

Market Power Mitigation Advice to Minister

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1.0 Advice

1.1 CONTEXT

On July 25, 2019 the Minister of Energy (Minister) advised the Alberta Electric System Operator (AESO) that the Government of Alberta had decided it was in the public interest to remain with the existing energy-only market.¹ In addition, the Minister indicated that, during consultations on this decision, they heard repeated references to concerns with market power and market power mitigation. For this reason, the Minister further advised the AESO to complete a policy review of this particular issue for both the energy and ancillary services markets. This report summarizes the AESO's advice to the Minister on this matter.

The AESO appreciates this timely opportunity to investigate and gather stakeholder feedback on the market power mitigation framework, recognizing that the framework to date has supported an efficient and effective market for Albertans.

1.2 AN EFFICIENT AND EFFECTIVE FRAMEWORK

Market power mitigation in Alberta's energy-only market relies on a policy, legislative and regulatory construct that, in the AESO's view, remains efficient and effective. The AESO is of the view, with respect to this particular aspect of the market framework, that it is likely sufficiently robust to address any future changes that may occur in the market.

In developing the advice that is provided in this report, the AESO was mindful of the period of change and uncertainty that the market has recently experienced, and the benefits that are realized by maintaining a stable, consistent and robust framework with clear roles and expectations for agencies and market participants. The AESO also recognized and considered that, while purposeful regulation provides for a strong and robust market, caution must be exercised to ensure that the framework does not create an undue administrative burden to participants or become overly restrictive. Similarly, the AESO is of the view that stability and certainty of an efficient and effective framework is of greater benefit to the market than a period of continuous change seeking a perfect solution, and thus changes should only be made for clear and compelling reasons.

¹ The letter, addressed to the Board Chair of the AESO, dated July 25, 2019, is attached as Appendix A.

In completing this analysis, the AESO reviewed offer control concentration, the offer behaviour of market participants, and how these two elements have affected both short- and long-term market efficiency measures. In reviewing the outcomes from this analysis, the AESO was guided by the following market efficiency principles:

- **Cost:** Different mitigation frameworks have varying costs associated with their design, implementation, and administration. The incremental benefit of a market power mitigation framework should exceed its cost.
- **Competition:** A mitigation framework should ensure that no participants are given an unfair competitive advantage and that there are no artificial barriers preventing efficient entry and exit.
- **Effective operations:** The mitigation framework should ensure that price signals are allowed to reflect real-time conditions of supply and demand, thereby promoting efficient production and consumption decisions.
- **Public interest:** The mitigation framework should be clear, stable, and transparent. This reduces uncertainty in the market and supports robust competition.

The AESO put out a request for information to seek input from stakeholders regarding market power and market power mitigation in the context of Alberta's energy-only market. The AESO reviewed and considered this stakeholder input in developing the advice provided in this report. In addition, a review of market power mitigation frameworks in other power markets was also undertaken to determine whether there were any best practices that should be considered.

Lastly, the AESO recognizes that market power mitigation is relevant in both the energy and the operating reserve (OR) markets. While related, these markets have different fundamental and economic drivers, and as such, the AESO has provided distinct analysis and advice for these markets when required.

1.3 ADVICE: MAINTAIN THE CURRENT FRAMEWORK

The current market power mitigation framework is expected to remain efficient and effective into the future, and thus the AESO advises the Minister that no policy changes are required to the current mitigation framework embedded in the energy and operating reserves markets at this time. This view is supported by the AESO's analysis of short- and long-term efficiency tradeoffs, historical offer behaviour of market participants, and a forward-looking assessment of concentration as well as stakeholder input. Further, the AESO anticipates that if future monitoring reveals that changes to the mitigation framework are needed, it is likely these changes can be implemented under the current legislative and regulatory structure.

With respect to the current market power mitigation framework, the AESO believes that the following features are important to maintain certainty in the industry:

- Continuation of the competitive framework laid out through the *Electric Utilities Act* (EUA) and the *Fair, Efficient and Open Competition Regulation* (FEOC Regulation) requiring all market participants to conduct themselves in a manner that supports the fair, efficient and openly competitive operation of the markets.
- Continuation of a holding limit for generation assets at 30 per cent of the total maximum capability of generating units in Alberta.
- Continuation of the physical withholding limitations, including must-offer requirement for all suppliers.
- Continuation of an offer cap in the energy market.
- Continued ex-post investigation and ongoing monitoring abilities for the AESO and the Market Surveillance Administrator (MSA) to ensure market rules and participant conduct supports the fair, efficient, and openly competitive operation of the market.

The AESO's analysis did not uncover any systematic efficiency issues in the market that would justify changes to the current comprehensive mitigation framework. The feedback received from stakeholders and the MSA generally aligned with this conclusion, and identified only limited concerns with market power and the current market power mitigation framework.

1.3.1 Essential functions for an effective framework

1.3.1.1 A need for clarity

In order for the current market power mitigation framework to be successful into the future it is important that stakeholders have clarity on how it will be implemented. Consistent and predictable implementation of the framework by agencies such as the AESO and the MSA will assist in restoring stability to the industry after a period of significant uncertainty.

A number of stakeholders noted, and the AESO agrees, that additional certainty and clarity would assist with maintaining a fair, efficient, and openly competitive energy-only market in the future. Mainly, numerous stakeholders specifically stated that direction confirming that unilateral economic withholding is acceptable behaviour in the energy-only market would be helpful. This would continue to allow market participants to submit offers with the intent to recover their full operating costs as well as a return on, and of, their fixed costs.

The AESO also recognizes that there has been ongoing uncertainty over many years in relation to acceptable market participant conduct for offers in the energy-only market. This uncertainty has been amplified given recent AESO consultation on an ex-ante mitigation framework as part of the proposed capacity market design, as well as recent consultations by the MSA with respect to removing and consulting on the *Offer Behaviour Enforcement Guidelines* (OBEG). The AESO is of the view that clarity on what constitutes acceptable offer behaviour should be provided to the market. Government acknowledgement of the acceptability of the existing mitigation framework would be beneficial in providing some clarity and certainty for market participants, as would consistency in the MSA's application of offer behaviour guidelines and advisory opinions going forward.

1.3.1.2 Ongoing monitoring

Ongoing monitoring of the market will continue to identify if and when concerns about market power might arise. This responsibility is shared across the AESO and the MSA. For example, in addition to the AESO's and MSA's monitoring of market participant behaviour and compliance with market rules, the MSA's periodic efficiency analysis identifies and reports on the relative size of short- and long-term efficiency losses, indicating when conditions might arise that justify changes to the market, including the mitigation framework.

