation paper</li></ul> <p>Questions will be taken throughout the presentation</p>
11:45 – 12:00 pm	Closing remarks and next steps

# Energy Storage Roadmap Update

- Provide a quarterly progress update on energy storage activities:
  - Share progress update on the Energy Storage Roadmap integration activities since October 2020 update;
  - Provide an update on activities planned for Q1 2021;
  - Provide an update on interrelated initiatives; and
  - Provide an opportunity for stakeholders to submit questions on the update information provided.

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# What's new since October?

- Implementation of energy storage projects:
  - ✓ ENMAX Crossfield implemented Oct 26, 2020
  - ✓ ATCO Rycroft implemented Nov 30, 2020
- There are 8 projects currently on the connection list
  - Fortis Alberta Buffalo Creek
  - Fortis Alberta Killarney Lake
  - EDTI DG Solar
  - ATCO Longspur
  - Greengate Midnight MPC
  - Fortis Alberta Metiskow
  - Fortis Alberta Burdett
  - TPG Canyon Creek
  - TCE Saddlebrook
- Two of these projects currently have in-service dates (ISDs) in 2021
  - Fortis Alberta Buffalo Creek
  - ATCO Longspur

- ESILF 2<sup>nd</sup> workshop held on Nov 27<sup>th</sup>, 2020 with the attendance of majority of the members, Alberta Energy, Market Surveillance Administrator (MSA) and the Alberta Utilities Commission (AUC)
- Scope of the workshop included presentations from ESILF members on their expertise and experiences in the selected topics
- Workshop topics included:
  - Storage as a transmission alternative (SATA);
  - Sharing learnings from other jurisdictions on legislation, regulations and policy; and
  - Market qualification parameters, process, models and data (SCADA) requirements
- Presentations and summary of the workshop will be posted on [www.aeso.ca](http://www.aeso.ca)

- Future workshop topics are as follows:
  - *Workshop 3: Scheduled for March 19<sup>th</sup>, 2021*
    - Economic modelling
    - Sharing of experiences in commissioning and testing of new technologies or configurations
    - Process efficiencies within existing framework



# Looking ahead

# 12-month Rolling Timeline

Classification	ES Roadmap Integration Activities	2020 Q4			2021 Q1			2021 Q2			2021 Q3		
		O	N	D	J	F	M	A	M	J	J	A	S
Education and Awareness	<b>ES Progress Updates – UPDATED</b> Share progress on the Energy Storage (ES) Roadmap integration activities, interrelated initiatives and provide a forum to address stakeholder questions.	E				E			E			E	
	<b>ES Industry Learnings Forum (ESILF) – UPDATED</b> Organize forum to provide expertise and key learnings to the AESO on targeted matters related to the integration of energy storage in Alberta.		E				E						E
Phase 2 Long-term Implementation	<b>ISO Tariff Design – RESUMED</b> Work in concert with ISO tariff design to ensure ES is considered.	Progress will align with Bulk and Regional Tariff Design											
	<b>Forecasting, Planning and Market Reports</b> Develop and implement forecasting and planning models to support Long-term Outlook (LTO) and Long-term Transmission Plan (LTP).	A			C			D					
	<b>Configuration, Qualification and Connection Requirements</b> Develop appropriate functional specification documents; identify market participation options, permissible configurations and metering requirements for ES.	C						D					
	<b>Market Participation</b> Evaluate long-term options for energy storage participation in the Energy and Ancillary Service markets.	C, D						D					
	<b>Operations</b> Perform technical studies for the review of the operating parameters and requirements for the different types and configurations of ES; identify the impact to the connection processes and system applications to enable full range of ES operation.	C						D					

**E – Engagement:** inform and/or discuss topics with Stakeholders

**A – Analysis:** internal work phase for the AESO where an activity is researched, performed analytics, studies, etc.

**C – Conception:** after analysis, AESO will conduct an options analysis and may develop recommendations on the matter.

**D – Development:** AESO shares recommendations and works with stakeholders to create proposed ISO rules or changes to existing ISO rules.

