

This document provides additional information on standby operating reserves and proposed pricing alternatives in support of the Operating Reserve Market Review.<sup>1</sup>

Some information in this document is sourced from the following Information Documents: #2013-005R, Operating Reserve,<sup>2</sup> #2013-006R, Regulating Reserve<sup>3</sup> and #2013-007R, Contingency Reserve.<sup>4</sup> For more detailed information on the current standby operating reserves market and technical requirements, please refer to these Information Documents.

## Standby Reserve Fundamentals

The purpose of standby operating reserve is to provide additional operating reserve for use when the volume of operating reserves for which dispatches have been issued in the active market is insufficient to meet the real-time operating and reliability requirements of the interconnected electric system. Often, this insufficiency occurs when a resource with an active contract has a forced outage and is unable to provide the active reserve volume that the AESO has procured. The AESO issues dispatches for all pool assets in the active portfolio before issuing dispatches for any pool assets from the standby portfolio. There is a standby portfolio of pool assets for each type of operating reserve procured in the operating reserve market.

### Terminology

The AESO acknowledges that there has been conflicting terminology when referring to the 3 different states of standby reserves. To provide clarity to market participants and for the purposes of discussion moving forward, the following terminology will be used, which aligns with the ISO rules, Consolidated Authoritative Document Glossary, and the Watt-Ex Agreement.

- 1) Participants that have entered into a contract by successfully selling standby reserves in the day ahead market will be referred to as **contracted**.
- 2) When the AESO requires reserves from a contracted standby provider, it activates standby reserves by issuing a dispatch through the Automated Dispatch and Messaging System (ADaMS) and the provider is now **dispatched**. A dispatched provider must comply with the relevant rules and standards corresponding to the type of operating reserve it is providing.
- 3) If the AESO requires real power from a dispatched provider of contingency reserves, it will issue a directive through ADaMS and the provider is now **directed**.

### Pricing

The standby market utilizes a two-part pricing model with a premium price and an activation price.

- (i) Premium Price – the price paid to the seller to provide the AESO the option to call on the operating reserve if required.

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<sup>1</sup> <https://www.aeso.ca/stakeholder-engagement/rules-standards-and-tariff/operating-reserve-market-review/>

<sup>2</sup> <https://www.aeso.ca/assets/Information-Documents/2013-005R-Operating-Reserve-2020-06-19.pdf>

<sup>3</sup> <https://www.aeso.ca/assets/documents/ID-2013-006R-Regulating-Reserve.pdf>

<sup>4</sup> <https://www.aeso.ca/assets/documents/ID-2013-007R-Contingency-Reserve.pdf>

- (ii) Activation Price – the price paid to the seller if the AESO issues a dispatch for the operating reserve.

The AESO clears the market using a blended price formula, which ranks the standby offers based on the following algorithm:

$$\text{Blended Price} = \text{Premium} + (\text{Activation \%} \times \text{Activation Price})$$

Activation percentages are based on historical product activation rates for on peak and off peak hours. They are subject to change as market conditions change. If there is a change, the AESO gives notice to market participants.

If 2 blended prices are equal, the AESO selects the offer that was submitted to the Watt-Ex system first until its quantity requirements are filled.

When the contingency reserve provider receives a directive to provide a quantity of contingency reserve, the provider continues to receive the activation price and also receives the pool price for the real power provided.

The standby operating reserve merit order sorts all the standby quantities procured for each product from lowest activation cost to highest activation cost. The lowest cost quantities are activated first. The AESO only issues dispatches for the quantity required to address the deficiency in active operating reserve.

## Proposed Alternatives

In session 2 of the Operating Reserve Market Review, the AESO described two proposed alternatives for pricing of standby reserves.<sup>5</sup> Participants provided initial feedback on the high-level proposals.<sup>6</sup> While some participants were supportive of the simplifications created by the two proposals, others indicated that the complexity of the current pricing structure is necessary to properly capture the economic and operational fundamentals of the product. In light of this, the AESO is seeking feedback on a third alternative that would retain the current pricing structure with an indexed activation price. This section will provide further detail on the three proposed pricing alternatives.