This monitoring is critical as there are a number of upcoming changes that may impact operations and behaviour in the market, and have the potential to create risk to consumers if not addressed in advance. The framework has always recognized a need for periodic rule evolution when required in response to changing conditions, and the AESO is of the view that any concerns can be identified and addressed within the current framework. Some examples of upcoming changes that may impact the operation and competitiveness of the market include:

- The expiry of the thermal power purchase arrangements (PPAs) resulting in increased offer control concentration in both the energy and OR markets.
- The expiry of the hydro PPA, resulting in changed incentives for the operation of the hydro assets in both the energy and OR markets.
- Knock-on impacts of increasing variability on the system from higher renewables penetration, leading to altered behaviour from market participants.

The AESO will monitor the impacts of these changes and consider whether any market design changes are required in response to these, taking into account current market conditions and any other relevant circumstances.

1.3.1.3 Further considerations: Energy-only market evaluation

Pursuant to the Minister's July 25, 2019 direction, the AESO will be providing its analyses and recommendations on whether changes are needed to the price floor, price ceiling and shortage pricing in Alberta's energy-only market. It is important to note that, while the AESO's analysis related to market power mitigation supports the continuation of the current framework, this conclusion is limited to this aspect of the framework. Changes to any one of the market price elements that are currently being studied by the AESO could impact the operation of the energy market going forward, and this in turn may require the effectiveness of the market power mitigation framework to be revisited. The AESO will advise if it identifies any further considerations to the market power mitigation framework in its February 1, 2020 status update and July 31, 2020 recommendation.

1.4 MARKET POWER IN ALBERTA'S ENERGY-ONLY MARKET STRUCTURE

Market power exists when a firm can profitably raise prices above competitive levels, usually measured as short-run marginal cost. The exercise of market power may create market inefficiencies resulting in an inefficient level of consumption and loss of productive efficiency. The exercise of market power, however, is distinct from anti-competitive behaviour, which is intended to impede competition by creating, maintaining, or enhancing market power.

While anti-competitive behaviour is prohibited, the exercise of market power which results in limited loss of static efficiency has long been an integral part of Alberta's well-functioning competitive energy-only market. The static efficiency losses are considered justifiable, as they allow suppliers to recover fixed costs which typically are not recouped when prices are set at short-run marginal cost. Limited exercise of market power helps to ensure efficient long-run investment, or dynamic efficiency, in an energy-only market structure.

Alberta's energy-only market has historically been competitive; successfully achieving the balance between short- and long-term efficiency tradeoffs through a market framework that has included the following market power mitigation elements in both the energy and OR markets:

- The FEOC Regulation obligates market participants to conduct themselves in a manner which supports the fair, efficient and openly competitive electricity market. This regulation has also established a market concentration limit by prohibiting any one entity from holding offer control of more than 30 per cent of the total maximum capability of generating units in Alberta.
- The FEOC Regulation requires all generating capability to be offered to the power pool. This regulation is supplemented by an ISO rule that requires a supplier to offer all its available output from a generating asset. Together, these effectively prohibit physical withholding in the energy market. There is no comparable must-offer requirement in the OR market.
- Legislated PPAs that were designed, in part, to distribute the supply of generation from large incumbents to new market entrants. This was a way to open the Alberta market to new participants as the deregulated market was being established and to reduce the market power risks associated with supply concentration.
- The MSA's OBEG, which described in broad terms provides guidelines on acceptable market participant offer behaviour into the energy and OR markets under the FEOC Regulation, as well as behaviour that would be considered unacceptable. These guidelines provide greater clarity regarding the MSA's application of the FEOC Regulation.
- An ISO rule that limits the price at which supply can be offered into the energy market to a maximum level of \$999.99/MWh, and in the OR market AESO bids that limit the maximum price for OR products.
- The MSA's ability, codified in legislation and regulation, to conduct investigations into market participant behaviour when there is concern the behaviour did not support the FEOC Regulation.²
- The AESO's ability, codified in legislation and regulation, to monitor market participant compliance with the ISO rules, and report suspected rule contraventions to the MSA.³

1.5 ENERGY MARKET ANALYSIS

To develop the advice provided in this report, the AESO undertook a review of the concentration of supply, past offering behaviour of market participants, and the historical market performance relative to short- and long-term efficiency measures. These are important elements of the Alberta market structure that successively build upon one another to form the AESO's advice. Specifically, market concentration helps to inform the competitive landscape of the market; the manner in which market participants offer their energy into the market helps the AESO to understand how market participants' offer behaviour has changed over time under differing market conditions; and the static and dynamic efficiency analysis establishes quantitative measures to assess overall market efficiencies.⁴

² See Section 39 and 42 of the *Alberta Utilities Commission Act*

³ See Section 21.1 of the *Electric Utilities Act* and Section 23(1) of the *Transmission Regulation*

⁴ Appendices B, C and D include the full summaries of the AESO's analysis for each of these elements

1.5.1 Concentration

The concentration of the ownership of supply can result in portfolios which are sufficiently large such that one or more firms have market power. Historically, today and as projected into the future, the supply of power in the Alberta electricity market is concentrated in the portfolios of a few large market participants. The AESO completed two sets of analyses to summarize the concentration of offer control in the electricity market: a review of individual supplier offer control levels and a review of concentration levels of the aggregate of the largest suppliers.

With the termination of a number of coal asset PPAs in 2018, the offer control of the largest market participant reached a high of 22 per cent. In 2021, with the expiry of the remaining PPAs, the largest firm's offer control concentration is expected to reach 27 per cent, which will be the highest level experienced in Alberta's deregulated market over the previous decade. This level is below the maximum threshold of 30 per cent set out in the FEOC Regulation. Further, in 2021 the aggregated offer control of the four largest market participants is expected to reach 64 per cent, which is slightly higher than the current level of 61 per cent. According to the Competition Bureau's *Merger Enforcement Guidelines*⁵, the opportunity for the coordinated exercise of market power may arise when this level exceeds 65 per cent.

The estimated 2021 concentration levels are expected to be temporary concentration peaks for the province, with coal plant retirements and new asset additions reducing the concentration over time. These increased levels of offer control and increased concentration levels of the top firms do not alone indicate that these firms will be more likely to exercise market power; however, it is an indication that the ownership structure in the market may present the ability and incentive for these firms to exercise market power. For a full discussion of this topic please see Appendix B.

1.5.2 Offer behaviour

The AESO reviewed how energy was offered into the market over the period 2013 to 2019. These years were broken into three periods:

- **2013 to 2015:** the period of time prior to the turn-back of PPAs to the Balancing Pool.
- **2016 to 2017:** the period of time where the Balancing Pool directed or offered the volumes of a number of the coal PPA assets into the market.⁶
- **2018 to 2019:** the period of time subsequent to the termination of a number of coal PPAs.