- AESO cross-functional groups continue to work on:
  - Forecasting, planning and market reports
  - Configurations, market qualification and connection requirements
  - Market participation
  - Operations
  - Storage as a transmission alternative
- Cross-functional groups are currently awaiting the Market Participation Option Recommendation to finalize their deliverables.

- The AESO's long-term integration of ES will cover the development of recommended changes to AESO authoritative documents that capture the unique attributes of ES
- Technical studies and learnings from the short-term activities will feed into the long-term activities
- Tariff – all ES tariff-related activities will continue to be part of the Bulk and Regional Tariff Design

- Fast Frequency Response (FFR) is
  - A fast-acting transmission reliability service facilitating the arrest and recovery from frequency decay caused by events such as the sudden loss of imports on the British Columbia / Montana interties
  - Designed to prevent under frequency load shed (UFLS) operation
  - Providers need to respond within 12 cycles (0.2 seconds) when a system frequency of 59.5 Hz is detected
  - Currently provided by load through Load Shed Service for imports (LSSi)

- The AESO is launching a pilot project targeted at any new technology capable of meeting FFR technical and eligibility requirements
- The AESO is coordinating with the Market Surveillance Administrator (MSA) to enable the FFR by new technology pilot within existing ISO Rules
- Key learnings targeted include:
  - Confirming capability of new technology to provide the service
  - Observing participation in energy and ancillary services markets as well as FFR

- Targeting to procure
  - 20 – 40 MW of FFR service from 1 – 3 capable service providers
- Single stage open procurement is planned
  - Proponents will be required to submit pricing as a part of their proposal
- The following will be provided during the procurement:
  - Commercial agreement
  - FFR technical requirements

- Minimum capacity requirement of 5 MW to participate
- Facility connected to the Alberta Interconnected Electric System via either transmission or distribution
- Targeting in-service facilities or sufficiently mature development projects on track to be in service during Q1 2022
- Must be capable of meeting FFR technical requirements (*see next slide*)



- The FFR technical requirements for pilot participants are expected to be similar to that of LSSi, adapted for new technology such as energy storage
  - Including the 0.2 second detection and response time
  - Response to an underfrequency event is expected to be a fast increase (i.e., positive net change) in real power output
  - Requires an underfrequency protective relay and event recording to provide the service
  - A SCADA system will be used to participate in the service
- Further technical requirements will be provided during the procurement competition

- Timing is expected as the following:
  - Launch competition by Q2, 2021
  - Award to successful proponents in mid-2021
  - A 12-month service period for each service provider starting as early as Q3, 2021 or as late as Q1, 2022

- Next Steps

- Procurement competition details will be posted on the AESO's website
- Periodic updates will be provided via the AESO's Stakeholder Newsletter
- Further information will be released on the AESO's website by Q2, 2021
- Additional information regarding LSSi is available on the AESO's website: <https://www.aeso.ca/market/ancillary-services/load-shed-service-for-imports/>
- Questions can be directed to [energystorage@aeso.ca](mailto:energystorage@aeso.ca)

# Interrelated Initiatives Update

- AESO re-started engagement on Bulk & Regional Rate Redesign in September 2020
    - Tariff treatment for energy storage remains in scope of this engagement
- <https://www.aeso.ca/stakeholder-engagement/rules-standards-and-tariff/bulk-and-regional-tariff-design/>
- Session 5 scheduled for March 25<sup>th</sup>
    - Present preferred rate design, including energy storage treatment, to stakeholders
    - Present and discuss path to achieving minimal disruption
    - Present bill impact summary and assumptions
    - Provide Bill Impact Tool
    - Begin to discuss implementation considerations

# Next Steps

- ESILF workshop 3 planned for March 19, 2021
- Next progress update session planned for May 2021
- If you have questions related to this update, please email [EnergyStorage@aeso.ca](mailto:EnergyStorage@aeso.ca) with the subject *ES Q1 Update* by March 10, 2021

