Operating Reserves Market Review Session #2

April 7, 2022

Public

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Introductions & Session Overview

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Agenda

Topic	Presenter(s)	Time	Duration
Welcome, introductions, session overview	Nicole LeBlanc	9:00 am	10 min
General stakeholder feedback	Brendan Jewitt	9:10 am	30 min
Group 1 design recommendations	Brendan Jewitt	9:40 am	40 min
Discussion and Q&A	Open discussion	10:20 am	20 min
Break	N/A	10:40 am	10 min
Group 2 design alternatives	Brendan Jewitt	10:50 am	40 min
Discussion and Q&A	Open discussion	11:30 am	20 min
Next steps	Ruppa Louissaint	11:50 am	10 min

Introductions

- Markets
  - Nicole LeBlanc, Director Markets & Tariff
  - Ruppa Louissaint, Manager Markets
  - Brendan Jewitt, Economist
- Grid Reliability
  - Biju Gopi, Manager, Operations Engineering and Market Support
- Legal and Regulatory Affairs
  - Jackie Gow, Legal Manager, ISO rules & ARS
  - Melissa Mitchell-Moisson, Regulatory Analyst
  - Brij Modha, Regulatory Analyst
  - Michelle Jackson, Regulatory Administrator

Initiative summary

- Purpose of this initiative:

> Assess opportunities to enhance competition and price fidelity in the existing OR markets to improve efficiency.

- At the highest level the market is functioning, but there are several design elements that are not performing in a way that promotes efficiency
- Incremental change should be sufficient to address the concerns
  - Ensuring an efficient market design is essential, especially given the importance of OR both economically and operationally as the system and fleet evolve

Initiative timing and coordination

- Some stakeholders expressed concerns that parallel initiatives create challenges for process and coordination
  - Others said this initiative should proceed while ensuring coordination
- The AESO has reviewed interdependencies and has determined that the scope and/or time horizon of other initiatives are different enough to create minimal risks
  - The incremental design changes proposed in this engagement are expected to enhance competition and ensure that the operating reserve markets are functioning efficiently in the short and medium-term
  - During this period, long-term changes such as new products to facilitate the energy transition can be evaluated
- The AESO will ensure that stakeholders are made aware of any interdependencies as they are identified
  - The scope and pace of this initiative have been carefully considered together with other ongoing initiatives

Initiative process

Session 1	Nov 30, 2021	• Background • Purpose and scope • Initial discussion of alternatives and considerations for group 1 design elements • Introduction of group 2 design elements
Session 2	Apr 7, 2022	• Continued discussion of group 1 design elements, including stakeholder feedback and initial recommendation • Initial discussion of alternatives and considerations for group 2 design elements
Session 3	Late August, 2022	• Explore and discuss operating reserve price cap(s) • Detailed recommendation on all design elements
Rule drafting	Q3/Q4 2022	Subject to change as initiative progresses
Application filing with AUC	Q4 2022	
Implementation	2022/2023	

*Dates and content subject to change

Session summary

- Our objectives in this session are to:
  - Address general points of stakeholder feedback received after session 1
  - Share and discuss the AESO's draft recommendations on the group 1 market design elements
  - Explore and discuss potential alternatives for the group 2 market design elements
  - Provide an update on the timing and format for the remainder of the engagement

AESO Stakeholder Engagement Framework

General Stakeholder Feedback

Public

Introduction

- This section will address some of the feedback that was received that was not specific to a particular market design change
- The AESO thanks participants for taking the time to give valuable constructive feedback
  - The AESO has reviewed and considered all the feedback it received and will continue to do so, regardless of whether a given point of feedback is included for discussion in today's presentation
- We will focus on critical feedback, as supportive feedback, while helpful, does not prompt us to reconsider our rationale

Group 1 vs Group 2

- Some stakeholders suggested that certain design elements be moved between group 1 and group 2
- The purpose of the groups was primarily to divide content between session 1 and 2
  - The groups were not necessarily reflective of priority or importance
- We will be discussing all design elements going forward in the engagement

Contingency reserve directives

- Some stakeholders expressed concerns regarding the fairness of directives for contingency reserves
- System controllers issue directives to maintain reliability and have the discretion to take action to prevent adverse outcomes
  - As participation is enabled from new types and sizes of assets, system controllers must have the tools they need to effectively utilize the services these resources have contracted for
- The AESO has initiated interface updates that will assist the system controllers with issuing directives to the contracted providers of each service
  - These interface updates may be implemented as soon as Q2 2022
- We will continue to monitor this outside of this initiative