The AESO reviewed how offers were submitted at different price levels during different supply cushion levels in each of these three periods. The objective of this review was to understand how or if suppliers changed their offer volumes and prices as offer control changed to different firms. When looking at the market as a whole, the AESO observed that recent offer behaviour is not significantly different from the behaviour that occurred in the 2013 to 2015 period, even though the market is more concentrated. Average prices for all non-zero dollar offers have increased marginally but these increases likely reflect increased carbon costs, offset somewhat by lower natural gas prices. This indicates, in combination with the efficiency analysis, that the market has maintained competitive offer strategies while higher market concentrations levels occurred. For a full discussion of this topic please see Appendix C.

⁵ Competition Bureau, *Merger Enforcement Guidelines*, section 5.9. <https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/O3420.html>

⁶ During the 2016 to 2017 period, a number of thermal PPA assets were offered into the market by an agency, and as such the associated offers may not have been comparable to the offers made by other market participants. This unique situation is not expected to exist again in the future.

1.5.3 Efficiency measures

In 2012 the MSA published a *State of the Market Report*, a substantial analysis assessing the state of competition in the energy-only market, in which they concluded that “the market [was] found to be competitive”.⁷ The AESO completed analyses for the period 2013 to 2018 using similar methods to those used by the MSA in 2012. The AESO reviewed measures that evaluate the static efficiency of the market; that is, how closely market prices reflect the short-run marginal costs of the most efficient supply assets in the market. The AESO also evaluated dynamic efficiency, a measure that reflects the continued efficiency of the market in attracting investment over time. In evaluating dynamic efficiency, the AESO assessed how annual power prices have provided entry signals for new supply.

For both of these measures the AESO found that during the 2013 to 2018 period the market performed efficiently. The AESO found static efficiency losses in the 2013 to 2018 period were within the range the MSA previously determined to be reasonable. The AESO also found that the market was dynamically efficient such that when market prices signaled the need for new generation, new generation was added to the market. This occurred in 2015 with the addition of the Shepard generating unit. With market signals indicating the profitable entry of generation in 2021, additional generation assets, both gas and renewable supply, have been announced by a number of market participants in the second half of 2019. For a full discussion of this topic please see Appendix D.

1.5.4 Conclusions

The AESO’s conclusions with respect to market power in the energy market are as follows:

- **Concentration:** Supply in the energy market is and will continue to be concentrated. Concentration levels are expected to peak in 2021 but are expected to remain below both the FEOC Regulation and Competition Bureau thresholds.
- **Offer behaviour:** The AESO has not observed significant changes in energy market offering behaviour during the 2018 to 2019 period, a time period with increased offer concentration, compared to that during the 2013 to 2015 period, a time period of competitive offer behaviour with lower concentration.
- **Efficiency:** Static efficiency losses have been minimal and within the levels previously deemed to be acceptable. The recent period of high offer concentration has not resulted in static efficiency losses significantly different from observations in the 2008 to 2017 period. The market has been dynamically efficient with new generation being added when market prices signaled that new generation could be added profitably.

Overall these findings indicate that the energy-only market framework, which relies on some exercise of market power through economic withholding to achieve prices that allow for the recovery of fixed costs, has been efficient. While offer control concentration levels will increase with the expiry of the PPAs at the end of 2020, recent offer behaviour under higher concentration levels provides indications that the market will continue to be efficient under varied concentration levels. Ongoing monitoring will be critical to ensure the market continues to provide efficient and competitive outcomes and, as noted above, the AESO is of the view that the framework in place allows the MSA and AESO to effectively address any concerns identified through the course of their collective monitoring.

⁷ Market Surveillance Administrator, *2012 State of the Market Report*. <https://resources.albertamsa.ca/uploads/pdf/Archive/2012/Notice%20SOTM%20Final%20121210.pdf>

1.6 OPERATING RESERVE (OR) MARKET ANALYSIS

To maintain overall reliability of the grid, the AESO procures a range of ancillary services that are needed to ensure reliability. The AESO has long-term contracts in place for the provision of some ancillary services, such as Load Shed Service for imports (LSSi), transmission must-run (TMR) and Black Start services. This report will focus on the OR elements in the market, as the OR products (regulating, spinning and supplemental reserves) are procured daily through market mechanisms and make up the largest portion of ancillary services costs.

While critical to reliability, the size of the OR market is dramatically smaller than the energy market, with the total annual value of the OR market ranging from approximately \$50M to \$250M while energy market transactions have ranged from \$1.5B to \$6.5B annually. While the exercise of market power has a smaller impact on overall cost to consumers, the AESO is of the view that it is important to ensure the OR market is efficient and the risk of market power abuse in this market is minimized.

The AESO has assessed the potential for market power in this market separately, as the history and operation of the OR market varies in important ways from the energy market. In developing our advice related to the OR market, the AESO evaluated supply concentration levels and market price outcomes. For a full discussion on this topic please see Appendix E.

1.6.1 Concentration

The AESO assessed the offer control for OR products, finding that the offer control for OR products is more concentrated than for energy. There has been recent OR market participant entry with the addition of new generating units and participation by load customers but concentration levels are expected to remain high. Assessing concentration levels in 2021 based on the volume of qualified OR assets, it is expected that the largest firm will be qualified to provide up to 25 per cent of the total OR supply and close to 50 per cent of the regulating reserve product. While the volume of qualified capacity that can provide OR is between two and four times what the AESO requires, the actual completed sales of OR is very concentrated. Four firms have historically provided over 70 per cent of the total OR volumes and over 80 per cent of the regulating reserve product, with the assets owned by the largest firm representing over 40 per cent of total sales and nearly 50 per cent of the regulating reserve sales. This concentrated sales outcome may be largely explained by the incentives in the hydro PPA, as this PPA provides significant financial incentives for the operator of the PPA hydro assets to provide substantial OR volumes to the market. This level of sales also likely demonstrates the physical characteristics of hydro facilities, which are well suited to providing OR. These assets have the ability to store energy that can be provided on short notice and have a low variable cost of operations which allow these assets to provide OR products at a lower cost compared to thermal resources.

1.6.2 Offer behaviour

The AESO reviewed offer behaviour on select occasions when price setting did not align with market fundamentals. The outcome during these limited periods suggests that, at least in some instances, the structure, conduct and performance of the OR market has not delivered competitive outcomes.

An important fundamental change in the structure of the OR market will occur at the end of 2020 with the expiry of the hydro PPA. The physical operational requirements of the hydro facilities are unlikely to change when the hydro PPA expires but the financial incentives associated with OR sales will change significantly, and at the same time, concentration levels of the OR market will increase. The impact of these changing incentives on the OR market is uncertain although, as noted below, the AESO is assessing options for mitigating these impacts if necessary.

