



AESO Discussion Paper

Operating Reserve Market Redesign Concepts

December, 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 NGX¹. Since that time, there have been changes made to the Hydro PPA notional quantities 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 by markets participants over the years as well as 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. The issues in the OR market have been summarized in an October discussion paper – Operating Reserves Market Issues and Project Plan (“Issues Paper”) and will be further considered at the pending working group meetings. This discussion paper outlines an OR market concept that provides for alignment with the pending move of the energy market gate closure to T-2 (two hours before delivery). Further, the concept addresses design complexity issues addressed in the issues paper and summarized below. The AESO proposes this design option as a starting point in design discussions and welcomes dialogue from industry about other design alternatives.

This paper provides a summary of the outstanding issues in the OR market and a conceptual design option for an OR market that will address the noted issues. Part of that concept 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 should be consistent with the longer term vision for the OR market. This is discussed below.

¹ 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.

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

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 options². These include:

- 1) The impact of the Hydro PPA and Notional Reserve Quantities Agreement between the Balancing Pool and TransAlta Utilities³;
- 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.”⁴
- “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

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

³ 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.

⁴ Page 36, DOE Market Policy.

review of the operating reserve market design, depending on opportunities or challenges resulting from energy market design refinements.”⁵

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 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, noting that other design alternatives may warrant consideration by the stakeholder working group.

2.0 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 as were explained in issues paper and will be further explained as part of the working group.

- The AESO as a single buyer exerts significant influence on the market results. The dual mandate of the AESO to act as market designers and market buyer has carried issues for many. While many of these dueling mandates have been addressed through governance and transparency,

⁵ Page 35-36, DOE Market Policy.

many inconsistencies stakeholders and the AESO see between the existing market design and sections of the Electric Utilities Act, in particular sections 5 and 6 have not been addressed.

- There have been some issues of market liquidity partly due to the competing platforms, lack of transparency with OTC trades and also due to the significance of the hydro PPA as the seller.
- The OR market design remains quite complex especially for the size of the market. The technical requirements for OR will likely create a degree of complexity that is absent in the energy market.
- The equilibrium pricing model in concert with indexed pricing creates a “free option” for OR offers. This exists because an equilibrium market is indexed to another equilibrium market providing for double the upside. It is recognized that changing the pricing design will change offer behaviour; however an alternative design model warrants consideration.
- There are some perverse contract terms in the OR contracts including liberal liquidated damages and force majeure terms. Some of the contract design terms were adopted from PPA’s. While changing the terms needs to ensure that unintended consequences will not result, it is important to examine whether the contract terms cause risk of non delivery and harm to other participants.

3.0 AESO Design Concepts for OR Market

To address the issues inherent in the current OR Market, the AESO proposes to work with industry on this complex issue to identify and advance design options.

As a starting point, the AESO has outlined a design concept for discussion. The concept outlined is premised on achieving convergence between the pending energy market design and OR structure. This conceptual design model represents one view of a long term vision for the OR market. While it is noted that many Eastern FERC markets use a co-optimization model to secure OR products, that model is not consistent with the current energy market policy and as noted by the Department of Energy should not be considered as a first option. The conceptual model that the AESO has forwarded outlines an attempt at convergence of the energy and OR markets by Participant optimization of assets with AESO maintaining its mandate of reliability and markets. As a short term option, the AESO would like to examine changes to the contract terms while continuing to use the the current NGX platform to address market issues. Some of these are noted below.

As noted , the design model outlined is intended to be a starting point in discussions. The AESO recognizes that there are a number of design alternatives that warrant consideration as part of the working group. Given the complexity of the design, it was viewed that a holistic design alternative would be effective for discussions. The detail of the design presented does not reflect any

preconceived decision by AESO on final OR design. Rather, the model outlined is presented in some level of detail so that discussions can occur about how any particular design feature may be different than today's market. Further detailed design is required but is premature pending the outcome of the design working group.

