



# **AESO Discussion Paper**

## **Operating Reserve Market Improvements**

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October, 2007

## Executive Summary

The Operating Reserves (“OR”) market was designed in 2000 and commenced operation on a Watt-ex platform in 2001, now operated by NGX<sup>1</sup>. Since that time, there have been changes made to the Hydro PPA contract with the Balancing Pool regarding settlement of the trade index, but relatively few other changes have been made to the market. Following the review of the wholesale market structures in 2005, it was recommended that AESO review the OR market to address a number of issues including the complexity of the structure.

The AESO’s review of the current OR market evaluated issues that were raised in light of recent discussions about “Fair, Efficient and Openly Competitive” and pending changes to the energy market. In the AESO’s view, the current OR market is unsustainable due to extensive market design issues. This discussion paper outlines an OR market model that provides for alignment with the pending move of the energy market gate closure to T-2 (two hours before delivery). Further, the proposal addresses design complexity issues.

This paper provides an overview of the current OR design, a summary of the outstanding issues in the OR market and a proposal for an OR market redesign that will address the noted issues. Part of that proposal is to align the OR market with the energy market so that Participants can optimize their offers across assets for the energy and operating reserve products on a similar timeline. It is expected that convergence between the markets will improve efficiency, provide for greater opportunity to optimize assets across energy and reserve products, reduce errors associated with forecast and remove the AESO as the single buyer. Additionally, as is outlined below, the paper summarizes some proposed changes to the OR products and settlement to address issues related to price signals in the market.

In order to implement any future OR design change, AESO IT system changes are required. The extent of system changes at AESO will be a function of the final design. Given that there may be opportunities for more immediate change to the OR market on the current NGX trading platform, the paper outlines design steps that could be implemented as a first phase in parallel with work on the complete OR market design. Any changes in the short term would need to be consistent with the vision for the OR market aligned with the T-2 energy timeline. This is discussed below.

The AESO welcomes feedback on the design concept as well as questions and comments on design elements and possible implementation options. Further detailed design work will follow industry consultation likely through the establishment of an industry steering committee.

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<sup>1</sup> The OR market was originally traded on the Watt Exchange (Watt-ex). In 2006, the Watt-ex platform was acquired by NGX and the OR market continues to trade on that platform. This platform will be referred to as NGX throughout this paper.

## 1.0 Introduction:

On June 6, 2005, the Alberta Department of Energy released the electricity market policy paper entitled, “Alberta’s Electricity Policy Framework: Competitive – Reliable – Sustainable”. The paper was the result of discussions and consultations led by the DOE involving stakeholders, the AESO and the other implementing agencies.

The Policy Framework identified a number of issues inherent in the current operating reserve (“OR”) market and identified some design options<sup>2</sup>. These include:

- 1) The impact of the Hydro PPA and Notional Reserve Quantities Agreement between the Balancing Pool and TransAlta Utilities<sup>3</sup>;
- 2) Complexity of the current structure relative to the size of the market and transparency issues that may create forecast errors and allocation inefficiencies between products and markets;
- 3) the single buyer design; and
- 4) examination of opportunities for self procurement.

The policy paper went on to make the following recommendation regarding the OR market:

- “Based on mixed stakeholder comments and in keeping with the approach taken with respect to the energy market (i.e. incremental refinements to current market design), the Department recommends taking a similar approach to changes in the operating reserve market design. While the Department supports in principle the concept of a design with multiple buyers and sellers, by allowing the self-procurement of operating reserve by loads, the Department recommends that the ISO continue to work with stakeholders to determine the desirability of this option.”<sup>4</sup>
- “There is general consensus that while the current operating reserves market employs complex mechanisms in relation to the size of that market, they are not considered barriers to participating in this market. This issue may require review of the operating reserve market design, depending on opportunities or challenges resulting from energy market design refinements.”<sup>5</sup>

In more recent discussions and consultations that the AESO has been involved in with stakeholders and other implementing agencies, there has been a focus on

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<sup>2</sup> The Operating Reserve market refers to a trading platform for spinning, supplemental and regulating reserves. It does not refer to other ancillary services.

<sup>3</sup> The DOE policy considers this item to be addressed based on the new agreement that came into effect of August 1 2004 addressing concerns identified in the MSA January 2004 Spinning Reserve Market Event Report. See Page 35. However, there may remain some issues related to the Hydro PPA and its relation to the OR market that warrant further consideration.

<sup>4</sup> Page 36, DOE Market Policy.

<sup>5</sup> Page 35-36, DOE Market Policy.

Section 5 and 6 of the Electric Utilities Act (the “EUA”) and how they relate to the energy and OR market.

In the AESO’s evaluation of the current OR market and consideration of OR market improvements, the AESO has paid particular attention to the sections of the EUA outlined below:

- Section 5(c) – “to provide for rules so that an efficient market for electricity based on fair and open competition can develop in which neither the market nor the structure of the Alberta electric industry is distorted by unfair advantages of government-owned participants or any other participant”;
- Section 5(h) – “to provide for a framework so that the Alberta electric industry can, where necessary, be effectively regulated in a manner that minimizes the cost of regulation and provides incentives for efficiency”;
- Section 6 – “Market participants are to conduct themselves in a manner that supports the fair, efficient and openly competitive operation of the market.”

In light of the recent discussions and consultations regarding Section 5 and 6 and the issues inherent in the current market (as pointed out in the 2005 market policy paper), this paper provides a brief overview and evaluation of the OR market as well as a detailed discussion and proposal for OR market improvements.

## **2.0 Background:**

The current design of the OR market is a result of extensive consultation at the opening of the energy market. On July 26, 2000 the then Transmission Administrator (the “TA”) issued a paper entitled “The Acquisition of Ancillary Services in 2001 and Beyond”. This paper outlined the TA’s and other stakeholders views on the procurement principles that were considered when the existing OR market was put in place in 2001. The first principle that this paper outlined was reliability at minimum cost. This principle is significant in the market design as the ability to reduce system ancillary services costs resulted in additional remuneration for the TA<sup>6</sup>.