1.6.3 Static and dynamic efficiency tradeoffs

In the energy market, the exercise of market power allows market participants to recover their fixed costs of investment. There is no need for the incremental exercise of market power in the OR market because the price of reserves is indexed to the price of energy (typically it is a discount to the price of energy). Over a period of time, the energy price should include both full operating and fixed costs. Therefore, further increases in price due to the exercise of market power in the OR market are in excess of what is needed to achieve dynamic efficiency. Because the OR market has seen periods of weaker competitive response compared to the energy market, the exercise of market power in the OR market will increase the price without a corresponding long-term dynamic efficiency gain.

1.6.4 Conclusions

The AESO's conclusions with respect to market power in the OR market are as follows:

- **Concentration:** The OR market is smaller than the energy market and is much more concentrated. OR offer concentration is expected to increase with the expiry of the PPAs in December 2020.
- **Offer behaviour:** The hydro PPA currently provides strong financial incentives for one of the largest providers of OR to ensure that a significant portion of its capability is scheduled to provide OR. When the PPA expires this financial incentive will be removed. While there are operational limitations regarding the hydro facilities, the OR market consequences of this PPA expiry are unknown.

There have been occasions where strategic behaviour has occurred in the OR market resulting in price outcomes that were not consistent with a competitive market. These instances demonstrate that the opportunity for participants to exercise market power exists today.

- **Efficiency:** Because the OR price is indexed to the energy price, the exercise of market power in the energy market is included in the settled price for OR. Further increases in the price of OR due to exercise of market power in the OR market are unlikely to result in long-term dynamic efficiency gains, challenging the acceptability of allowing the additional exercise of market power in the OR market.

As conditions in the OR market evolve toward a more concentrated market, competitive pressures from other participants may have a limited bearing on disciplining strategic behaviour. These conclusions indicate that some changes to the OR markets may be helpful to support and increase effective competition, such as facilitating entry by additional qualified resources and improving competition within the existing OR products and market. The AESO is evaluating options for such, and is of the view that these potential changes can be completed within the existing framework, and would not require changes to the current regulatory and legislative environment.

1.7 ENERGY AND OR MARKETS: STAKEHOLDER COMMENTS

As part of developing the advice provided in this report, the AESO sought stakeholder views on the current market power mitigation framework. The AESO received feedback from 18 market participants, representing supply, load, commercial and retail service providers. The AESO also received comments from the MSA.⁸

1.7.1 Stakeholder view: Framework remains effective and changes should be minimized

Stakeholders were generally aligned in their opinion that no change is needed to the methods which are used to mitigate market power in either the energy or the OR markets. Stakeholders referenced the historical competitiveness of the market, citing the addition of supply when supply was required and that findings of market power abuse have been rare. Stakeholders also noted that allowing the market to continue to operate in a competitive manner and avoiding regulatory uncertainty will help restore investor confidence in the Alberta electricity market.

Stakeholders emphasized the importance of the stability of market rules and the regulatory framework for continued success in the wholesale market,⁹ and that any changes should be consistent with Alberta's overall market philosophy of open competition.¹⁰ In addition, stakeholders suggested certain improvements, including: codifying the ability for generators to offer at prices greater than marginal cost and embedding the inclusion of the MSA's OBEG principles in the FEOC Regulation;¹¹ revisiting the 30 per cent offer control limit in the FEOC Regulation and establishing targeted mitigation approaches for the firms owning the largest amount of offer control.¹² Stakeholder comments regarding areas for improvement in the OR market were more general in nature, with a focus on the AESO taking measures to improve competition in this market.

When providing comments related to the criteria that should be used when evaluating a market power mitigation framework, stakeholders commented that the framework should be clear and transparent, rely on competition or competitive forces, impose little regulatory burden, provide regulatory stability, and that the criteria should value dynamic efficiency over static efficiency.

⁸ The summary of this feedback and each individual submission can be found here: <https://www.aeso.ca/market/market-updates/letter-of-notice-for-stakeholder-input-on-market-power-mitigation/>. The summary can also be found in Appendix F.

⁹ ENMAX p1 <https://www.aeso.ca/assets/Uploads/ENMAX-MPM-stakeholder-comment-matrix-Redacted.pdf>

¹⁰ Suncor p2 <https://www.aeso.ca/assets/Uploads/Suncor-MPM-stakeholder-comment-matrix-Suncor-Redacted.pdf>

¹¹ Capital Power p1-2 <https://www.aeso.ca/assets/Uploads/Capital-MPM-stakeholder-comment-matrix-Capital-Power-Redacted.pdf>

¹² IPCAA p1 <https://www.aeso.ca/assets/Uploads/IPCAA-MPM-stakeholder-comment-matrix-Oct-29-19-Redacted.pdf>

1.7.2 Market Surveillance Administrator (MSA) comments

The MSA also responded to the request for feedback, and the AESO has reproduced their recommendations for a reformed market power mitigation framework below.

- Maintain the current offer price cap of \$999.99/MWh and the 30 per cent limit on market share for any one market participant.
- Maintain the current FEOC regulatory regime.
- Introduce administrative shortage pricing.¹³
- Maintain the provisions that allow the MSA to issue guidelines provided they are approved first by the Alberta Utilities Commission (AUC) and the MSA offers an Advisory Opinion Program to deal with specific situations in real time.
- There should be no change in the regulatory jurisdiction of the MSA, as the existing FEOC regime is capable of safeguarding the market from any anti-competitive conduct.¹⁴

1.8 JURISDICTIONAL REVIEW

The AESO reviewed the mitigation approaches used by other electricity markets within the U.S., Australia and New Zealand. These jurisdictions, including both energy-only and capacity market designs, provide a diversity of market structures and mitigation frameworks that are utilized by markets to address market power concerns. A summary of these market approaches can be found in Appendix G.

The jurisdictional review indicated that approaches used by other electricity markets are varied. However, in general, markets with capacity markets apply an ex-ante offer mitigation approach while energy-only markets use an ex-post framework with some ex-ante features. The following are features of interest from these markets:

- **Agreed-to mitigation approaches for large suppliers in other energy-only markets:** Both New Zealand and ERCOT have approved offer approaches for suppliers deemed pivotal in those markets.
- **Price “speed limits”:** New Zealand and Australia, both energy-only markets, have limits on the frequency at which the market price can be set at high levels.
- **Acceptance of static inefficiencies:** Australia expects there to be periods of transient market power, meaning occasional price spikes above marginal costs is to be expected in a workable competitive market.
- **Ex-ante pivotal supplier identification and conduct and impact tests:** the U.S. ISOs with capacity markets, which provide a revenue stream in addition to energy revenue, generally use ex-ante approaches with the following elements:
 - A pivotality test: identifies suppliers that are deemed to be pivotal and applies mitigation as necessary.
 - Conduct and impact tests: prior to the setting of the market price, if an offer from a pivotal supplier has been found to increase prices higher than some threshold, mitigation is applied to the offer to ensure that prices are set at a competitive level.

¹³ The AESO is of the view that this recommendation is better considered in the pricing advice being developed for the government.