**Break**



# Long-term Energy Storage Market Participation Draft Recommendation



## Transmission

Forecasting & Market Analytics  
Transmission Planning  
Transmission Engineering  
& Standards  
Transmission Connection



## Markets

Market Design  
Tariff Design  
Operations Planning  
& Engineering



## Tools

Operations Systems  
Grid & Market Operations  
Finance & Settlement  
IT Systems



## Regulatory

Legal & Regulatory

# Scope of the market design component of the markets pillar

- Market participation includes offer and dispatch requirements along with the corresponding reporting and compliance requirement, and treatment of ancillary services (AS) within energy market participation
- Market participation is described within Part 200 of the ISO rules. Part 200 includes:
  - Submissions
  - Dispatching
  - Restatements
  - Dispatch Down Service
  - Ancillary Services
- Outage Notification Rules under Division 306 were also evaluated,
- Any associated changes in the AESO's *Consolidated Authoritative Documents Glossary* (CADG)

**Problem/  
Opportunity  
Identification**

**Options  
Identification**

**Recommendation  
and Rationale**

**Rule  
Drafting**

- Present the draft recommendations for long term energy storage market participation
  - approach that balances value, benefit, cost of implementation, market transparency, operational effectiveness, timing of need
- Address clarifying questions from stakeholders in advance of receiving written stakeholder input

## Distribution System Inquiry

*The current assumption is that distributed energy resource (DER) and transmission connected generation (TCG) will have consistent treatment in the market, and the energy market continues to extend into the distribution system for the dispatch and settlement of DERs.*

## Energy Storage

## Self-supply and Export

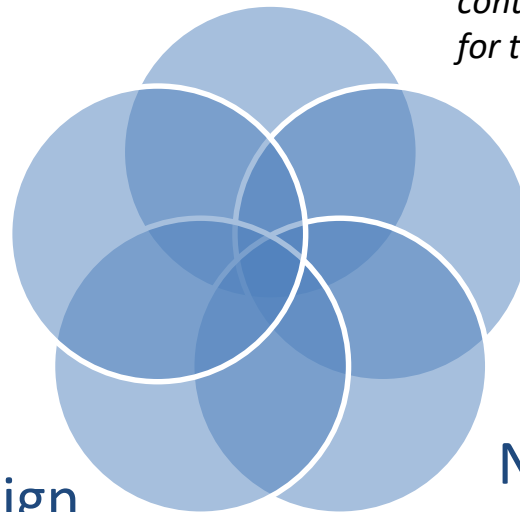
*The current assumption is sites made up of solely a combination of generation and storage (no on-site end-use load) are not offside the regulatory framework regarding self-supply.*

## Tariff Re-design

*The assumption is the rate designed applicable to storage will not result in conflicting behaviors caused by competing price signals*

## Non-Wire Solutions

*The current assumption is storage will be a market asset that may provide non-wires solutions, rather than a regulated asset capable of participating in the energy and AS markets*



Design Principles	Rationale
Technology Agnostic	In order to facilitate FEOC principles the market treatment needs to be consistent across all participating technologies and applies to all storage applications
Minimizes Complexity	Strive for a simple elegant solution that is effective. Allow participants to intuitively submit bid and offer data into and operate their assets in the energy and ancillary services markets in a manner that supports the operation of the facility while at the same time provides a coordinated approach to the market rules. Complex designs lead to confusion and acts as a barrier to entry
Maximizes Participation	Maximizing participation in the market improves competition, and price fidelity
Participation Flexibility	Allow some flexibility to how the asset can best participate given its technical configuration in order to remove barriers to entry and prevent overly constraining rules while maintaining the FEOC principles
Dispatch-ability	Reduce the variability in delivered volumes resulting from System Controller dispatch. The design should give the system controller the ability to monitor and control energy storage facilities in support of power delivery and balancing across the AES
No Grandfathering required	The solution should avoid the need to grandfather existing assets as much as possible

Using these principles the AESO is able to assess the validity of the design options.