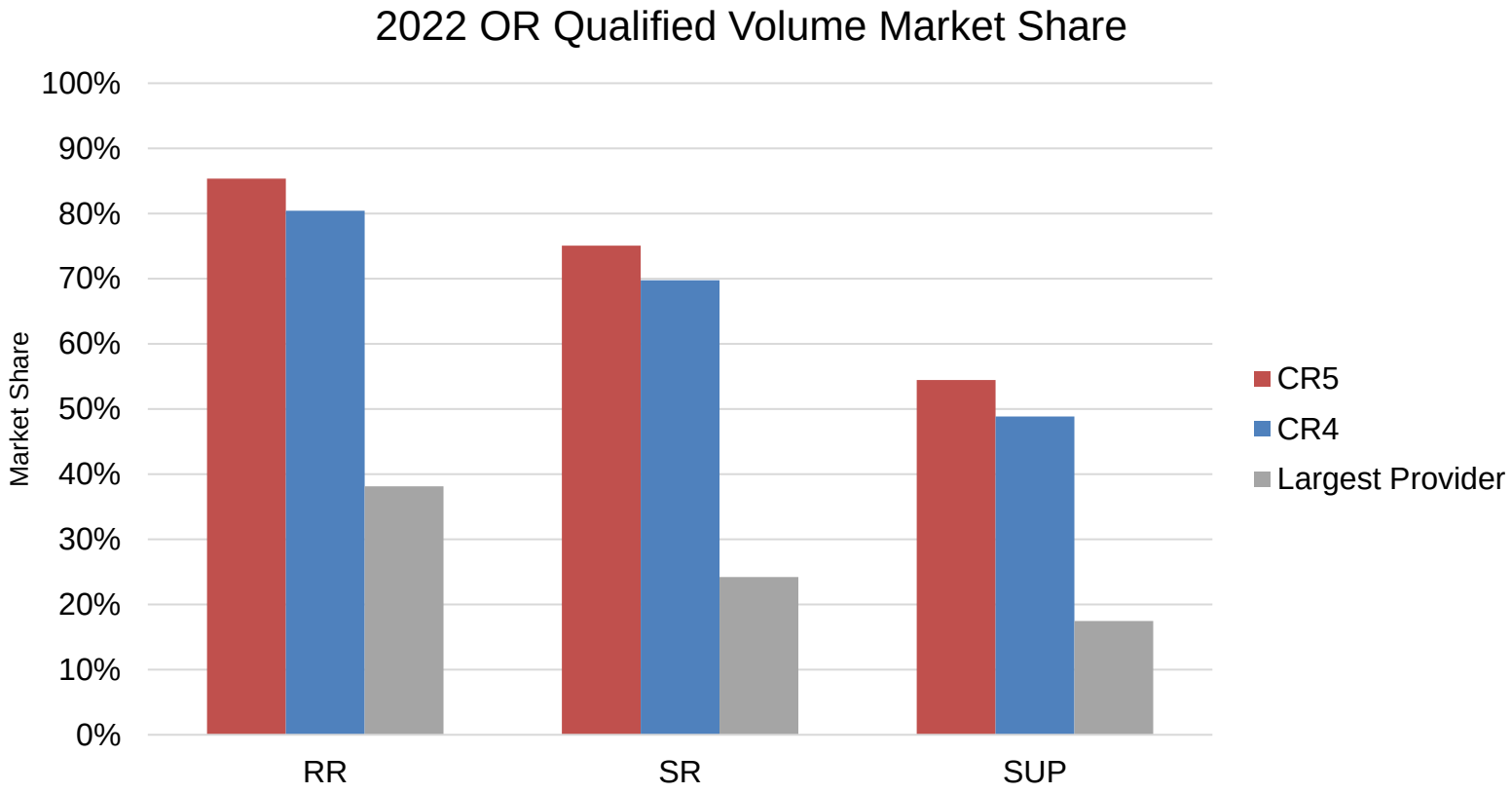
Performance by technology type

- Some stakeholders asked for data on the performance of OR providers by technology type
- The AESO and MSA continually monitor OR providers to ensure compliance and enforce the relevant rules and technical standards
  - This enforcement will continue to ensure reliability and a level competitive playing field as new types and sizes of assets enter the market
- Data associated with this ongoing enforcement is not made public

Quantifying potential benefits

- Some stakeholders asked for more quantification of potential benefits of the design changes
  - While we would like to do so where possible, the nature of these changes (e.g. enabling entry) would make this type of analysis highly speculative
    - E.g. quantifying the MW of capacity enabled by a particular change
  - We will continue to perform quantitative analysis where we deem it is necessary to support our recommendations
- Especially where implementation cost and complexity are relatively minor, the AESO is of the view that economic theory and FEOC principles can be relied upon to justify change
  - The AESO has an obligation to enable open competition

Updated market concentration metrics



- The actual concentration metrics for 2022 are approximately 5-10% lower than the 2021 forecast in the 2019 market power mitigation advice
  - While the market is still concentrated, new entry in this time period is one of the contributing factors to our conclusion from session 1 that broader structural market changes are not needed at this time