¹⁴ See p14 <https://www.aeso.ca/assets/Uploads/MSA2-Submission-Related-to-Electricity-Market-Reforms-20191101.pdf>

While there are common elements among jurisdictions with capacity markets, the mitigation designs for energy-only markets reflect the unique attributes, policy approaches and risk tolerances of each jurisdiction. Overall, the approach to mitigation needs to ensure that the required economic signals are obtainable in the market so that supply meets reliability goals. Several stakeholders cautioned against importing solutions from other jurisdictions that may not share the same market philosophy as Alberta, and the AESO agrees.¹⁵ Based on this jurisdictional review, the AESO does not see any need to pursue the specific measures utilized in these jurisdictions at this time.

1.9 ALTERNATIVE MITIGATION DESIGN

Should the ongoing monitoring raise concerns that justify a change to the existing market power mitigation framework, the AESO is prepared to consider a range of alternative mitigation designs. These alternatives could be minor additions to the existing framework, such as additional compliance or market-based operational requirements for participants, to larger changes, such as formulaic limits on offers in certain market conditions. Given the AESO's findings that the current mitigation framework has provided for an efficient market, none of these alternative mitigation designs are recommended.

The AESO recognizes that should changes be identified as required in the future to maintain an efficient and effective market power mitigation framework for market participants, the AESO is of the view that the current legislative framework is likely sufficiently flexible to permit these changes without any need for legislative or regulatory amendments. Should any changes be required, the AESO expects to be able to leverage current processes to make these changes within the existing structure.

¹⁵ Suncor p2 <https://www.aeso.ca/assets/Uploads/Suncor-MPM-stakeholder-comment-matrix-Suncor-Redacted.pdf>
 URICA p3-4 <https://www.aeso.ca/assets/Uploads/URICA-MPM-stakeholder-comment-matrix-URICA-Response-2019-10-28-Redacted.pdf>
 IPCAA p3-4 <https://www.aeso.ca/assets/Uploads/IPCAA-MPM-stakeholder-comment-matrix-Oct-29-19-Redacted.pdf>
 TC Energy p7 <https://www.aeso.ca/assets/Uploads/TCEnergy-MPM-stakeholder-comment-matrix-TCE-Comments-Redacted.pdf>
 Heartland p22-23 <https://www.aeso.ca/assets/Uploads/Heartland-Generation-MPM-Comment-Matrix-Redacted.pdf>
 EDF p3-4 <https://www.aeso.ca/assets/Uploads/EDF-MPM-AESO-Comment-Matrix-FINAL-Redacted.pdf>
 Vidya p3-4 <https://www.aeso.ca/assets/Uploads/Vidya-MPM-stakeholder-comment-matrix-Vidya-Redacted.pdf>
 ENMAX p4 <https://www.aeso.ca/assets/Uploads/ENMAX-MPM-stakeholder-comment-matrix-Redacted.pdf>
 CWG p4 <https://www.aeso.ca/assets/Uploads/CWG-2019-10-29-Market-Power-Mitigation-CWG-Comments-Redacted.pdf>

Appendix A:

Letter from the Minister of Energy
dated July 25, 2019





ALBERTA
ENERGY

*Office of the Minister
Deputy Government House Leader
MLA, Calgary-North West*

July 25, 2019

AR33195

Mr. Will Bridge
Board Chair
Alberta Electric System Operator
330-5 Avenue SW
Calgary AB T2P 0L4
will.d.bridge@gmail.com

Dear Mr. Bridge:

Over the past several weeks, I have met with both senior officials of the Alberta Electric System Operator (AESO) and stakeholders representing broad interests across the sector on the subject of Alberta's market design.

After careful consideration, the Government of Alberta has decided it is in the public interest to return to the existing energy-only market. Alberta's energy-only market is a proven system that has successfully attracted investment into the province and supported a high quality of life for Albertans. Government believes the existing energy-only market will continue to provide Albertans with a reliable supply of electricity at affordable prices.

We understand that timely implementation of this decision is key to providing policy clarity to agencies. Government intends to introduce legislation as quickly as possible to halt implementation of a capacity market and return to an energy-only market.

During the consultations, I heard concerns about a lack of clarity regarding mandates and roles of Alberta's electricity agencies. I have directed Alberta Energy to examine and propose options to address these concerns.

In addition, I heard repeatedly that certainty and stability in electricity market design are critical to secure future investment in our electricity system and our province. I also heard a range of views on whether the existing energy-only market requires design changes to remain successful in the future. Because of the clear need for certainty and stability, I am

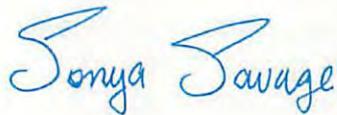
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directing the AESO to take a measured and thoughtful pace to examining if any changes to the existing energy-only market are needed, and to work in consultation with Alberta Energy. By July 31, 2020, the AESO must provide me with analyses and recommendations on whether changes are needed to the price floor/ceiling and shortage pricing in Alberta's energy-only market. I ask require a status update on this work on or before February 1, 2020.

I also heard repeated references to concerns with market power and market power mitigation. In response to those concerns, I have asked Alberta Energy to complete a policy review of this particular issue for both the energy-only and ancillary services markets. I ask the AESO to submit its advice on this topic to me by November 29, 2019.

Please accept my sincerest gratitude for the AESO's availability and advice during the 90-day review and your significant and high-quality efforts to date. The government of Alberta continues to value and rely on the AESO to support our outcomes regarding the implementation and operation of Alberta's energy-only market, which supports our broader economy and benefits all Albertans. I know I can count on the AESO's full support as we implement this decision and seek to restore predictability and certainty to Alberta's electricity market design.

Sincerely,



Sonya Savage
Minister

cc: Mike Law, President and Chief Executive Officer, AESO
Grant D. Sprague, Q.C., Deputy Minister of Energy
Doug Lammie, Assistant Deputy Minister of Electricity and Sustainable Energy

Appendix B:

Alberta Offer Control Concentration



Alberta Offer Control Concentration

This analysis was undertaken in regards to the energy market and provides an overview of the concentration of offer control in the electricity market on a historical, current, and forward-looking basis.

Why this is important

The greater market share that a participant has, the more profitable it may be for them to withhold capacity and consequently, the more market power they may have. The amount of unilateral market power a firm has is dependent on their own market share; however, multiple firms may also coordinate the exercise of market power. While explicit collusion is prohibited by law¹ and the FEOC Regulation², firms may, over time, observe the behaviour of one another and learn how to cooperate implicitly to benefit each other. Therefore, in evaluating the need for market power mitigation, it is important to consider the market shares both of individual firms and groups of firms.

Market concentration on its own does not necessarily indicate that firms will exercise market power. However, it is an indication that the firms may have the ability and incentive to exercise market power.