# Jurisdictional review of Storage Participation Models

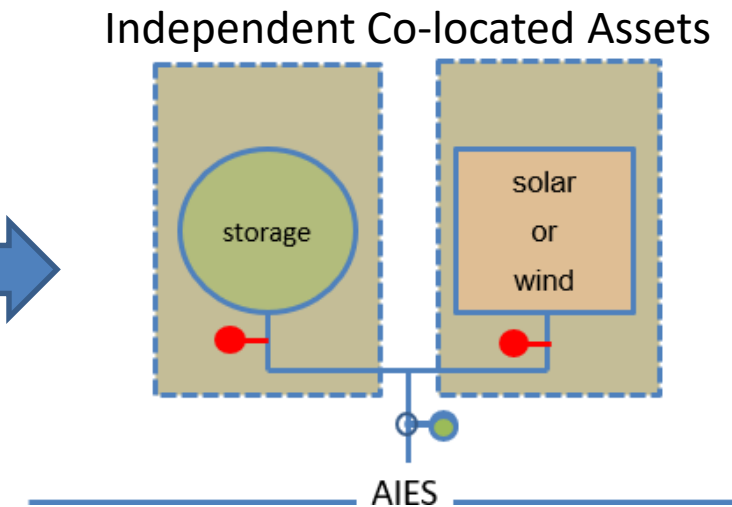
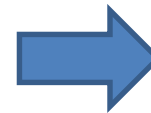
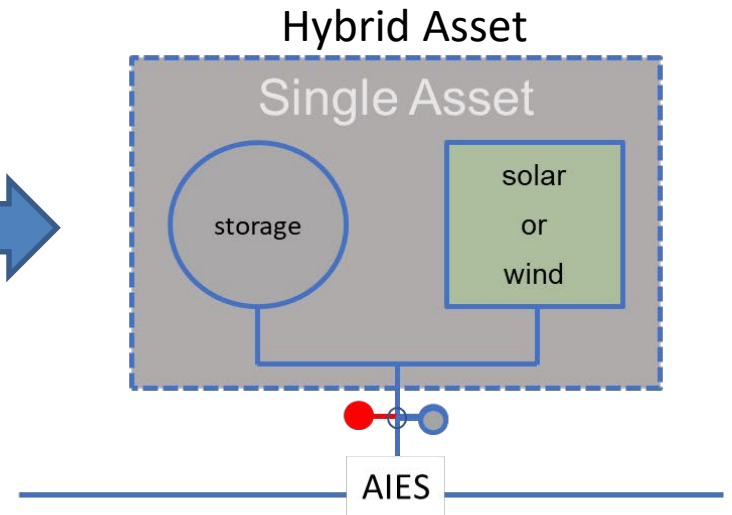
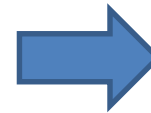
- Where relevant the AESO looks to other jurisdictions implementations and lessons learned to help inform our design decisions.
- Federal Energy Regulatory Commission (FERC) designs cannot be applied to Alberta due to fundamental structural differences in the Alberta electricity market compared to FERC-regulated markets.
  - commitment decisions in FERC markets are made by the ISO, based on participant submitted multi-part offers and bids,
  - Alberta’s energy market allows resources to make their own commitment decisions.
- Alberta’s implementation of the energy storage participation model, offer parameters, AS provision, pricing and settlement as well as state of charge management will be distinctly different from FERC markets as the markets were designed under different policy frameworks.
- See “Storage Integration Efforts in U.S. Wholesale Electricity Markets,” located on to better understand the implementations in FERC jurisdictions.