Group 1 Design Recommendations

Public

Introduction

- ‘Group 1’ design elements explored in session 1 include:
  - Equilibrium pricing & AESO bid price
  - Standing offers
  - Offer transparency
  - Minimum qualification & offer size
- This section will include a summary of critical stakeholder feedback, any further or updated considerations, and the AESO’s recommendation
- The AESO thanks participants for taking the time to give valuable constructive feedback
  - The AESO has reviewed and considered all the feedback it received and will continue to do so, regardless of whether a given point of feedback is included for discussion in today’s presentation

Economic principles & objectives

- The following objectives provide context to the AESO economic principles
- We have used the principles to assess each design alternative

Economic Principle	Objectives
Competition	• Competition across the energy and operating reserve markets should be maximized • Barriers to entry should be minimized • The market design should not enable anti-competitive practices
Effective Operations & Pricing	• Price signals should guide efficient capacity allocation across energy and operating reserve markets • Price signals should incent efficient investment in reserve-capable capacity • The framework should enable participation by assets that are well-suited to providing reserves • The operating reserve markets should be designed and operated in alignment with technical standards and product definitions
Cost	• The opportunity for cost recovery should exist across the energy and operating reserve markets • The cost of administering the operating reserve markets should be minimized
Public Interest	• Changes to the operating reserve market design should only be made with a clear justification to avoid unnecessary disruption to market stability

Equilibrium pricing & AESO bid price

Current practice

- The equilibrium price in the active OR markets is determined by averaging the marginal offer and the AESO bid price
  - AESO bid prices are not visible to parties outside the WattEx platform
  - The AESO bid price currently acts as an offer and price cap
- Dispatched active reserve providers are paid the energy pool price + the equilibrium price

AESO proposed alternative

- Remove equilibrium pricing and set the uniform price at the marginal offer price
  - The index to the energy pool price would remain
- Replace the AESO bid price with a publicly disclosed price cap

Equilibrium pricing & AESO bid price

Stakeholder feedback

- Interest in the level of the price cap(s)

Updated considerations

- Further information on the price cap(s) will be shared in session 3
  - Will be set with similar principles to the energy price cap, while considering that the energy pool price is already passed through
    - Allow reasonable opportunity for cost recovery, including fixed costs and commitment costs
    - Allow for price signals to indicate scarcity of reserves
    - Limit the potential for abuse of market power
  - The evaluation against these principles will be informed by:
    - Other jurisdictions, with consideration for differences in market structure
    - Historical market outcomes, adjusted for updated cost fundamentals
    - Relevant and feasible quantitative analysis

Equilibrium pricing & AESO bid price

Economic Principle	Considerations
Competition	• Sets price based solely on competitive forces • Simplified pricing may encourage competition
Effective Operations & Pricing	• Simplifies offer strategy • Enhanced price fidelity; price will better reflect competitive environment • The AESO bid price should allow reasonable opportunity for cost recovery while accounting for product scarcity and limiting the potential for abuse of market power
Cost	• Implementation cost to be explored further once the design recommendations have been determined; initial assessment is expected to be minimal
Public Interest	• Sharing the AESO bid price publicly will increase transparency

Equilibrium pricing & AESO bid price

Draft recommendation

- Remove equilibrium pricing and set the uniform price at the marginal offer price
- Replace the AESO bid price with a publicly disclosed price cap

To be analyzed further

- The level of the price cap(s)

Standing offers

Current practice

- Market participants must submit new offers to the WattEx platform each time they wish to participate

AESO proposed alternative

- Allow for market participants to submit standing offers that would carry forward and be automatically included in future trading intervals
  - These offers would remain until changed by the participant or if the trader is deactivated

Standing offers

Stakeholder feedback

- Concerns were raised regarding reliability implications if offers were no longer reflective of actual capability
  - The addition of an expiry date was suggested as a mitigation measure, and the AESO agrees that this would likely be effective
- There was generally little interest in this change

Updated considerations

- The AESO explored this possibility as an opportunity to streamline participation, but we do not believe this change is required for market integrity

Standing offers

Economic Principle	Considerations
Competition	• Reduces participation burden
Effective Operations & Pricing	• An expiry date or other mitigation measure would be necessary to ensure offers are still reflective of availability
Cost	• Implementation cost to be explored further once the design recommendations have been determined; initial assessment is expected to be minimal
Public Interest	

Standing offers

Draft recommendation

- Do not pursue standing offers at this time
  - At this time, due to limited interest, the potential for reliability impacts outweighs the benefit
  - As with all the recommendations, the AESO may adjust based on stakeholder feedback, especially as potential group 2 changes progress

Offer transparency

Current practice

- Offers to the WattEx platform are visible to all participants as soon as they have been submitted
  - Participants typically submit offers in the final moments of each procurement
- 60-day lagged offer information is available with clearing price and participant attribution for cleared volumes only

AESO proposed alternative

- Move to a sealed-bid format
- Align OR offer disclosure with the energy offer disclosure stipulated by the FEOC regulation
  - Publish offer price, volume, and offer control party with a 60-day lag
  - These changes would align the OR market with the energy market by reducing real-time transparency and increasing ex-post transparency