What is the offer control concentration in Alberta

The supply of power into the Alberta market has been concentrated in the portfolios of a few large market participants. The individual firms which have the offer control and their share of the market have changed over time, but through time the market has been and is expected to remain concentrated.

The AESO completed two sets of analyses to summarize the concentration of offer control in the electricity market. The first analysis was a review of the offer control concentration levels of individual firms historically as well as projected into the future. The second analysis reviewed the combined concentration levels of the largest suppliers both historically and into the future.

Energy market offer control

Figure 1 below graphically represents the energy market offer control by market participant and shows how offer control has changed through three distinct time frames:

- 2013 to 2015, Pre-Balancing Pool period: This period illustrates the power purchase arrangement (PPA) ownership largely in place since the auction of the PPA statutory instruments in 2000. ATCO³, Capital Power, TransAlta and Suncor shares of offer control were generally less than 15 per cent. TransCanada and ENMAX held offer control of between 15 per cent and 20 per cent of the available supply.
- 2016 to 2018 Q1, Balancing Pool period⁴: during this time period many of the PPA buyers returned thermal PPAs to the Balancing Pool. As such, the Balancing Pool offer control approached

¹ *Competition Act* (R.S.C., 1985, c. C-34)

² http://www.gp.alberta.ca/documents/Regs/2009_159.pdf Section 2(i)

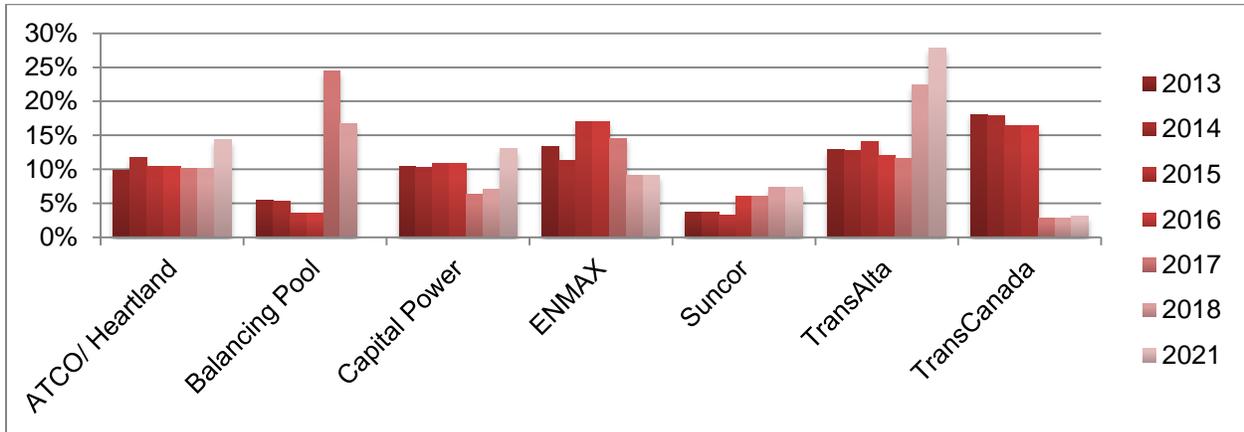
³ In May 2019 The ATCO Group announced that a subsidiary, Canadian Utilities, would complete the sale of the vast majority of power generating assets to Heartland Generation Ltd. The assets historically owned by the ACTO group will be referred to in this report as ATCO prior to the sale and ATCO/ Heartland subsequent to the sale.

⁴ While the PPAs weren't officially terminated until 2017, the output of these units were offered into the market at variable cost based on instruction from the Balancing Pool in 2016.

25 per cent. Capital Power, ENMAX and TransCanada experienced large reductions in their share of offer control.

- 2018 Q2 forward, Post-Balancing Pool period: during this time period, the market becomes more concentrated with TransAlta projected to have over 25 per cent of the offer control by 2021. ATCO/Heartland has the second largest offer control with nearly 15 per cent while Capital Power, ENMAX, Suncor and TransCanada have offer control shares between 5 per cent to 12 per cent.

Figure 1: Market share offer control by market participant



Concentration ratios

Concentration ratios describe the combined market share offer control of the largest firms in a market. The concentration levels noted below reflect the market share that the three largest firms (CR3), the four largest firms (CR4) or the five largest firms (CR5) control. This information shows that the Alberta power market has been and will become more concentrated in the future. Table 1 shows that the concentration level of the top four firms (CR4) has ranged from a low of 54 per cent in 2014 to a high of 61 per cent in 2018 and is expected to reach 64 per cent in 2021. The CR5 metric is projected to reach a high of 72 per cent in 2021.

Table 1: Concentration ratio (CR) by year

Year	CR3	CR4	CR5	CR6
2013	44%	55%	65%	70%
2014	42%	54%	64%	69%
2015	47%	58%	69%	72%
2016	46%	56%	67%	73%
2017	51%	61%	67%	73%
2018	49%	58%	66%	73%
2021	55%	64%	72%	75%

A useful reference for assessing market concentration is the Competition Bureau's *Merger Enforcement Guidelines*.⁵ In assessing the impact that a merger may have on the competitive environment in a market, the Competition Bureau considers whether the merger will increase the concentration in the market to a level at which competitive forces are no longer sufficient to discipline the exercise of market power. According to these guidelines, the opportunity for the unilateral exercise of market power may arise with an individual market share above 35 per cent. Additionally, opportunity for the coordinated exercise of market power may arise with a CR4 above 65 per cent. While the FEOC Regulation prohibits individual market shares to exceed 30 per cent⁶, the CR4 is expected to temporarily approach the level at which the opportunity for coordinated exercise of market power may arise.

There are reasons that electricity markets may be particularly vulnerable to the exercise of market power. These include, for instance, the lack of substitutes, real-time balancing of supply and demand, and limited retail price visibility. Therefore, the Competition Bureau's threshold should only be used as a reference point, as market power may still be present when market shares are within the threshold.

Conclusions

The distribution of offer control in the Alberta power market has been concentrated and is expected to become more concentrated in the future. However, it is expected that the concentration of offer control will peak in 2021 with the expiry of the PPAs. Subsequent to 2021, coal unit retirement and replacement with new generating units from a variety of competitive suppliers will likely reduce the offer concentration levels from those projected in 2021.

While offer control projections suggest a temporary increase in concentration, these projections alone are not sufficient to determine whether this increased concentration will lead to the increased exercise of market power. The AESO is of the view that the increased concentration levels should be assessed with offer behaviour activities and the resulting price outcomes in order to determine whether the market is continuing to achieve efficient price levels. This analysis follows in Appendix C and Appendix D.