- Allow for hybrid asset configurations and variable energy resource (VER) block submissions for those assets in order to facilitate dispatch of variable energy and ensure required visibility.
- Optional full-range participation using the linked-assets submission option for those participants that choose to submit the entire range of the resource, and a must communicate charging levels requirement for participants that choose not to participate with their full-range.
- State of charge will be defined as an aggregate measurement from the site as a percent charge ranging from zero to one hundred percent that will be provided to the AESO and updated in real-time via SCADA.
- Commissioning of sites with both controllable inflows and outflows will be required to submit 2 offer blocks. One at zero dollars and another at the offer cap.

**Recommendation 1: Allow Hybrid  
asset configurations and VER block**

# Asset configurations: Should hybrids be permitted?



**Issue:** Hybrid asset dispatch response variability and operational visibility

## **Options for Hybrid asset dispatch:**

- VER block volume - Add additional information within the offer indicating the volume of Variable Energy Resource energy within each block MW of the offer;
- Controllable-only Participation – Offers are only submitted for the storage component of the hybrid asset. Wind and solar output is assumed to be at the offer price floor (\$0/MWh);
- Status Quo – Allow the participant to choose whether the hybrid asset is to be considered a Generating Unit or a Wind or Solar Aggregated Generating Facility that continues to permit a large dispatch variance.

- **Stakeholder concerns**
  - Independent assets on the same site would incur demand transmission service (DTS) charges
  - Configuration permitted in short-term implementation
- **AESO conclusions**
  - DTS issue can be avoided with appropriate metering
  - Certain storage installations would be difficult to configure as independent assets
  - Should not take away the ability for VERs to submit priced energy blocks even though they are not used currently
  - Dispatch response variability is a reliability risk
- **Recommendation**
- Allow for hybrid asset configurations and VER block submissions for those assets
- Enabling hybrids would improve participation, give the market participants more flexibility, would not impact reliability, and would not require grandfathering. The VER block submission option provides a balanced approach between participant flexibility and the AESO's requirement for dispatch visibility.

# Recommendation: Solar/Wind & Storage Hybrid Participation using VER Block Submissions



25 MW Hybrid made up of:  
 15 MW of VER and  
 10 MW of Storage

Block	offer			Block	offer	
	\$/MWh	MW			\$/MWh	MW
bk 4	220	25	VER Block	bk 4	220	25
bk 3	45	20		bk 3	45	23
bk 2	36	15		bk 2	36	21
bk 1	25	10		bk 1	25	18
bk 0	0	5		bk 0	0	15

- The VER block approach gives some certainty as to where in the offer the storage resource will choose to charge.
- The AESO proposes to automatically assign the VER capacity to the lowest blocks from the bottom up
  - No change to the structure of the offer and bid proforma is required.
  - Gives the AESO System Controller a sense of where in the offer the resource could be expected to use some of the VER generated energy for charging without limiting the flexibility of the hybrid operation.
  - Dispatch tolerances will be applied to the dispatch limits when assessing the compliance to a dispatch instruction.

Questions?

**Recommendation 2: Optional full-range participation, linked assets, or must communicate requirement**



**Issue:** Half-range participation allows a portion of a resources' controllable and dispatchable capacity to not have to participate, unlike generators. This results in unpredictable price response, fails to add liquidity, and can result in “saw-tooth” real-time prices

- In the  $\frac{1}{2}$  range option only the discharge capacity participates in the energy market
- With full range participation the charge and discharge capability participates

# Options, Conclusions, and Recommendations: 1/2 vs Full-range Energy Market Participation

- **Stakeholder concerns**
  - Lost flexibility with mandatory bidding
- **AESO conclusion**
  - Mandatory bidding may prove difficult for all storage applications as it may be difficult to comply with bid dispatches
  - Mandatory bidding may require grandfathering of existing storage and loads if implemented
  - Fair, efficient and openly competitive (FEOC) and tech agnostic principles mean we should extend mandatory bidding to controllable load (price responsive loads) as well.
  - Provides participants who may benefit from a price signal and dispatch instruction to guide their operation the ability to do so.
    - Receiving a dispatch instruction minimizes price risk and removes the requirement to continually monitor the system marginal price
  - Optional bidding provides participants the ability to qualify for adjustments to load on the margin for the consumption portion of the energy storage asset.