Offer transparency

Stakeholder feedback

- Support for the simple open auction format
  - Concerns with reduced information in the market if a sealed-bid format is adopted
- Ex-post data should be shared as quickly as possible
- The open auction format is a means of managing offers that participants do not wish to be partially accepted

Offer transparency

Updated considerations

- There is limited experience with simple open auctions, as they are especially vulnerable to implicit coordination and price manipulation
  - When open formats are used, they typically include a dynamic ‘clock’ mechanism

Auction Type	Common Variants	Preferred for

Sealed-bid	First-price
	Second-price (Vickrey)
		• Repeated markets
		  • Price discovery occurs over time
		• High concentration
		  • Higher risk of implicit coordination

Open	Ascending clock (Dutch)
	Descending clock (English)
		• Auctions only held once
		  • No dynamic price discovery
		• Unknown costs
		  • Price discovery especially important

Offer transparency

Economic Principle	Considerations
Competition	• Sealed-bid format is less vulnerable to implicit coordination and price manipulation • Offer price information is currently not published, but could aid in transparency if it is published after an appropriate delay
Effective Operations & Pricing	• Sealed-bid format may reduce the opportunity for price discovery; however, this opportunity is currently reduced when participants offer at the last moment • Daily operating reserve price report through ETS allows for price discovery over time • The pool price index mitigates cost uncertainty associated with pool price risk for active reserves
Cost	• Implementation cost to be explored further once the design recommendations have been determined; initial assessment is expected to be minimal
Public Interest	• Increased transparency is generally in the public interest unless it creates competitive or commercial issues • Dynamic open auction formats (e.g. ascending, descending clock) are more complex

Offer transparency

Draft recommendation

- Move to a sealed-bid format

To be analyzed further

- Timing of offer information disclosure
  - Seeking feedback on if/why the daily price report is not sufficient for price discovery purposes
- Impact and accommodations for inflexible offer blocks
  - Seeking further information on whether more competition can be enabled by allowing offer blocks that will not be partially filled in the day-ahead OR market

Minimum qualification & offer size

Current practice

- The minimum qualification size for regulating reserves (RR) is 15 MW, spinning reserves (SR) is 10 MW and supplemental reserves (SUP) is 5 MW
- The minimum offer size for all OR is 5 MW
- Dispatch tolerance is currently 1 MW for assets <= 20 MW and 5% for assets > 20 MW

AESO proposed alternative

- Reduce minimum qualification and offer size to 1 MW for all products
- Change dispatch tolerance to 5% for all assets

Minimum qualification & offer size

Stakeholder feedback

- Concerns about technical feasibility, including compliance monitoring
- Interest in moving to a size below 1 MW
- Concerns about directive practices

Updated considerations

- A recent technical study has confirmed that it is technically feasible to lower the minimum size thresholds to 1 MW for all OR products
  - This conclusion was shared as part of the consultation on Distributed Energy Resources (DERs) Markets Participation in 2021
- AESO systems do not have the capability to dispatch offers below 1 MW and introducing this capability would involve significant costs
- Moving to 5% dispatch tolerance for all assets ensures a level playing field and reduces red tape
  - SCADA data will be required for effective compliance monitoring of assets down to 1 MW

Minimum qualification & offer size

Economic Principle	Considerations
Competition	• More participation from different resource types and configurations can be enabled • 5% dispatch tolerance for all assets ensures a level playing field
Effective Operations & Pricing	• Operational studies have confirmed technical capability for assets >= 1 MW • AESO systems do not currently have the capability to handle offers or dispatches below 1 MW • SCADA and Maximum Authorized Real Power (MARP) data will still be required, ensuring effective compliance monitoring • 5% dispatch tolerance for all assets ensures that reserve volumes are still reliable and consistent down to the 1 MW level
Cost	• Increased competition may lead to cost savings • The cost to moving below 1 MW would be significant • Implementation cost to be explored further once the design recommendations have been determined; initial assessment is expected to be minimal
Public Interest	• Uniform rule treatment will reduce red tape

Minimum qualification & offer size

Draft recommendation

- Reduce minimum qualification and offer size to 1 MW for all products
- Change dispatch tolerance to 5% for all assets

Group 1 Discussion and Q&A

Public

BREAK

Discussion and Q&A

- Proposed in-scope items – group 1
  - Equilibrium pricing & AESO bid price
  - Standing offers
  - Offer transparency
  - Minimum qualification & offer size

Group 2 Design Alternatives

Public

Introduction

- This section includes the AESO's proposed alternatives for the following design elements introduced in session 1:
  - Block procurement
  - Contingency reserve procurement
  - Standby reserves
- The AESO also introduced OR curtailment priority for discussion in group 2 , but will not be pursuing changes to these practices at this time