Recent changes to the energy market means generators make OR commitments a day in advance or earlier, while the energy market is 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.

In light of the issues that have been raised concerning the existing OR market framework, the AESO outlines a set of market design concepts that may provide greater opportunity for convergence between the energy and AS markets. This design concept 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 an active buyer as OR would be dispatched in real time as required. In this model, the AESO becomes the market facilitator. A more real time forecast, not 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. An overview of this concept is outlined in the following sections.

3.1 Market Products

As a design alternative to the current OR market, the AESO has considered a design that is consistent with the energy market whereby participants submit offers to supply reserves which would be stacked into a merit order. Conceptually, a participant could offer seven price / quantity pairs for each OR product – regulating, spinning and supplemental, reflecting the technical capability of their assets. 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 a separate standby product in this design as further reserves would be dispatched by going up the OR merit order for each product – regulating, spinning, and supplemental.

In this concept, offers for operating reserve products would be submitted at the same time as offers for energy. 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. A must offer requirement for OR is nonetheless contemplated to ensure that all of a generator's offers (energy and OR) represents the full technical capability of an asset and 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 shortage⁶ in the OR merit order.

Though a number of design details are related, it is envisioned that the block size submitted would be limited to a minimum of 5 MW and a maximum of the supplier's maximum reserve capacity. Blocks can be designated as either flexible or inflexible, like the energy market. If this option creates dispatch issues it may need to be reconsidered.

3.2 Market Pricing

Due to the issues raised with the equilibrium pricing model, the OR market could be changed to a pay as offered market (instead of a clearing market) with all offers indexed to Pool Price. Each element is discussed below. Again, it is noted that the design proposed for the changes to the pricing structure is an opener for discussions with the working group.

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 participant's offer and then be indexed to the pool price which settles at the marginal unit dispatched. This approach would in effect "double the upside" for participants and accordingly is inappropriate. The pay as offered model provides participants certainty regarding

⁶ 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.

the settlement for OR products, reduces complexity and breaks the free option link.

In addition to changing to a pay as offered model, the pricing for each OR product could 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 OR market pricing. 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, and should be further considered by the working group.

In order to facilitate full some discussions, an example of how this design proposal could be operationalized is provided. The table below provides an example merit order for an OR product:

Volume	Offer
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 would be paid as per their offers. In addition, the assets would 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. In this concept, 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 20 MW and the next OR offer is inflexible and is for 30 MW, the SC would continue dispatching up the OR merit order until 20 MW can be dispatched. Consistent with the energy market design, the OR market merit order would be dispatched based on the participant offers without consideration for a "co-optimized" solution across energy and operating reserve

offers. Un-dispatched inflexible blocks will move to the top of the merit order following dispatch and will be used in event of incremental OR needs.

As a design concept the AESO needs to consider whether a price cap is required for the OR products or whether it may limit sufficient return for delivery of some products. As one option, given that a residual product or capacity derivative of energy – 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 should also be capped at the energy price. To be clear, conceptually submitted offers could indicate a premium over pool price (i.e., PP+10); however, the resultant settlement price would 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.⁷

Finally, for market transparency, a daily market index should continue to be published.

3.3 Market Procurement & Dispatch

In the concept outlined, 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. For consideration of the working group an overview of how a merit order for OR could be dispatched with energy is outlined.

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 possible 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 would 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 would be given at 15 minutes to the hour

⁷ 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”.

for the start of the hour, a corresponding adjustment is made to the energy⁸ offers to reflect the committed capacity. However, should the subsequent planned energy market dispatch not result in sufficient availability for an operating reserve product, the OR offer would be deemed “ineligible⁹” 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. The AESO believes participants at T-2 should be able to offer their assets for OR and energy. Moving OR from day ahead to T-2 would better ensure that the merit order reflects offers that are physically available for delivery.