- ALM results from sub-hourly settlement stakeholder consultation
- Comparable to Payment to Suppliers on the Margin
- Provides sink assets (loads, charge portion for ES) an incentive to bid into the market
- ALM to proceed with energy storage rule development

# Options, Conclusions, and Recommendations: 1/2 vs Full-range Energy Market Participation

- **AESO conclusion continued**
  - Without bidding the AESO has no visibility of the storage asset operations
  - The system operational risks associated with maintaining supply and demand balance increases with increases in energy storage installed capacity that does not bid their charging capacity.
- **Recommendation**
  - Optional full-range participation for sink assets 5 MW or above
  - “if bid-must bid”
    - participant can choose to bid its consumption MW in all hours or not at all
    - decision is made as part of the asset configuration prior to site commissioning
  - Require storage facilities 5 MW or above to indicate charging levels for those who choose not to bid (“must communicate”), providing the AESO with visibility of storage asset operations
    - The process and procedures will be developed with stakeholders

- Participation Option 1 – Absolute Zero
  - This submission structure is simply to convert the entire range of operation to a positive value offer.
- Participation Option 2 – Linked assets
  - This implementation option leverages the current source and sink asset model to integrate storage.
  - A source asset is created to offer energy exports from the storage asset to the grid and a sink asset is used to bid any energy imports to the storage asset due to charging.
- Participation Option 3 – B-OFFER
  - Submission of a combined bid/offer for the entire range of the facility that does not require the conversion factor when translating between the submission and the expected net-to-grid output.

- **Stakeholder concerns**
  - Administrative complexity
- **AESO conclusion**
  - The linked asset mechanism is an extension of the current implementation where additional submission validation is added to the Energy Trading System to ensure the offer and bid from the same facility are compatible and the resulting dispatches are feasible.
  - Linked-assets submission mechanism allows AESO to update the existing bidding rules to better align with offer requirements without changing the fundamentals of submission and dispatch.
  - Linked-assets submission mechanism is technology agnostic and provides greater flexibility and less complexity than the other mechanisms.
- **Recommendation**
  - Optional full-range participation using the linked-assets submission option

Questions?

## Recommendation 3: Define State of Charge



- **Stakeholder concerns**
  - Available Capability should be linked to state of charge
  - Assumed state of charge would be used in dispatch decisions
- **AESO conclusions**
  - State of charge management is the responsibility of the operator and is managed through their energy market offers and bids
  - State of charge is not part of the energy market submission
  - The participant is in the best position to determine % charge of the asset
  - In order to use the term in the rules we will need to define it in the CADG
- **Recommendation**
  - State of charge will be defined as an aggregate SCADA measurement from the site as a percent charge ranging from 0% to 100% that will be provided to the AESO and updated in real-time via SCADA.

Questions?