Block procurement

Current practice

- The AESO procures reserves in four time blocks, as follows:
  - On peak means the period from 07:00 to 22:59:59
  - Off peak means the period from 00:00 to 06:59:59 and from 23:00 to 23:59:59
  - AM super peak means the period from 05:00 to 07:59:59
  - PM super peak means the period from 16:00 to 23:59:59 in November, December, and January and from 17:00 to 23:59:59 in all other months
- Only active RR are purchased for super peak blocks, while all reserves are procured for on peak and off peak blocks

Considerations

- Some technologies may prefer the flexibility of hourly procurement, while others may prefer the commitment certainty of block procurement
- If there is interest in this change, procurement shape analysis can be performed to assess the magnitude of any potential cost savings
  - Want to first understand the impact on entry and competition

Block procurement

AESO proposed alternative

- Move to hourly reserve procurement
  - Like standing offers, the AESO does not believe this change is required for market integrity and will only pursue further if there is sufficient interest from market participants

Block procurement

Economic Principle	Considerations
Competition	• Hourly procurement may enable entry from new asset types
Effective Operations & Pricing	• Block procurement may aid unit commitment decisions for some asset types
Cost	• Further analysis is needed to estimate any potential cost savings from moving to hourly procurement • Implementation cost to be explored further once the design recommendations have been determined; initial assessment is expected to be minimal
Public Interest	

Contingency reserve procurement

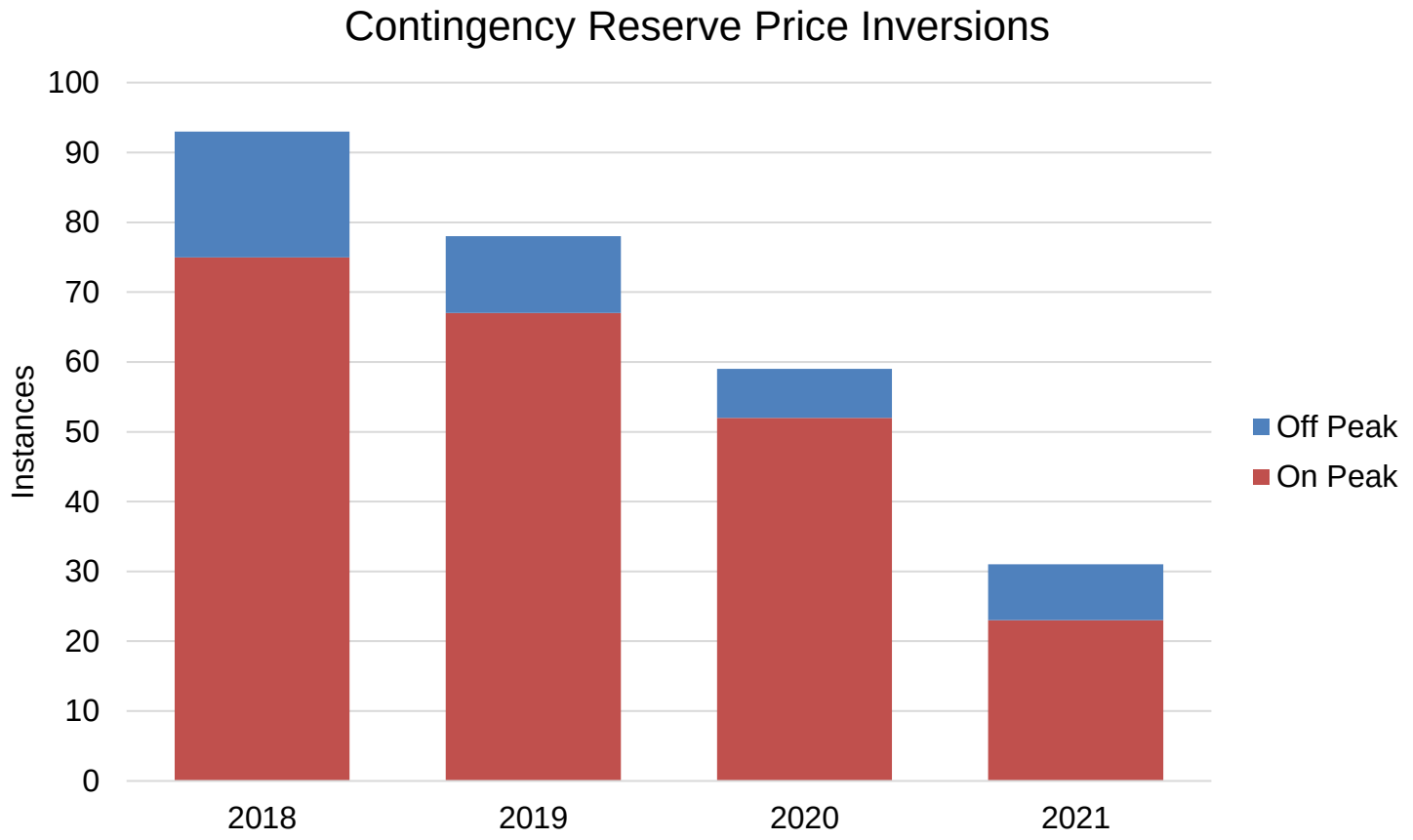
Current practice

- Spinning (SR) and supplemental (SUP) reserves are procured through separate sequential auctions
- BAL-002-WECC requires that the AESO hold a minimum of 50% of total contingency reserves (CR) as SR
  - The AESO currently procures 50% of CR as SR