It should be noted that the pre-dispatch concept outlined is not a “co-optimized” dispatch model¹⁰ 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. 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 strikes a balance between simplicity and efficiency and also represents the process followed today.

Conceptually, a new OR merit order would be utilized at the top of each hour. That is, OR offers would 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, while participants can submit the offers in combination to reflect positioning of their assets for both energy and OR, it is recognized that participants will not know their OR dispatches in advance of their energy market offers and accordingly may not be dispatched 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 would be an Acceptable Operating Requirement for a restatement under the energy market rules to reposition the unit in the energy market to provide OR.

⁸ Energy including imports would be considered in the pre-dispatch schedule. Imports and exports would continue to be dispatched prior to the hour to coincide with current tagging and dispatch rules with other control areas.

⁹ Eligibility will be measured as positioned appropriately in the energy market to allow the asset to deliver OR as offered and dispatched.

¹⁰ 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.

In this concept, un-dispatched 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 re-dispatch occur during real time to adjust for changes in the energy market that may make lower priced OR offers eligible. While a re-dispatching solution would result in the most efficient solution, the complexity required for an instantaneous re-dispatch is not warranted.

3.4 Other Considerations

3.4.1 Proposal and Self Supply

The DOE Electricity Policy Framework paper of June 2005 proposed that the AESO consult with participants to determine interest in facilitating self procurement of 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 in the current model. Just as energy market participants have financial arrangements in place for energy, similar arrangements could exist for OR.

The design concept outlined in this paper removes the AESO as the buyer and instead the merit order is dispatched to meet system needs. The key reason for the debate on self supply is addressed in the design concept and 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 design concept 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. The AESO welcomes design alternatives on this element as part of the working group.

3.4.2 Proposal and Interties

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

3.4.3 Proposal and Asset Substitution

As the AESO OR market moves closer to real time, 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.

In the design concept under consideration, a participant will have the ability to reposition an asset with a restatement to meet an OR dispatch.

4.0 Policy Coherence

The AESO design concept 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 design concept also addresses other design issues inherent in the market. This design concept 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 incremental changes to current structure.

Consideration of design alternatives as part of the working group will need to ensure that the policy coherence remains.

5.0 Implementation: Project Plan

Given the scope of design concept choices 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 working group. As part of the working group, alternative design models will be considered and accordingly it is premature to define a project plan for implementation. 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 systems¹¹ and can be achieved using the current merit order development in concert with changes to contract terms for trade.

To parallel track design implementation on the current platform while considering longer term AESO system changes, it is proposed that industry advance these

¹¹ 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.

discussions in two phases. Phase I could include immediate changes to the contract terms and possibly the trading rules to address issues outlined while continuing trading on the NGX platform. The following design changes intended to address pressing issues may make sense for early implementation and warrant consideration at the working group:

- 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 as well as a market settlement cap are 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 following design specification.

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 and/ or further or alternative 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: Design Concept and Impact on Market

The AESO OR market redesign concepts address the issues with the current design that have been identified over time. The market design concept developed by AESO for early consideration provides for convergence with the energy market and should result in prices that reflect market conditions for both energy and the operating reserve products. Further, the revised design proposal 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 concepts may impact settlement and delivery under the Notional Reserves Quantity Agreement per the Hydro PPA¹². However,

¹² 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

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 concept does not necessarily address issues and obligations of the largest seller. Other design options for TransAlta within a redesigned market may lead to efficiencies and may be considered by the Balancing Pool and TransAlta. The table below summarizes the conceptual market changes and how the issues are addressed. In the AESO's conceptual design, the issues with the current market design are addressed, with design choices striking a balance between simplicity and efficiency. The market redesign concept 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.

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 model¹³; however, this approach is not consistent with the principles of participant optimization inherent in the Alberta market design. 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 concepts outlined in whole or in part and will work through these options in addition to suggestions from industry through the working group.

NGX of the contract terms. The elements that can be accommodated are subject to further discussions both with industry and NGX.

¹³ 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.