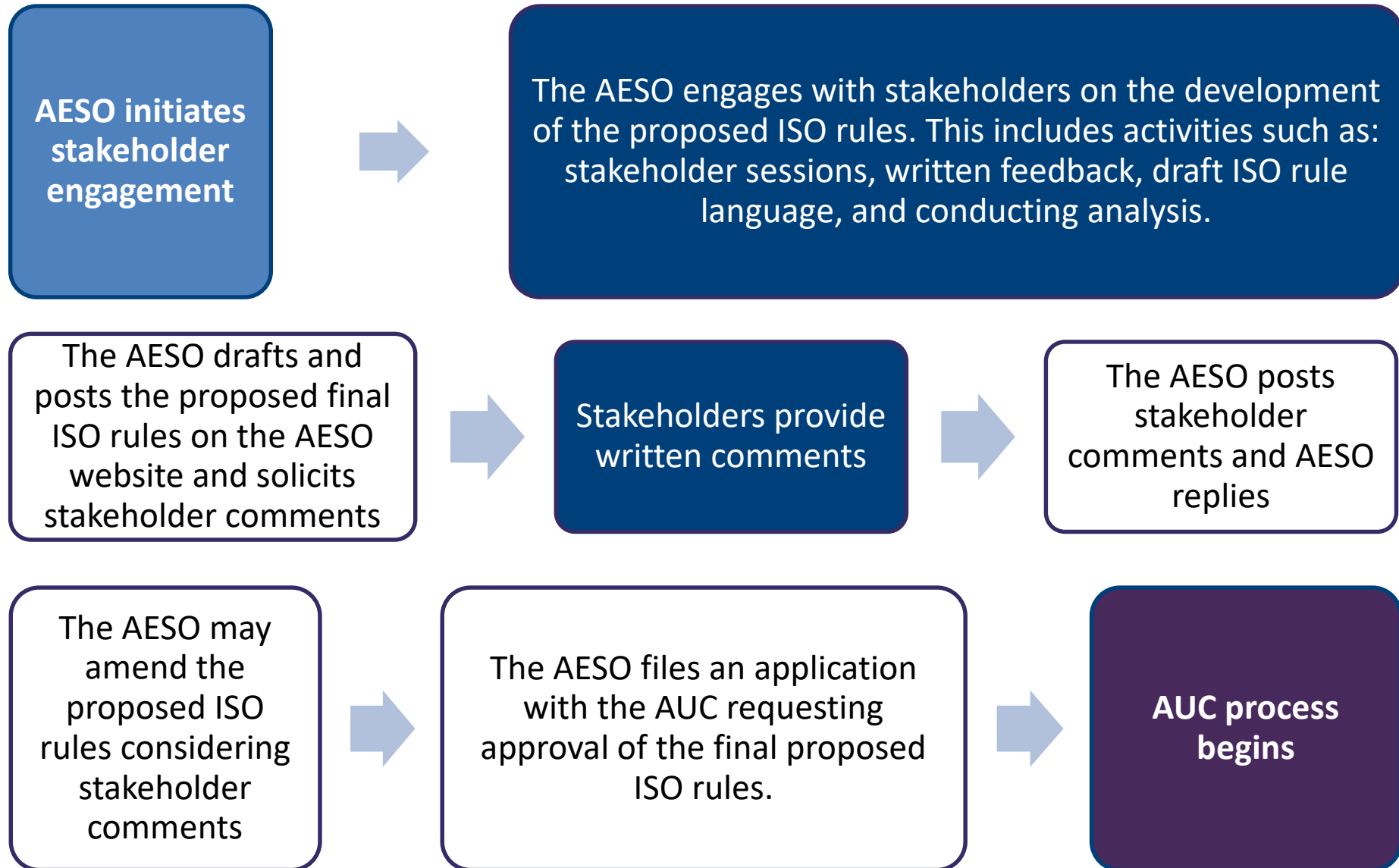
**Recommendation 4: Revise  
commissioning rules to better reflect  
energy storage requirements**

- **Stakeholder concerns**
  - none
- **AESO conclusions**
  - Current rules are designed for generators and loads
  - 2 options for fix it:
    - Allow multiple blocks
    - Create an new acceptable operational reason (AOR) for restatement while commissioning storage
  - Adding more to an already lengthy definition is undesirable
- **Recommendation**
  - Commissioning of sites with both controllable inflows and outflows will be required to submit 2 offer blocks. One at zero dollars and another at the offer cap.

Questions?