Considerations

- Volumes that are qualified for SR are also capable of providing SUP
- When the SUP price exceeds the SR price, the AESO is buying SUP when substitutable SR may be available at a lower price
- The current sequential auction format is susceptible to these outcomes

Contingency reserve procurement



- In recent years, the SUP price has exceeded the SR price in approximately 30-90 instances per year
  - The frequency of these price inversions has been declining, likely due to new entry in SUP creating more competition

Contingency reserve procurement

AESO proposed alternative

1) Carry uncleared SR volumes forward into the SUP procurement
   - Retain current sequential approach
   - SR offers that do not clear the market will be submitted into SUP auction
   - Participants may improve their position in SUP (increase volume, lower price)
   - Previous SR volumes that clear as SUP will be treated as SUP

The AESO also considered the following alternative

2) Move to a simultaneous approach for CR
   - Participants simultaneously submit offers for SR and SUP
   - All CR offers are stacked from lowest to highest price
   - Offers are cleared in order of merit until:
     - Total reserve requirement is met, **or**
     - 50% of total reserve requirement has been procured as SUP
       - *Then continue clearing SR only until SR requirement is met*

Simultaneous CR procurement option 1 illustrative example

- CR volume need: 300 MW
  - Need SR = 150 MW

CR type	Offer MW	Offer Price	Cumulative SR
SR	50 MW	-$200/MW	50 MW
SR	50 MW	-$70/MW	100 MW
SR	50 MW	-$30/MW	150 MW
SR	25 MW	-$10/MW	175 MW
SR	25 MW	$0/MW	200 MW
SR	50 MW	$10/MW	250 MW
SR	25 MW	$40/MW	275 MW

Cleared as SR

Brought forward to SUP auction

- Results in 150 MW of SR at -$30/MW

Simultaneous CR procurement option 1 illustrative example

- CR volume need: 300 MW
  - Need SUP = 150 MW

CR type	Offer MW	Offer Price	Cumulative SUP
SUP	50 MW	-$50/MW	50 MW
SR -> SUP	25 MW	-$10/MW	75 MW
SUP	50 MW	-$5/MW	125 MW
SR -> SUP	25 MW	$0/MW	150 MW
SR -> SUP	50 MW	$10/MW	200 MW
SUP	50 MW	$30/MW	250 MW
SR -> SUP	25 MW	$40/MW	275 MW

Clearing offer block without SR offers

- Results in 150 MW of SUP at $0/MW
  - Without residual SR offers, the SUP price would be $30/MW

Contingency reserve procurement

Economic Principle	Common Considerations	Option 1 Considerations (sequential)	Option 2 Considerations (simultaneous)
Competition	• Combined volumes will create broader base of liquidity • SR participants may adjust offer behaviour based on new auction mechanism		
Effective Operations & Pricing	• Pricing SUP at a premium to SR sends price signals that conflict with the product fundamentals • Increased competition has recently reduced instances of price inversions		• Simultaneous procurement complicates position control to ensure capacity is not contracted for multiple services
Cost	• Implementation cost to be explored further once the design recommendations have been determined	• The AESO has estimated potential savings using historical offers to be approximately $1MM/year. Updated offer behaviour may impact realized savings.	• Implementation cost may be moderately higher than sequential approach • Cost savings should be similar to the sequential approach
Public Interest		• Sequential approach adds minor complexity to market	• Simultaneous approach adds moderate complexity to the market

OR curtailment priority

- OR curtailment priority was included in session 1 as a group 2 proposed in-scope item
  - Included the current curtailment practices for OR and energy under ISO Rules 203.6 – *Available Transfer Capability and Transfer Path Management* and 302.1 – *Real Time Transmission Constraint Management*
- The AESO has determined that it will not be pursuing any changes to these practices at this time
  - A broader review of potential alternatives has found impacts that go beyond the scope of enhanced competition and price fidelity in the OR markets
  - Implementation of potential changes would likely exceed the 2022/23 timeframe targeted by this initiative

Standby reserves

- AESO has assessed the need for standby reserves and has determined it serves several purposes:
  - Enhances reliability by filling in when active OR providers are unable to provide
  - Reduces total procurement costs due the probabilistic nature of day-ahead reserve requirement forecasting
    - If the AESO procured only active reserves to meet anticipated reserve needs with a high degree of certainty, this would result in persistent over-procurement
  - Maximizes competition in the energy market by allowing standby volumes to continue participating (where applicable)
  - Facilitates an openly competitive market by reducing the frequency of out-of-market conscriptions
- The AESO does not believe these outcomes can be achieved with active reserves alone and therefore recommends continuing to procure standby reserves with adjustments to the pricing and procurement mechanism