The AESO is mandated with a very different responsibility and while obligated to physically secure OR and to make prudent financial arrangements, it is not financially motivated to procure AS at a minimum cost. Additionally, the focus of the market has changed and this is reflected in the AESO’s mandate for providing rules so that a fair, open and efficient market can exist; provide a framework so that the electric industry can, where necessary be effectively

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<sup>6</sup> The design of the market structure at that time was a “for profit” TA separate from the “not for profit” Power Pool. In the “for profit” model, the TA was financially incented to reduce transmission and associated costs.

regulated in a manner that minimizes the cost of regulation and provides incentives for efficiency; and allow for market participants to conduct themselves in a manner that supports the fair, efficient and openly competitive operation of the market.

## **2.1 Current Operating Reserve Market Design:**

Operating reserve products are traded through a market as it was viewed that these products were contestable and a market would create the opportunity for a number of players to sell OR to the AESO. Unlike in other jurisdictions wherein OR products are taken from the energy market in a co-optimization dispatch with energy, it was viewed that a separate OR market would allow participants to individually value the products.

The design of the existing OR market was implemented in the middle of 2001 and has operated without any material changes since then. Under the existing design, most OR requirements are purchased within a five day window before real time<sup>7</sup>, with trades completed no later than a business day in advance of delivery, reflecting the AESO's obligation to secure OR prior to each day's operations of the energy market. For example, the operating reserve requirements for Tuesday are purchased no later than the end of Monday's trading session. Requirements for Saturday, Sunday and Monday are purchased no later than end of Friday. The main reason the AESO procures volume over five days is to protect itself from being cornered on the last day as the sole buyer.

The OR market was designed as a day ahead market to align with an energy market that required bids to be submitted by noon day ahead. Given that energy offers were required to reflect forward delivery obligations, the ancillary services market was designed to close before this timeline.

Additionally, it was viewed that the AESO did not need to run any market that a third party could facilitate. Instead, the AESO could dispatch resulting contracts and settle accordingly. As such, the market was designed to transact on NGX, a common trading platform. This provides transparency and anonymity to market deals.

### **2.1.1 Products:**

From a technical perspective, there are currently three types of operating reserve products: regulating, spinning and supplemental reserves. The technical requirements for each of these services can be found by following the link below:

<http://www.aeso.ca/gridoperations/5135.html>

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<sup>7</sup> The AESO may also enter into term contracts within or prior to this five day trading window. An example of a term deals includes transacting for the balance of the month.

The regulating reserve requirement typically ranges from 110 to 225 MW over the day. The overall contingency reserve (spinning & supplemental) requirements are dictated by WECC and are based on numerous system conditions at any point in time. In general, Alberta must carry contingency reserves sufficient to offset the greater of Alberta's single largest contingency or the "five and seven rule" – 5% of on-line hydro and wind generation plus 7% of the on-line thermal generation less the non-firm load (as non-firm load is the load for which operating reserves are not required). Over the course of a day, the hourly contingency reserve requirement ranges from about 400 MW to 550 MW, of which at least 50% must be spinning reserve. With few exceptions, no one asset can provide more than 80 MW of operating reserves, including reserves being provided on the interties, which act as a single asset. The exceptions to this rule apply in recognition of "facility" attributes (versus asset attributes)<sup>8</sup> or to the hydro river system.<sup>9</sup>

Instead of operating reserves taken from the energy market merit order, the market design envisioned the trade of "active" products (that were forecast to be required for the delivery hours), and "stand by" products (that may be called upon occasionally). In the current design, the AESO procures both active and standby reserves for each of the three OR products. Standby OR requirements are established by the AESO to guard against situations where there are insufficient active OR volumes to satisfy our WECC requirements.

AESO Operations Planning group uses past experience and trends to forecast required OR volumes for the upcoming period and communicates these requirements to the AESO's Commercial Group. The Commercial group then buys the forecast volumes to ensure there are sufficient reserves to meet requirements. There could be insufficient active volumes if the AESO incorrectly forecasts its active OR requirements or if an active OR provider is unable or unwilling to provide the contracted service due to generation or transmission problems. Contracting for standby OR mitigates the number of occasions the AESO has to conscript OR in order to meet its requirements.

On NGX, active regulating, spinning and supplemental are transacted as either off-peak (7 days a week, HE1 through HE7, and HE24) or on-peak blocks. On NGX, standby OR are also transacted as either off-peak or on-peak blocks. Most of the active and standby volume requirements are transacted between D-1 and D-5.

### **2.1.2 Market Pricing:**

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<sup>8</sup> An example is at Joffre which has 3 units, that subject to transmission constraints, can act as more than one asset.

<sup>9</sup> Prior to the development of a market, the hydro system was counted as a number of assets aligned on a river system. These designations were grandfathered when the market opened thereby allowing hydro to provide more than 80 MW.

Almost all active OR transactions are indexed to pool price to reflect the market opportunity cost of providing OR instead of energy. Occasionally the AESO enters into arrangements for active reserves at a fixed price through an OTC trade.

The prices on NGX are set daily by the equilibrium of bids and offers. Using active on-peak regulating reserve for delivery on day x as an example; the AESO could procure volumes for this product for up to 5 business days prior to delivery, and there would potentially be a different equilibrium price set on each of these days.

An equilibrium price for each active OR product is calculated each day. The equilibrium price is determined by calculating the mid-point between the lowest bid and highest offer which cross. The trade index is the volume weighted average price paid for all OR volumes procured for the delivery hour. An example is provided below:

<b>Bid (volume, price)</b>	<b>Offer (volume, price)</b>
100MW @ PP-16	25MW @ PP-25
	55MW @ PP-18
	45MW @ PP-2

Equilibrium price = PP-17  
80MW transacted

In the example above, the AESO required 100 MWs, but only procured 80MW. Occasionally, the AESO does not procure all of its required volume, yet there is outstanding Bid and Offer volume posted.