⁵ <https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/03420.html>

⁶ http://www.qp.alberta.ca/documents/Regs/2009_159.pdf Section 5(5)

Appendix C:

Energy Market Offer Behaviour



Energy Market Offer Behaviour

As described in Appendix B, the concentration of offer control in the energy market has changed over time as the power purchase arrangement (PPA) assets were auctioned to the PPA buyers, and then as the PPAs were turned back to the Balancing Pool and then again as a number of PPAs were terminated. This analysis provides an overview of the offer behaviour of market participants in the energy market throughout these changing periods.

Why is this important

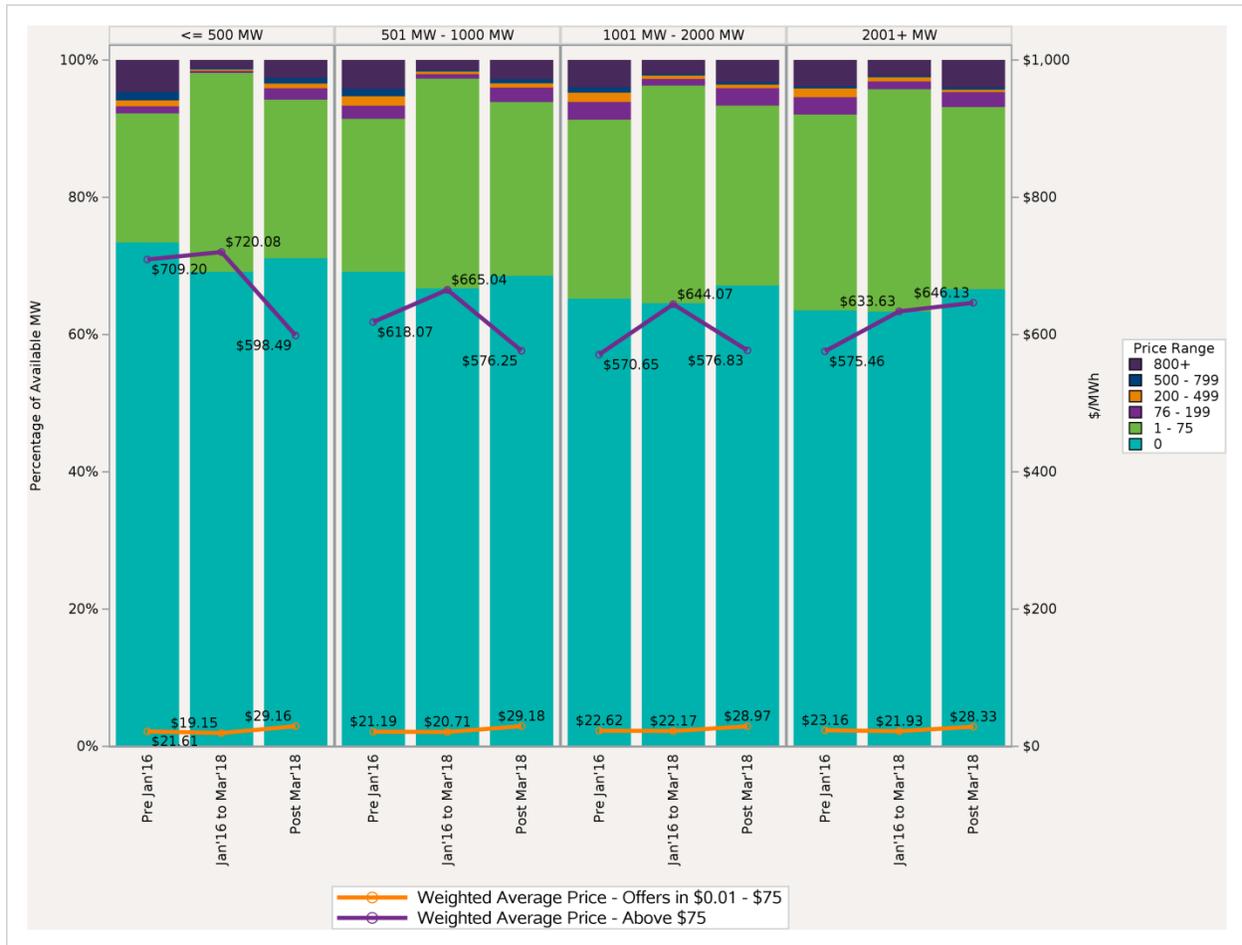
The objective of this analysis was to understand how or if the offering of supply in the energy market changed during times when offer control was held by different firms. While the analysis considered the time period from 2013 to 2019, the focus is primarily on the offer behaviour prior to and subsequent to the termination of the PPAs. The AESO considers the period prior to the turn-back of the PPAs to the Balancing Pool and the period subsequent to the termination of the PPAs as the most informative of what offering behaviour may look like subsequent to the expiry of all PPAs at the end of 2020.

Total offered volumes

Figure 1 below illustrates the offered volume of all market participants during the period 2013 to 2019. The stacked bars represent the volume, in percentage of all available volumes, offered into the market within various price groupings. The data within Figure 1 has been formatted as follows:

- Time period: the historical data has been grouped into three time periods:
 - 2013 to 2015: the period of time prior to the turn-back of PPAs to the Balancing Pool;
 - 2016 to March 2018: the period of time where the Balancing Pool directed or offered the volumes of a number of the coal PPA assets into the market; and
 - March 2018 to August 2019: the period of time subsequent to the termination of a number of coal PPAs.
- Supply cushion: the data has been grouped into four categories that reflect how offers were made during different supply cushions within each of the time periods noted above. The AESO reviewed offers during the following supply cushions:
 - less than and equal to 500 MW
 - 501 to 1,000 MW
 - 1,001 to 2,000 MW
 - 2,001 MW and greater
- The data also demonstrates the weighted-average offer prices of the energy offered into the market in both the time period and the supply cushion:
 - The purple lines indicate the average price for all offers above \$75/MWh. Offers in this price band are being used to reflect offers generally made above the marginal cost of assets
 - The orange lines indicate the weighted-average price of all offers above \$0/MWh and below \$75/MWh. These offers are generally reflective of an asset's marginal cost.