Standby reserve pricing and procurement

Current practice

- Standby reserves are procured to meet reserve requirements when the active portfolio is insufficient
- Market participants submit a premium and an activation price to WattEx
- These prices are combined using the following blended price formula to determine which offers clear the market

Blended Price = Premium + (Activation % x Activation Price)

- The activation % is determined by the AESO
- Participants that clear the market are paid the premium and, if activated, the activation price on a pay-as-bid basis

Considerations

- The lack of an activation price index creates uncertainty and price risk
- The current pricing mechanism is complex
- The pay-as-bid pricing structure distorts offer strategy incentives

Standby reserve pricing and procurement

AESO proposed alternatives

1) Move to single-part offers with only an activation price
   - Index the activation price to pool price
     - Mitigates the price risk that necessitates the premium payment
   - Clear the market using a uniform pricing mechanism
   - Uniform price could be set day-ahead, or set in real-time based on the highest activated offer price
     - AESO could clear a set volume day-ahead with the uniform activation price set at the highest cleared offer, or
     - All day-ahead offers could be carried to real-time and the activation price would vary in real-time based on the highest activated offer
2) Move to single-part offers with only a premium price
   - Pay activated standby reserve providers the prevailing active reserve price
     - If market participants require a higher price than the active reserve price, they can account for that in their premium price offer as active reserves are procured before standby reserves
   - Clear the market using a uniform pricing mechanism

Standby reserve pricing and procurement

Economic Principle	Common Considerations	Option 1 Considerations (activation price)	Option 2 Considerations (premium price)
Competition	• Simplified pricing may encourage more participation	• Removal of premium payments may reduce participation incentive	
Effective Operations & Pricing	• The indexed activation price will mitigate price risk • A uniform price format creates better offer strategy incentives	• Real-time activation prices allow for larger volume procured day-ahead, thereby potentially reducing out-of-market conscriptions	• Participant feedback is needed to understand whether there are direct costs or opportunity costs associated with providing inactivated standby reserves
Cost	• Implementation cost to be explored further once the design recommendations have been determined	• Removal of premium payments may reduce costs • Real-time activation prices may have higher implementation cost to enable pricing and settlement	
Public Interest	• Both options move to a single price uniform auction that is more transparent and less complex		

Recap

Group 1	Draft Recommendation
Equilibrium pricing & AESO bid price	Remove equilibrium pricing and discuss price cap in session 3
Standing offers	Do not pursue at this time
Offer transparency	Move to a sealed-bid format, with ex-post offer disclosure recommendation in session 3
Minimum qualification & offer size	Move to a minimum size of 1 MW for all reserve types with dispatch tolerance of 5% for all assets

Group 2	Alternative(s) to explore
Block procurement	Hourly procurement
Contingency reserve procurement	Residual spinning reserve offers carried forward to supplemental reserve procurement
Standby reserve pricing and procurement	1) Move to single-part offers with only an activation price 2) Move to single-part offers with only a premium price

Group 2 Discussion and Q&A

Public

Discussion and Q&A

- Proposed in-scope items – group 2
  - Block procurement
  - Contingency reserve procurement
  - Standby reserves