Standby OR transactions have a premium (take or pay) and an activation price (\$/MW). Both the premium and activation are fixed prices. Further, standby OR's do not use equilibrium pricing as set out above. Instead, a pick system is used. The AESO posts its bids for each of the standby products, with the required volume, premium price and an activation price. In the event that a seller wants to trade at the premium and activation price, it may pick how much volume it wishes to sell, and a transaction is then complete. The opposite is also true, in that if the AESO wants to trade at a seller's premium and activation price, it too may pick how much volume it wishes to purchase, up to the volume offered.

Over the counter trades are discussed below. The pricing for these products often align with NGX, but they may also be specialized to reflect the terms of trade.

### **2.1.3 Market Procurement:**

Active and standby transactions take place either on NGX or over the counter (“OTC”). As the AESO is the only buyer, the majority of purchases are made through the exchange in order to promote transparency.

Each day the AESO ensures all of its D-1 volumes for active and standby are procured. If the AESO does not transact all of the forecasted volume on NGX, it attempts to procure the outstanding volumes over the counter. The AESO emails outstanding requirements to all counterparties that have signed an OTC Agreement. Offers are submitted to the AESO, and the AESO selects the best offers.

The OTC market is utilized to execute non-standard or shaped deals that NGX was not designed to accommodate or to test new product design. Examples include active contracts with fixed prices, term standby contracts, and term active contracts in which the start dates for the deal do not align with the start dates on NGX.

It is typical for the AESO to enter into ten or more OTC transactions on any given day. While the AESO may be able to transact up to 98% of its OR needs on any given day over the exchange, for a number of reasons including offer sizes and activity in trading sessions, the AESO will still require OTC volumes. As an example, the AESO’s forecast for active OR has an hourly profile associated with it and these profile volumes cannot be transacted on NGX with the current product design. Therefore, these requirements must be procured OTC.

### **2.1.4 The Hydro PPA and Notional Reserve Quantities Agreement<sup>10</sup>:**

The Hydro PPA is a financial contract extending to December 2020 between TransAlta and the Balancing Pool which prescribes that in exchange for control of the formerly regulated hydro assets in the new deregulated market, TransAlta maintains a notional obligation<sup>11</sup> to provide OR to the Alberta market. The term ‘notional obligation’ indicates that TransAlta has a financial obligation<sup>12</sup> to the Balancing Pool. The Notional Reserve Quantities Agreement apportions the total OR obligation into the three active OR products and also stipulates that the price

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<sup>10</sup> For further information on the Hydro PPA, refer to the MSA Report, Spinning Reserve Market Event Report, January 23, 2004 from which most of this section is referenced.

<sup>11</sup> This Arrangement fixes the monthly remuneration for the Owner, as set out in Schedule B (the “Fixed Monthly Payment”) of the quantities of Electricity and Reserve, notionally produced by the Hydro Plants, as set out in Schedule C (the “Notional Energy Quantity” and “Notional Reserve Quantity”). Section 2.1 Hydro PPA.

<sup>12</sup> If in any Month the Fixed Monthly Payment is greater than the sum of the Floating Energy Amount and Floating Reserve Amount, the Buyer shall pay to the Owner the difference. If in any Month the sum of the Floating Energy Amount and Floating Reserve Amount is greater than the Fixed Monthly Payment, the Owner shall pay to the Buyer the difference. Section 4.2 Hydro PPA.

basis of any financial payment is to be the Trade Index for the product which is published by NGX.

The design of this arrangement is such that TransAlta would be approximately cash flow neutral if actual reserve volumes provided matched the notional quantities and all volumes transacted at the weighted average equilibrium price. The financial incentives in the Hydro PPA and subsequent Balancing Pool agreement promote strategic bidding behavior by TransAlta to manage their obligations as well as the financial consequences of these actions.

Because the Hydro PPA was designated to settle financially at the market price (or Trade Index), the design of the Index is a key element for both the Balancing Pool and TransAlta, and to the industry as a whole as an indicator of trade values for OR products.

### **2.1.5 Dispatching Operating Reserves:**

At the end of trading on the NGX platform, participants nominate an asset to deliver their OR obligations and this information is provided to the AESO and integrated with OTC transaction prices and volumes to produce an OR merit order that is used for dispatch only. The merit order for OR is dispatched separately from the merit order for energy.

As discussed above, participants must submit their energy offers to ensure they can meet their OR obligations as all of the AESO's contracted active OR are dispatched to meet forecast WECC requirements. Standby OR's are only dispatched if required. In the event the AESO has not dispatched sufficient active OR, as per the WECC requirements, the AESO will dispatch standby OR.

Reasons why the AESO may have insufficient active OR include:

- the AESO's forecast for its active requirements were too low<sup>13</sup>; or
- an active OR provider is unavailable to provide the service.

When a standby provider is dispatched they are paid the previously agreed to activation price. If the AESO needs to dispatch a standby provider, it dispatches the lowest activation priced providers first.

## **2.2 Market Design Issues:**

As noted in the DOE market policy paper and as identified by both AESO and market participants since the development of the market, the OR market is overly complex and burdensome and suffers from a number of outstanding issues which include a sole buyer and pricing issues. This section summarizes the issues existing in the current OR market.

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<sup>13</sup> A forecast error can occur for example if the System Controller requires more regulating reserve than normal due to system operating conditions as per OPP 401.

### **2.2.1 Equilibrium Pricing:**

When the existing market design was implemented in 2001, equilibrium pricing was intended to allow sellers and buyers to enter offers and bids at any time while the trading session was open without being concerned about monitoring the market all day. The bid equilibrium pricing model ensured that a buyer will not pay more than their price or the seller receives less than their offer price if transacted. This pricing mechanism was intended to encourage potential OR providers to participate in the OR market without requiring 7×24 staffing.