### *Option 1 – Single-part offers with only an activation price*

Participants submit a single-part offer to Watt-Ex, containing a volume and an activation price. The activation price will be indexed to the energy pool price. Participants do not submit a premium price offer and no premium is paid. The activation price of the highest accepted offer will set the uniform activation price for all accepted offers. Standby reserve providers whose offers are accepted will be contracted to provide standby reserves.

Contracted standby reserve providers will participate in the energy market (if applicable) as they do today; however, they will not receive a premium payment. Contracted standby reserve providers will continue to be dispatched to provide reserves in order of merit as they are today (from the lowest activation price offer to the highest activation price offer). If they are dispatched, they will be paid the uniform activation price index that was determined in the day-ahead market plus the energy pool price.

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<sup>5</sup> <https://www.aeso.ca/assets/LARA-Rules-and-ARS/Operating-Reserve-Market-Review-Session-2-Presentation-2022-03-31-Updated-2022-04-04-v2.pdf> PDF pg 58.

<sup>6</sup> <https://www.aeso.ca/assets/LARA-Rules-and-ARS/Stakeholder-Comment-Letter-OR-Market-Review-Session-2-Additional-Feedback-2022-05-16.pdf>

Reserve Type	Payment		
	Contracted	Dispatched	Directed
Contingency Reserves (Spinning & Supplemental)	No payment for contracted standby reserves Participant may still participate in the energy market	Receive the uniform indexed activation price (activation price + pool price) per dispatched MW	Continue receiving the uniform indexed activation price (activation price + pool price) per dispatched MW Receive the pool price for the real power provided
Regulating Reserves	No payment for contracted standby reserves Participant may still participate in the energy market	Receive the uniform indexed activation price (activation price + pool price) per dispatched MW Receive the pool price for the real power provided	N/A

**Option 2 – Single-part offers with only a premium price**

Participants submit a single-part offer to Watt-Ex, containing a volume and a premium price. Participants do not submit an activation price. The premium price of the highest accepted offer will set the uniform premium price for all accepted offers. Standby reserve providers whose offers are accepted will be contracted to provide standby reserves.

Contracted standby reserve providers will participate in the energy market as they do today and will earn the uniform premium price. There will no longer be a merit order for dispatches, as there is no activation price submitted. Instead, the AESO will dispatch based on a rotation such that all providers have a similar rate of activation. If a provider is dispatched, they will continue to earn the premium payment. They will also earn the prevailing active reserve price. For example, if a standby provider is dispatched for spinning reserves during the on-peak time block, that provider will earn the active price index for on-peak spinning reserves plus the energy pool price. For standby regulating reserve volumes dispatched during a super peak time block, the prevailing price will be the higher of the two block prices.

Reserve Type	Payment		
	Contracted	Dispatched	Directed
Contingency Reserves (Spinning & Supplemental)	Receive the uniform premium per contracted MW during the relevant time block Participant may still participate in the energy market	Continue receiving the uniform premium per contracted MW Receive the prevailing active reserve price (equilibrium price + pool price) per dispatched MW	Continue receiving the uniform premium per contracted MW Continue receiving the prevailing active reserve price (equilibrium price + pool price) per dispatched MW Receive the pool price for the real power provided

Reserve Type	Payment		
	Contracted	Dispatched	Directed
Regulating Reserves	Receive the uniform premium per contracted MW during the relevant time block Participant may still participate in the energy market	Continue receiving the uniform premium per contracted MW Receive the prevailing active reserve price (equilibrium price + pool price) per dispatched MW For super peak hours with overlapping blocks, the prevailing active reserve price is the higher of the two block prices Receive the pool price for the real power provided	N/A

***Option 3 – Two-part offers with an indexed activation price***

Participants continue to submit a two-part offer to Watt-Ex, containing a volume, a premium price and an activation price. The activation price will be indexed to the energy price. All other aspects of the pricing framework will remain the same as the current practice described above.