# ISO Rule Development

- Section 20 of the *Electric Utilities Act* grants authority to the AESO to develop ISO rules.
- AUC Rule 017, *Procedures and Process for Development of ISO Rules and Filing of ISO Rules with the Alberta Utilities Commission*, sets out the requirements for the development of ISO rules, including:
  - Stakeholder engagement requirements; and
  - AUC application requirements

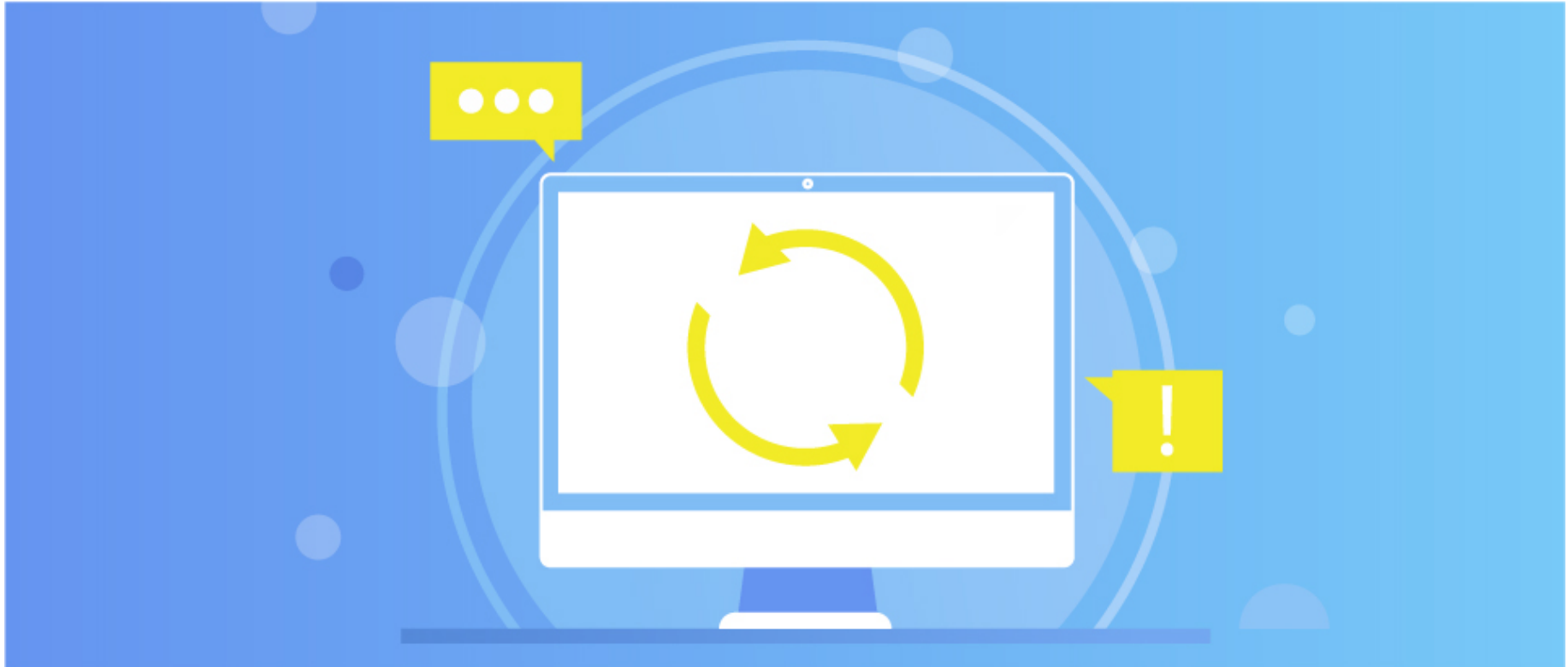




- Stakeholders to provide written feedback by March 17, 2021
- The AESO will consider stakeholder feedback through its rule development process and determines further consultation steps, which could include, seeking written feedback on:
  - specific issues identified in the stakeholder session,
  - proposed draft ISO rule language, and
  - any other matters the AESO considers valuable in advancing the development of the proposed Energy Storage ISO Rule Amendments.
- For questions regarding the development of energy storage rule amendments, please email the AESO at: [rules\\_comments@aeso.ca](mailto:rules_comments@aeso.ca).

Thank you

# Contact the AESO (change to: Stay Informed)



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