Over the last few years it has become clear that the expected benefit of equilibrium pricing has not materialized, and in fact OR participants submit prices seconds before markets close. Further, the market is subject to offers placed strategically to influence the clearing price. Recent examples by Participants see Offers of 1 MW (even though the AESO cannot accept or dispatch 1 MW blocks) likely for the purpose of increasing the non-weighted equilibrium price. When these 1 MW blocks are cancelled due to a buying constraint on the AESO side, the equilibrium price is not recalibrated and accordingly is distorted. Finally, it would be imprudent for the AESO to bid high just to ensure volume was cleared via NGX as this would inflate the clearing price for the entire traded volumes.

One further issue with the equilibrium pricing model is that it creates a “free option” or a no-risk upside for participants given that the OR equilibrium market clears against another equilibrium market – the energy market. Because the OR and energy products are associated, it make sense for the pricing to reflect it. However, the pricing methodology should not create unreasonable settlement options. This is explained further in Section 3.3 below.

### **2.2.2 Perverse Contract Terms:**

In addition to issues related to equilibrium pricing, there are other issues with design incentives inherent in the OR market design.

Insufficient Liquidated Damages: There are incentives for participants to renege on OR obligations as the penalties are not sufficient and the acceptable “reasons” for non-delivery are quite loosely defined. For example, under the NGX and OTC Agreements, if an OR supplier fails to provide the contracted service for reasons other than Force Majeure or Forced Outage, liquidated damages are applicable. Liquidated damages are calculated as the AESO’s incremental replacement cost for one hour. The liquidated damages are calculated in the same manner, regardless of the term of the contract. Regardless if the contract is for one day during the off peak hours (eight hours) or a balance of month on peak contract (up to 496 hours), the liquidated damages are calculated for just one hour. This is an inadequate deterrent to prevent OR providers from renegeing on their OR contract when it makes financial sense to do so. Active offers are somewhat hedged as they are indexed to pool price and accordingly reflect the

lost opportunity to the energy market transaction. In comparison, standby offers have both fixed premium and activation prices. Whenever the pool price is greater than a participant's activation price, the incentive to "price majeure" occurs, for purposes of price incentives. This impacts not only the AESO but also other participants that have sold standby service.

Liberal Force Majeure Options: The Force Majeure definitions used in OR contracts reflect the language in the Power Purchase Agreements. These definitions were structured in such a manner to minimize barriers to entry and to encourage potential OR participants to participate. From a commercial perspective, the Force Majeure definitions are quite generous. This is not typical of other commodity markets such as natural gas.

Claims of Force Majeure are more frequent than originally anticipated, given that the initial intent was to provide protection from unforeseen outages resulting from a significant or catastrophic event. Accordingly, as it pertains to "delivery", the current OR Agreements are not consistent with sections 5c), 5h) or 6) of the EUA related to legitimate business efforts. Given the frequent use of force majeure claims, this raises questions of whether offers to provide OR reflect a supplier's availability. Because offers on the NGX platform are anonymous, the AESO has no ability to limit this behavior through selective procurement practices.

Finally, these issues are even more problematic given that the AESO has an obligation to secure and deliver on OR requirements as part of its WECC criteria. A force majeure event by one participant leads to a standby dispatch being issued to another participant which may result in energy being removed from the energy market. Dispatching OR becomes an increasing issue when participants frequently enact a force majeure. This impacts the market dispatches and the operations of other participants.

### **2.2.3 AESO Influence on Process:**

With the existing design, the AESO, acting as the single buyer, submits a Bid for OR requirements via NGX. While the AESO attempts to procure as much of its requirements as possible in a fair, open and efficient manner, the AESO bid creates a price cap for volumes transacted on NGX. Because of the existing NGX design and how the equilibrium price for active reserves is calculated, if the AESO were to ensure that all active volumes (on and off peak) that could be transacted on NGX were, in fact, transacted on NGX, the AESO's Bid would need to be significantly higher than average trades. This would be to ensure that the AESO's Bid is higher than the highest Offer.

Unfortunately, in an equilibrium clearing market, this extremely high Bid would then be used to calculate the equilibrium price, creating inflated pricing for the market. It would not be prudent on part of the AESO to create inflated prices

solely for the purpose of transacting on NGX. This result is a function of the equilibrium pricing design.

The design of the market should be revisited in order to remove AESO influence on the process, while ensuring fairness, openness and efficiency. The AESO influence on the OR process does not align with sections 5c), 5h) or 6) of the EUA.

A related issue is that with a single buyer of OR, the AESO, by default, procures on behalf of the load customer while OR providers have only one avenue to sell and that is to the AESO. Load customer self-procurement, which creates both multiple sellers and buyers, would also provide options for both the seller and buyer of OR. However, there are a number of issues that have been raised with self procurement which are addressed below. For example, it is argued that OR providers who also have load customers would simply self supply to them as part of an all-in contract deal and not allow other OR providers to competitively sell their products to the load customers. Further, implementing a self supply option increases the complexity.

#### **2.2.4 Market Liquidity on Competing Platforms:**

As mentioned above, for a number of reasons, the AESO procures a portion of its forecast volumes OTC. Suppliers submit offers and the AESO then selects the lowest priced offers. These transactions are at prices that are determined solely by each OTC supplier and are independent of the prices paid on NGX. Splitting the already small OR volumes across these two platforms further lowers the liquidity of the market on each platform. Having competing platforms bifurcates the market and does not align with sections 5c), 5h) or 6 of the EUA. Further, these OTC volumes are not reflected in the Trade Index that is based on market trades.

#### **2.2.5 Transparency of OTC:**

Market participants only have direct visibility of some of the market trades. All NGX transactions are transparent, unlike OTC transactions. OTC is a bi-lateral market. Through a discrete, non transparent process, OTC offers are submitted to the AESO, and the AESO selects the lowest priced offers.