Reserve Type	Payment		
	Contracted	Dispatched	Directed
Contingency Reserves (Spinning & Supplemental)	Receive the pay-as-bid premium per contracted MW during the relevant time block Participant may still participate in the energy market	Continue receiving the pay-as-bid premium per contracted MW Receive the pay-as-bid indexed activation price (activation price + pool price) per dispatched MW	Continue receiving the pay-as-bid premium per contracted MW Continue receiving the pay-as-bid indexed activation price (activation price + pool price) per dispatched MW Receive the pool price for the real power provided
Regulating Reserves	Receive the pay-as-bid premium per contracted MW during the relevant time block Participant may still participate in the energy market	Continue receiving the pay-as-bid premium per contracted MW Receive the pay-as-bid indexed activation price (activation price + pool price) per dispatched MW Receive the pool price for the real power provided	N/A

## Appendix – Illustrative Examples

### Contingency reserves

The following tables outline an illustrative example of providing standby contingency reserves under the following assumptions:

- Spinning reserves (SR) are used for this example, but supplemental reserves (SUP) would use the same pricing structure
- The period is 3 hours from HE 10-12 inclusive and is therefore entirely within the on peak block
- The asset is 50 MW and, when not dispatched for SR, is fully dispatched in the energy market
- The pool price remains the same throughout this period at \$50/MWh
- The participant contracted day ahead to provide 20 MW of standby on peak SR
- The asset is dispatched to provide SR for HE 11 & HE 12
- A contingency occurs and the asset is directed to provide real power from its SR volume for the entirety of HE 12
- The relevant pricing components will depend on the pricing option:
  - Current pricing framework (pay-as-bid):
    - Premium price offer: \$2/MWh
    - Activation price offer: \$30/MWh
  - Option 1 – Single-part offers with only an activation price (uniform):
    - Indexed activation price: -\$20/MWh
  - Option 2 – Single-part offers with only a premium price (uniform):
    - Premium price: \$2/MWh
    - On peak active SR price: -\$20/MWh
  - Option 3 – Two-part offers with an indexed activation price (pay-as-bid):
    - Premium price offer: \$2/MWh
    - Indexed activation price offer: -\$20/MWh

Hour Ending	Energy Market Dispatch (MW)	Standby SR Contracted (MW)	Standby SR Dispatched (MW)	Standby SR Directed (MW)
10	50	20	0	0
11	30	20	20	0
12	30	20	20	20

Hour Ending	Payment			
	Current pricing mechanism	Option 1 (activation offer)	Option 2 (premium offer)	Option 3 (two-part pricing with index)
10	Energy volume * pool price + contracted volume * premium price	Energy volume * pool price	Energy volume * pool price + contracted volume * premium price	Energy volume * pool price + contracted volume * premium price
	50 MWh * \$50/MWh + 20	50 MWh * \$50/MWh = <b>\$2,500</b>	50 MWh * \$50/MWh + 20	50 MWh * \$50/MWh + 20