Next Steps

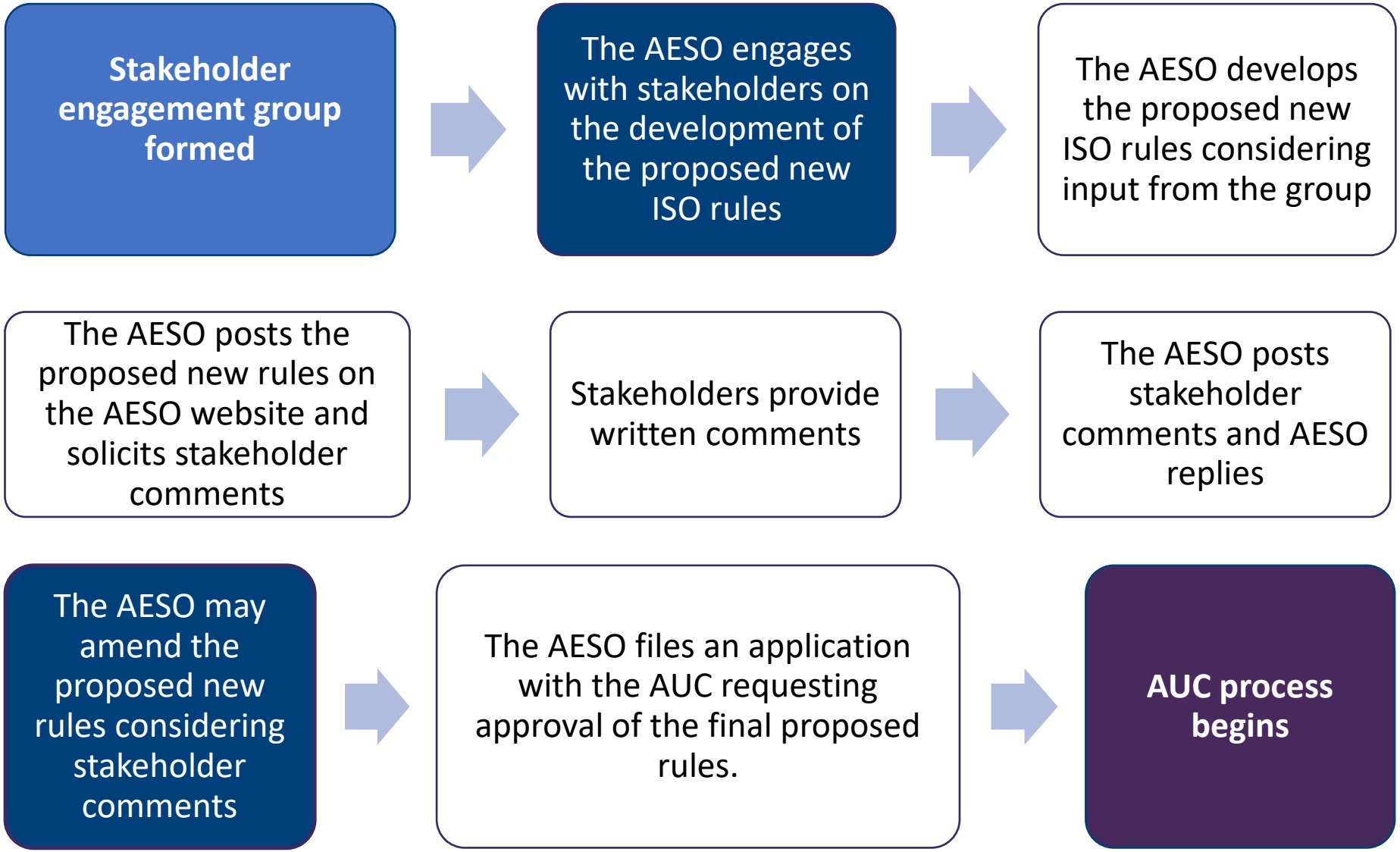
Public

Path forward

Session 1	Nov 30, 2021	• Background • Purpose and scope • Initial discussion of alternatives and considerations for group 1 design elements • Introduction of group 2 design elements
Session 2	Apr 7, 2022	• Continued discussion of group 1 design elements, including stakeholder feedback and initial recommendation • Initial discussion of alternatives and considerations for group 2 design elements
Session 3	Late August, 2022	• Explore and discuss operating reserve price cap(s) • Detailed recommendation on all design elements
AUC Rule 017	Q3/Q4 2022	Subject to change as initiative progresses
Application filing with AUC	Q4 2022	
Implementation	2022/2023	

*Dates and content subject to change

ISO Rule Process



Thank you

Public

Simultaneous CR procurement option 2 illustrative example 1

- CR volume need: 150 MW
  - Need SR >= 75 MW
  - Therefore, need SUP <= 75 MW

CR type	Offer MW	Offer Price	Cumulative SR	Cumulative SUP	Cumulative CR
SR	50 MW	-$200/MW	50 MW	0 MW	50 MW
SUP	50 MW	-$70/MW	50 MW	50 MW	100 MW
SR	50 MW	-$30/MW	100 MW	50 MW	150 MW
SUP	100 MW	-$10/MW	100 MW	150 MW	250 MW
SUP	50 MW	$0/MW	100 MW	200 MW	300 MW
SR	50 MW	$10/MW	150 MW	200 MW	350 MW
SR	25 MW	$40/MW	175 MW	200 MW	375 MW

- Results in 100 MW of SR at -$30/MW and 50 MW of SUP at -$70/MW

Simultaneous CR procurement option 2 illustrative example 2

- CR volume need: 300 MW
  - Need SR >= 150 MW
  - Therefore, need SUP <= 150 MW

CR type	Offer MW	Offer Price	Cumulative SR	Cumulative SUP	Cumulative CR
SR	50 MW	-$200/MW	50 MW	0 MW	50 MW
SUP	50 MW	-$70/MW	50 MW	50 MW	100 MW
SR	50 MW	-$30/MW	100 MW	50 MW	150 MW
SUP	100 MW	-$10/MW	100 MW	150 MW	250 MW
SUP	50 MW	$0/MW	100 MW	200 MW	300 MW
SR	50 MW	$10/MW	150 MW	200 MW	350 MW
SR	25 MW	$40/MW	175 MW	200 MW	375 MW

- Results in 150 MW of SR at $10/MW and 150 MW of SUP at -$10/MW