The AESO generates a weekly report outlining the average prices paid by the AESO over the last week, for each OR product, disseminated by on/off peak. This report aggregates all NGX and OTC transactions. OTC transactions do not align well with Section 6 of the EUA as there is a single buyer and the lack of transparency may call into question the openly competitive tenet.

### **2.2.6 Hydro Power Purchase Arrangement:**

The hydro assets are clearly a dominant factor in the OR market with notional obligations defined by their contract. The Hydro PPA maintained the hydro assets with TransAlta for operational reasons, but outlined financial settlement options tied to delivery of amounts of operating reserves to the Alberta market. This Agreement effectively defines TransAlta as the largest supplier of operating reserves and the financial terms effectively leave TransAlta short the market index on any given day. The financial settlement terms (with reliance on the OR market trade index) create an incentive to trade in such a way as to impact the settlement index. This set of incentives was previously identified in a study by the MSA that subsequently resulted in a renegotiation of the Notional Reserve Quantities Agreement.

The net result is that these Hydro PPA notional obligations potentially leave a small amount of residual OR product to be supplied by other market participants unduly influence market prices due to the volumetric obligations of the largest seller.

A key concern is that the financial incentives may result in perverse outcomes that may have a detrimental impact on the OR market functioning properly.

### **2.2.7 Complexity relative to size:**

The historical annual OR market value has been between \$70 and \$185 million dollars per year. Below is a table of AESO OR costs for the last 5 years.

<b>Year</b>	<b>AESO OR cost</b>
2002	\$155M
2003	\$120M
2004	\$70M
2005	\$125M
2006	\$185M

When compared to the energy market which is in excess of \$4 billion, the OR market is less than 5% of the size, yet more complex. The OR market has two trading platforms (NGX and OTC), pricing determined differently within each platform and has the AESO influencing the markets and acting as a market participant.

The complexity of the OR market does not align with sections 5c), 5h) or 6) of the EUA. The complexity impacts the willingness of participants to offer in the market and their ability to offer efficiently. If not addressed, the potential misalignment when the energy market moves to a T-2 design will only serve to increase this complexity as participants would not be able to optimize the asset operations on a similar timeline.

### **3.0 AESO Proposal for OR Market**

Forthcoming changes to the energy market outlined by the market policy and defined by the “Quick Hit” rules will influence the fashion in which participants offer energy into the market. In the existing market structure, generators must make OR commitments a day in advance or earlier, while the energy market will be two hours ahead. This misalignment is unnecessary and will likely result in less than fully efficient results. Locking down OR offers at T-2 would allow OR providers to better assess whether they want to participate in the OR market and how they might want to price their offers. Generators should be able to manage risk better and optimize returns more efficiently under a T-2 scenario for all products: energy, reserves, import, and export. Aligning the OR market with the energy market would allow for more efficient results.

### **3.1 Market Design Proposal**

In light of the issues that have been raised about the existing OR market framework, the AESO proposes a market design change that will provide greater opportunity for convergence between the energy and AS markets as well as address outstanding issues. This design proposal would see the utilization of a merit order for dispatching operating reserves with offer and dispatch criteria that mimic the energy market instead of the current complex forward contracting model.

By having OR sellers submit offers into a merit order for dispatch during the delivery hour, the AESO no longer needs to be a market participant as OR would be dispatched in real time as required. In this model, the AESO becomes the market facilitator. No day ahead forecast would be required, price would be used in establishing the merit order but would not be a factor in dispatch, and the participants would be able to optimize their offers for their asset across a suite of products at a common timeline. This approach would also address a number of the issues with the current system and provide for simplicity. The proposal is further outlined in the following sections.

### **3.2 Proposal – Market Products**

The AESO proposes that a merit order exists for each OR product – regulating, spinning, and supplemental. Though a number of these elements are design details, the AESO would propose to replicate the energy market as close as possible to allow for the greatest efficiencies. For example, participants would submit offers to supply reserves in any number up to seven price / quantity pairs for each product. All blocks that are dispatched act as “active” and any blocks remaining in the merit order effectively act as “standby”, similar to the energy market merit order. Accordingly, there is no need for standby in this design as further reserves would be dispatched by going up the OR merit order for each product – spinning, supplemental and regulating reserve.

It is proposed that offers for operating reserve products will be submitted prior to T-2 in alignment with offers for energy. The AESO is proposing a must offer requirement in the OR market at this time. The must offer for energy could imply that participants should “offer” the full capability of their assets, not just the energy component, so this obligation is consistent with current rules. Under an OR market design that is closely aligned with the energy market, OR providers should be financially motivated to make OR offers as they submit their energy market offers. By submitting their energy and OR offers simultaneously, an OR provider should be able to structure their offers in such a way that they would be financially indifferent between being dispatched in the energy market or the OR market.

It could be argued that the must offer requirement in the energy market makes a must offer requirement in the OR somewhat redundant. However, given the system need for OR, a must offer requirement ensures that sufficient reserves are available and limits the number of times the merit order would be insufficient and the AESO may need to direct a unit to run. Should a unit be directed, the AESO would rely on Article 11 in the AESO tariff for compensation in the event of a shortage<sup>14</sup> in the OR merit order.

Though a number of design details are related, at this early stage it is proposed that the minimum block size available is 5 MW and the maximum per asset is the lesser of asset capability for any product and 80 MWs to reflect current dispatch requirements for OR. For any block, it is proposed that the blocks can be designated as either flexible or inflexible, not unlike the energy market. If this option creates dispatch issues it may need to be reconsidered.

### **3.3 Proposal – Market Pricing**

Due to the issues raised with the equilibrium pricing model, it is proposed that the OR market be changed to a pay as offered market (instead of a clearing market) with all offers submitted as indexed prices to Pool Price. Each element is discussed below.