Hour Ending	Payment			
	Current pricing mechanism	Option 1 (activation offer)	Option 2 (premium offer)	Option 3 (two-part pricing with index)
	MWh * \$2/MWh = <b>\$2,540</b>		MWh * \$2/MWh = <b>\$2,540</b>	MWh * \$2/MWh = <b>\$2,540</b>
11	Energy volume * pool price + contracted volume * premium price + dispatched volume * activation price	Energy volume * pool price + dispatched volume * (activation price + pool price)	Energy volume * pool price + contracted volume * premium price + dispatched volume * (active SR price + pool price)	Energy volume * pool price + contracted volume * premium price + dispatched volume * (activation price + pool price)
	30 MWh * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * \$30/MWh = <b>\$2,140</b>	30 MWh * \$50/MWh + 20 MWh * (-\$20/MWh + \$50/MWh) = <b>\$2,100</b>	30 MWh * \$50/MWh + 20 MWh * \$2/MWh + (-\$20/MWh + \$50/MWh) = <b>\$2,140</b>	30 MWh * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * (-\$20/MWh + \$50/MWh) = <b>\$2,140</b>
12	Energy volume * pool price + contracted volume * premium price + dispatched volume * activation price	Energy volume * pool price + dispatched volume * (activation price + pool price)	Energy volume * pool price + contracted volume * premium price + dispatched volume * (active SR price + pool price)	Energy volume * pool price + contracted volume * premium price + dispatched volume * (activation price + pool price)
	(30 MWh + 20 MWh) * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * \$30/MWh = <b>\$3,140</b>	(30 MWh + 20 MWh) * \$50/MWh + 20 MWh * (-\$20/MWh + \$50/MWh) = <b>\$3,100</b>	(30 MWh + 20 MWh) * \$50/MWh + 20 MWh * \$2/MWh + (-\$20/MWh + \$50/MWh) = <b>\$3,140</b>	(30 MWh + 20 MWh) * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * (-\$20/MWh + \$50/MWh) = <b>\$3,140</b>

### Regulating Reserves

The following tables outline an illustrative example of providing standby regulating reserves (RR) under the following assumptions:

- The period is 2 hours from HE 10-11 inclusive and is therefore entirely within the on peak block
- The pool price remains the same throughout this period at \$50/MWh
- The participant contracted day ahead to provide 20 MW of standby on peak RR
- The asset is 50 MW and, when not dispatched for RR, is fully dispatched in the energy market
- The asset is dispatched to provide RR for HE 11
- As a result of providing 20 MW of RR in HE 11, the asset produced 10 MWh of energy in addition to its energy market dispatch
- The relevant pricing components will depend on the pricing option:
  - Current pricing framework (pay-as-bid):

- Premium price offer: \$2/MWh
- Activation price offer: \$30/MWh
- Option 1 – Single-part offers with only an activation price (uniform):
  - Indexed activation price: -\$20/MWh
- Option 2 – Single-part offers with only a premium price (uniform):
  - Premium price: \$2/MWh
  - On peak active RR price: -\$20/MWh
- Option 3 – Two-part offers with an indexed activation price (pay-as-bid):
  - Premium price offer: \$2/MWh
  - Indexed activation price offer: -\$20/MWh

Hour Ending	Energy Market Dispatch (MW)	Standby RR Contracted (MW)	Standby RR Dispatched (MW)
10	50	20	0
11	30	20	20

Hour Ending	Current pricing mechanism	Payment		
		Option 1 (activation offer)	Option 2 (premium offer)	Option 3 (two-part pricing with index)
10	Energy volume * pool price + contracted volume * premium price	Energy volume * pool price	Energy volume * pool price + contracted volume * premium price	Energy volume * pool price + contracted volume * premium price
	50 MWh * \$50/MWh + 20 MWh * \$2/MWh = <b>\$2,540</b>	50 MWh * \$50/MWh = <b>\$2,500</b>	50 MWh * \$50/MWh + 20 MWh * \$2/MWh = <b>\$2,540</b>	50 MWh * \$50/MWh + 20 MWh * \$2/MWh = <b>\$2,540</b>
11	Energy volume * pool price + contracted volume * premium price + dispatched volume * activation price	Energy volume * pool price + dispatched volume * activation price	Energy volume * pool price + contracted volume * premium price + dispatched volume * (active SR price + pool price)	Energy volume * pool price + contracted volume * premium price + dispatched volume * (activation price + pool price)
	(30 MWh + 10 MWh) * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * \$30/MWh = <b>\$2,640</b>	(30 MWh + 10 MWh) * \$50/MWh + 20 MWh * \$30/MWh = <b>\$2,600</b>	(30 MWh + 10 MWh) * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * (-\$20/MWh + \$50/MWh) = <b>\$2,640</b>	(30 MWh + 10 MWh) * \$50/MWh + 20 MWh * \$2/MWh + 20 MWh * (-\$20/MWh + \$50/MWh) = <b>\$2,640</b>