The pay as offered methodology change addresses the “free option” that exists in the current design. The free option exists in the current design because an equilibrium price in the OR market is settled against another equilibrium price (in the energy market). Since the energy market is already a clearing price market, continuing with a clearing priced market for OR would create a “free option” for participants in that the OR market could settle above a participants offer and then be indexed to the pool price which settles at the marginal unit dispatched. This

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<sup>14</sup> Given the WECC requirements for procuring and restoring contingency reserves, there is no opportunity for the AESO not to dispatch OR. Therefore, to the extent there is insufficient OR offered, it must through an equivalent “Supply Shortfall” procedure, not unlike OPP 801, develop procedures to secure OR services from the energy merit order. Energy shortfall procedures allow for the OR products to be released for energy needs, but until that occurs, the requirements for contingency reserves must be met.

approach would in effect “double the upside” for participants and accordingly is inappropriate. The pay as offered model provides participants certainty regarding the settlement for OR products, reduces complexity and breaks the free option link.

In addition to changing to a pay as offered model, it is proposed that pricing for each OR product be indexed to the energy market. This pricing construct will allow participants to reflect the value of the operating reserve product vis a vis the energy product and create an indifference to providing energy or reserves. This model protects against artificial inflation of market pricing intended to reflect the arbitrage value between markets. The AESO expects that an indexed pricing model will result in greater convergence with the energy market, more efficient asset allocation and less resistance to participation.

While the AESO believes that an indexed pricing model better allows participants to submit offers that stipulate indifference between supplying in the energy and OR markets, an argument can be made for the certainty related to fixed priced offers, especially in returning a contribution to fixed costs. This benefit is traded off against the lost opportunity that is forfeited in a design without an index to the opportunity energy product.

The table below provides an example merit order for an OR product:

<b>Volume</b>	<b>Offer</b>
20 MW	PP + 22
65 MW	PP + 15
30 MW	PP + 7
55 MW	PP + 5
25 MW	PP - 5
100 MW	PP - 20

For purposes of this example, the offers are listed with the cheapest providers at the bottom. The AESO requires 210 MW, therefore, the shaded offers are required. The in merit providers will be paid as per their offers. In addition, the assets will be paid Pool Price or clearing price for energy delivered in the energy market.

An OR provider’s ability to indicate a preference for each product would be accomplished by their offer prices. It is proposed that the OR provider may determine whether their OR offers are flexible or not. By way of an example, if the SC’s marginal requirement is 20MW and the next OR offer is inflexible and is for 30MW, the SC will keep going up the OR merit order until 20MW can be dispatched. Consistent with the energy market design, the OR market merit order will be dispatched based on the participant offers without consideration for a “co-optimized” solution across energy and operating reserve offers. Undispatched inflexible blocks will move to the top of the merit order following dispatch and will be used in event of incremental OR needs.

Given that a residual energy product – reserves – should not normally trade at a higher price than the primary product – energy – and given that the energy market has a price cap, it seems logical that the operating reserve market prices will also be capped at the energy price. To be clear, submitted offers may indicate a premium over pool price (i.e., PP+10); however, the resultant settlement price will be limited by the energy market cap of \$999.99 (i.e., hourly settlement at less of price cap and offer). Having an OR price that is completely unbounded would be inconsistent with the principles that establish a price cap in the energy market. The AESO recognizes that the current OR market has traded without a cap; however, in a redesign this consideration should be addressed given the linkages between the energy and OR markets.<sup>15</sup>

Finally, for market transparency, a daily market index will be published.

### **3.4 Proposal: Market Procurement & Dispatch:**

In this proposal, the AESO does not “procure” OR. Instead, OR as required would be dispatched from the OR merit orders. Conceptually, the OR merit orders could be dispatched instantaneously just as the energy market is dispatched. However, in the detailed design stage, the AESO needs to evaluate the tradeoffs in efficiency versus complexity of dispatching AS in time blocks – hourly or 15 minutes – versus dispatching instantaneously, especially given that assets need to position themselves to provide the service.

In terms of merit order coordination, given that the energy and operating reserve offers would be locked down and available to the System Controller at T-2, it is proposed that a pre-schedule for all products (energy and OR) can be determined before the delivery hour with consideration for the least flexible product first, followed by the most flexible. For example, assuming the OR products remain as hourly products; they will be less flexible than energy. In this scenario, a pre-schedule will be determined for regulating, spinning and supplemental reserves for the next hour, followed by associated energy market dispatches. In this pre-scheduling phase, a dispatch will be given at 15 minutes to the hour for the start of the hour, a corresponding adjustment is made to the energy offers to reflect the committed capacity. However, should the subsequent energy market dispatch not result in sufficient availability for an operating reserve product, the OR offer would be deemed “ineligible<sup>16</sup>” and would not receive a dispatch at the top of the hour. This “eligibility” criteria would also be used during the hour should OR be required.

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<sup>15</sup> Given that most operating reserve products are capacity derivatives of energy, the price cap for energy should apply to reserves. The AESO welcomes comments on whether this “rule” applies to regulating reserve and whether the combination of energy and operating reserve revenues is artificially limited by this “rule”.

<sup>16</sup> Eligibility will be measured as positioned appropriately in the energy market to allow the asset to deliver OR as offered and dispatched.

It should be noted that the proposed pre-dispatch protocol is not a “co-optimized” dispatch model<sup>17</sup> and that while pre-dispatching is planned by 15 minutes before the hour, the dispatches will be effective at the top of the hour. Regardless of the sequence and timing, the model will be based on a Participant optimized model using submitted offers only, not asset characteristics. This approach is consistent with current energy market design and current market policy. It is proposed that dispatching the OR market products first in the pre-schedule phase allows for an energy market price that reflects resultant energy market conditions once OR requirements have been scheduled. This approach also strikes a balance between simplicity and efficiency and also represents the process followed today.

It is proposed that a new OR merit order will be utilized at the top of each hour. That is, OR offers will be valid for each hour. As an OR provider is dispatched in one merit order, their offers from the same facility in subsequent merit order(s) will be adjusted so that the total dispatched volume will never exceed the suppliers maximum reserve capability. Asset eligibility analysis may need to be built into the system software depending on the specifications of the detailed design.

With the proposed changes to the OR market, participants will not know their OR dispatches in advance of their energy market offers and accordingly may not be able to reflect the OR technical requirements offered as part of their energy offers. Therefore, if a regulating or spinning provider is dispatched or directed by the SC, it will be an Acceptable Operating Requirement for a restatement under the energy market rules to reposition the unit in the energy market to provide OR.

Undispatched offers in the OR merit orders will continue to be marked as eligible or ineligible and will be moved to the top of the dispatched stack in order with lowest price at the bottom, ready for dispatch should additional OR be required. It should be noted, that for simplicity sake, it is not proposed that a variable redispatch occur during real time to adjust for changes in the energy market that may make lower priced OR offers eligible that were previously ineligible. While a redispatching solution would result in the most efficient solution, the complexity required for an instantaneous redispatch is not warranted.

### **3.5 Other considerations**

#### **3.5.1 Proposal and Self Supply**

The DOE Electricity Policy Framework paper of June 2005 proposed that the AESO consult with participants about interest in facilitating self procurement of

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<sup>17</sup> The approach used in most markets is a “co-optimized” approach such that day ahead, offers for energy and ancillary services are coordinated to with consideration to asset capabilities and the overall most efficient, least cost approach. The DOE market policy indicates that this solution should not be considered as a first alternative and accordingly the AESO is not recommending a co-optimization model at this time.

OR by loads. The direction resulted from suggestions that self supply could create more buyers and address issues related to the AESO acting as the single buyer. While the current model stipulates that the AESO is the single buyer and that loads must pay the resulting price, the option for loads to financially self supply exists by way of financial arrangements even in the current model. Just as energy market participants have financial arrangements in place for energy, similar arrangements could exist for OR.

The proposed redesign removes the AESO as the buyer and instead the merit order is dispatched to meet system needs. In the proposed design, while the key reason for the debate on self supply is addressed – that is the AESO as the sole buyer – loads can continue to make financial arrangements for OR, while relying on physical delivery and dispatch through the AESO.

The AESO does not recognize any impediments in the proposed design that would limit the ability of a load to continue to financially self supply or hedge their OR costs. Also, the AESO does not expect that a generator is limited in the design proposal from submitting reserve “offers” from contracted assets to reflect any forward sale of OR to a load. Both of these would fulfill the option for loads to self supply without reintroducing the AESO into the mix as the residual default buyer.

### **3.5.2 Proposal and Interties**

It is not anticipated that the market design proposal would change the way in which interties can participate in the market. Technical requirements including the need to limit any asset to 80 MWs of OR would remain in place recognizing the acceptable exceptions to this rule. For the intertie, the 80 MW limitation would be on the intertie as a whole. This proposal should make it easier for interties to make OR available to the Alberta market closer to real time while making arrangements for energy offers.

### **3.5.3 Proposal and Asset Substitution**

It is proposed that as the AESO OR market moves closer to real time that the need for asset substitution is lessened. Industry and AESO will need to consider the tradeoff in efficiency and complexity in continuing to allow asset substitution within a T-2 hour window.

It is proposed that a participant will have the ability to reposition an asset with a restatement to meet an OR dispatch.

## **4.0 Policy Coherence:**

The AESO proposal for the OR market is consistent with DOE policy on a number of fronts. While the AESO was asked to explore a number of issues

related to complexity and self supply, the proposal also addresses other design issues inherent in the market. This proposal as a whole remains consistent with market policy as it:

- is aligned with the Energy Only Market design
- provides competitive settlement of OR products
- provides for participant optimization
- identifies changes to current structure that could be incrementally phased in.

## **5.0 Implementation: Project Plan:**

Given the scope of changes outlined above and further given the system changes required to accommodate these design proposals, the AESO proposes that consultation on future design changes be handled with the guidance of a steering committee. Further, the AESO notes that there may be opportunities for more immediate design changes to the OR market on the current NGX trading platform that maintain the current IT systems<sup>18</sup> can be achieved using the current merit order development in concert with changes to contract terms for trade. Accordingly, the AESO proposes that changes to the OR market may best be handled in two distinct phases.

Phase I would include immediate changes to the contract terms and possibly the trading rules to address issues outlined while continuing trading on the NGX platform and may include the following design changes intended to address pressing issues outlined in section 2.2. Some design considerations that may make sense for early implementation include:

- an auction format could address concerns related to the AESO single buyer issue by removing the need for the AESO to “bid” in the market;
- introduction of an hourly shaped product to reduce the need for OTC contracts and in turn improve the value of the trade index to reflect total market trades;
- adjustments to the current pricing methodologies including pay as offered, indexed pricing and market settlement cap all intended to improve the market price signals and align with the energy market; and
- restructuring of standby product to align with new auction format.

Given that changes are required to address pressing OR market issues, Phase I changes can be targeted for possible 2008 implementation.

While Phase I is underway, the AESO would work with industry on the complete design rules for the implementation of an aligned merit order at T-2 model and

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<sup>18</sup> Phase I changes can include any elements that maintain the current IT infrastructure between AESO and NGX reflecting the transmittal of a set of merit orders for dispatch and subsequent settlement through NGX of the contract terms. The elements that can be accommodated are subject to further discussions both with industry and NGX.

further design changes to meet the complete OR market vision. Work on the required system changes could commence following design consultation and would likely require two to three years with implementation in 2009 /10.

## **6.0 Conclusion: Proposal and Impact on Market:**

The AESO proposal for OR market redesign addresses the issues with the current design that have been identified over time. The streamlined market design provides for convergence with the energy market and should result in prices that reflect market conditions for both energy and the residual capacity product. Further, the revised design removes the AESO influence as the buyer in the market and instead results in dispatching of required product to meet reliability standards.

It is recognized that any change in market structure will likely lead to changes in participant behavior. For example, the AESO recognizes that the elimination of the standby product will likely change offer behavior of participants in the active market.

It should be noted that the design proposal may impact settlement and delivery under the Hydro PPA<sup>19</sup>. However, given that the market will remain competitive and resulting prices should reflect market dynamics, the change in market design should not undermine the intent of the hydro PPA. The AESO recognizes that this design does not address issues and obligations of the largest seller. Other design options for TransAlta within a redesigned market may lead to efficiencies and should be considered by the Balancing Pool and TransAlta. The table below summarizes the proposed market changes and how the issues are addressed.

In the AESO's proposal, the issues with the current market design are addressed, with design choices striking a balance between simplicity and efficiency. The market redesign proposal continues to leave asset optimization choices in the hands of participants – consistent with the market policy. Participants are required to submit offers for the products available from their asset into the energy and operating reserve markets, and their offers should reflect the corresponding value of these reserve products. It is expected that this less complex design moved closer to real time should aid in market convergence and efficiency. The resulting OR markets should continue to be liquid enough to meet system requirements.

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<sup>19</sup> Given the recent renegotiation of the Trade Index, it is uncertain how the notional quantities agreement has changed. Accordingly, the evaluation of the impact on the Hydro PPA may warrant a confidential session of the AUC or involvement by the Balancing Pool and MSA.

The AESO notes that given the issues associated with the current design that market changes are required. Other markets have addressed these challenges through more complex methods and a dispatch optimization model<sup>20</sup>. This approach is not consistent with the principles of participant optimization inherent in the market policy; however, there would be a number of market issues resolved by this approach. Improvements may also be driven by the need for forecast OR requirements closer to real-time in order to accommodate more intermittent generation.

One other item of note is that the WECC is proposing new criteria to meet the new North America Reliability Council's policies for Frequency Responsive Reserves ("FRR"). FRR would be a replacement for spinning reserves. FRR might mean that the AESO requires less volume but more providers, depending on a unit's frequency response capability. This comes about because the maximum that any one generation facility can provide may be lowered from the current 80MW. Implementation is expected to take place over the next three years. While the timing is still a few years away, any market improvements need to be sufficiently flexible to address the likely possibility of FRR and any other product requirements being implemented (i.e., wind following).

The AESO welcomes feedback from industry participants on the design proposal outlined in whole or in part. A comment matrix is attached for use in submitting feedback.

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<sup>20</sup> The approach used in most markets is a "co-optimized" approach such that day ahead, offers for energy and ancillary services are coordinated to with consideration to asset capabilities and the overall most efficient, least cost approach. The DOE market policy indicates that this solution should not be considered as a first alternative and accordingly the AESO is not recommending a co-optimization model at this time.

Table 1: Overview of Operating Reserves Market – Current and Proposed Design – For Discussion.

<b>Elements</b>	<b>Current Design</b>	<b>Issues</b>	<b>Proposed Design</b>	<b>Issues Addressed</b>
Framework	<ul style="list-style-type: none"> <li>• Daily and term markets</li> <li>• Active and standby products</li> <li>• NGX platform supplemented by OTC</li> <li>• Equilibrium pricing on NGX</li> <li>• Pay as offered OTC</li> <li>• AESO single buyer</li> </ul>	<ul style="list-style-type: none"> <li>• Complex</li> <li>• Not aligned with energy market</li> <li>• AESO as single buyer</li> <li>• Perverse incentives</li> </ul>	<ul style="list-style-type: none"> <li>• T-2 dispatched market aligned with energy market</li> <li>• OR dispatched from merit order</li> <li>• Pay as offered</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce complexity</li> <li>• Eliminate AESO influence</li> </ul>
Products	<ul style="list-style-type: none"> <li>• Day/s Ahead or Term Active, Standby</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient Liquidated Damages</li> <li>• Liberal Force Majeure terms</li> </ul>	<ul style="list-style-type: none"> <li>• Active only, dispatched from merit order.</li> <li>• Compliance on dispatch</li> </ul>	<ul style="list-style-type: none"> <li>• Perverse design incentives addressed</li> </ul>
Pricing	<ul style="list-style-type: none"> <li>• Exchange-traded products entail equilibrium and fixed prices</li> <li>• OTC trades entail pay-as-offered pricing</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Bids, cancelled trades distort the price.</li> <li>• OTC trades not included in market index.</li> <li>• Complexity of indexed and fixed price components</li> </ul>	<ul style="list-style-type: none"> <li>• Pay as offered, indexed to pool price</li> <li>• Hourly published price for index</li> <li>• Timing alignment provides opportunity for participant optimization close to delivery</li> </ul>	<ul style="list-style-type: none"> <li>• Delinks free option.</li> <li>• Hourly settlement price transparent</li> </ul>
Procurement	<ul style="list-style-type: none"> <li>• In advance by AESO</li> </ul>	<ul style="list-style-type: none"> <li>• Inefficiency due to forecast errors</li> <li>• AESO is single buyer</li> <li>• AESO bid becomes price cap in clearing market, with OTC option available</li> <li>• Timing misalignment</li> </ul>	<ul style="list-style-type: none"> <li>• By product as required to meet WECC requirements</li> <li>• Procurement replaced with dispatch.</li> </ul>	<ul style="list-style-type: none"> <li>• AESO influence removed – dispatch instead of procurement</li> <li>• No OTC required</li> <li>• Hydro PPA submits offers as other generators</li> </ul>

		with movement of energy market to T-2.		would
Dispatch	<ul style="list-style-type: none"> <li>• All active dispatched</li> <li>• Standby on call as required</li> </ul>	<ul style="list-style-type: none"> <li>• Energy offers must reflect OR obligations in advance. Issues with asset substitution</li> </ul>	<ul style="list-style-type: none"> <li>• Dispatched at top of hour as required. Consider 15 minute or 1 hour dispatch versus instantaneous</li> </ul>	<ul style="list-style-type: none"> <li>• Compliance easier to monitor</li> <li>• Aligned with energy market</li> </ul>