Figure 1: Offer behaviour by offer block and offer price

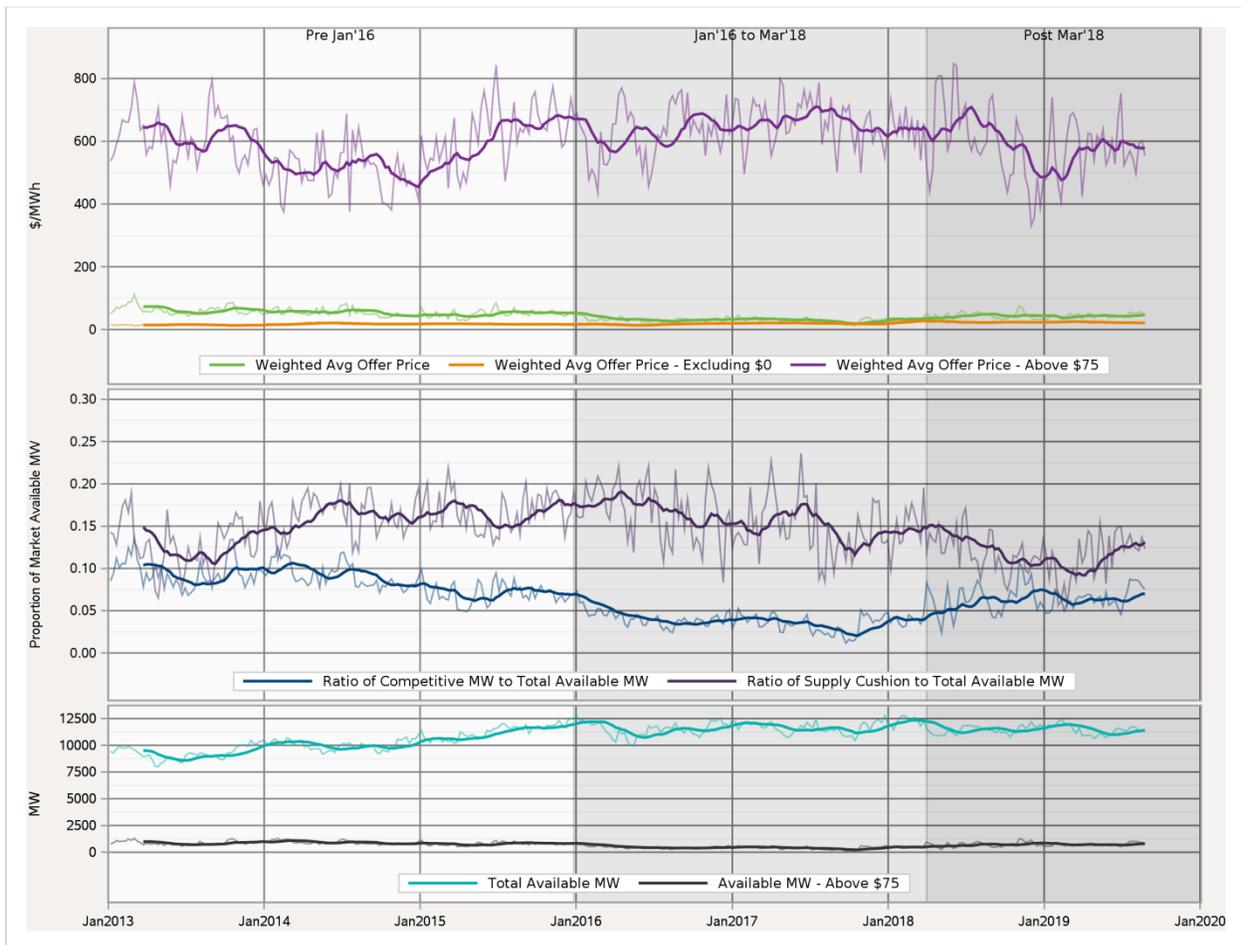


The following observations can be made:

- More volumes in blocks above \$75: In the post-Balancing Pool period (March 2018 to August 2019) the percentage of volume of available supply offered at higher price levels (indicated by the purple, dark blue, and orange blocks) increased from the percentage offered during the period the Balancing Pool was offering the PPA assets into the market. However, the percentage of supply offered in the higher priced blocks was slightly lower compared to the pre-Balancing Pool period. We believe the pre-Balancing Pool period and the post-Balancing Pool period better reflect the operations most comparable to what could be expected in the post-PPA period.
- Higher marginal cost offer prices: In the post-Balancing Pool period across all supply cushion levels, the price for volumes offered at prices greater than \$0/MWh but less than \$75/MWh (the orange lines) was higher than in the previous two periods. While natural gas prices in 2018 and early 2019 were lower than in the 2013 to 2017 period, carbon costs have increased by over \$10/MWh for coal generators and close to \$4/MWh for combined-cycle plants.
- Generally lower offer prices above \$75: The average price for offers made above \$75/MWh (the purple lines) have generally decreased in the post Balancing Pool period with the exception of the highest supply cushion periods.

Visualized another way and focusing on the on-peak hours, Figure 2 below shows that despite the supply cushion being somewhat lower in the post-Balancing Pool period relative to the supply cushion in the pre-Balancing Pool period (the dark purple line in the middle panel), the percent of MWs offered at prices greater than \$75/MWh (the blue line in the middle panel) is comparable to the 2013 to 2015 period. The offered price of those MWs (the purple line in the top panel) is also comparable to the offered price of supply during the pre-Balancing Pool period.

Figure 2: On-peak offer review



Conclusions

The AESO is of the view that the offer behaviour in the post-Balancing Pool period is likely to be most representative of the offer behaviour after the PPAs expire at the end of 2020. When looking at the market as a whole, the AESO has not observed offering behaviour in the more concentrated post-Balancing Pool period that was significantly different from the behaviour that occurred during the less concentrated period when the PPA buyers held offer control of PPA assets. How these offer strategies have translated into an efficient market price signal will be discussed in Appendix D.

Appendix D:

Short- and Long-term Energy Market Efficiencies



Short- and Long-term Energy Market Efficiencies

Appendix B discussed concentration metrics and Appendix C built on these metrics to analyze the offer behaviour of market participants. This section will examine how this offer behaviour has impacted the efficiency of the market and will review two measures of efficiency, static (short-run) efficiency and dynamic (long-run) efficiency.

Why is this important

Market efficiencies are an important consideration in assessing the need for market power mitigation. In Alberta's energy-only market, it is expected that generators will exercise some level of market power to recover their fixed costs. However, depending on how and when this market power is exercised, this may result in relatively high or low inefficiencies. Therefore, it is important to monitor that fixed costs are being recovered in a manner that causes a reasonably low level of static inefficiency.

Historically, it has been expected that some level of static inefficiency is acceptable due to resulting enhancements in dynamic efficiency. However, it may be necessary to implement alternative mitigation approaches if the balance of this tradeoff changes unfavourably either due to increased harm to static efficiency or failure to realize gains in dynamic efficiency. For example, more stringent market power mitigation measures could be implemented to achieve greater static efficiency, while price formation reforms would be used to achieve dynamic efficiency.

Static efficiency review

Static efficiency refers to the economic performance of a market in real time. As consumers and producers make short-term decisions, their actions will impact the amount of surplus that is generated. The two factors that comprise static efficiency are productive efficiency and allocative efficiency.

Productive efficiency

When output is produced at the lowest cost, the market is productively efficient. Therefore, inefficiency arises when high-cost resources are used instead of more efficient, lower-cost resources. This wasteful utilization of resources constitutes a loss to society.

Allocative efficiency

When all gains from trade are exhausted, the market is allocatively efficient. Gains from trade arise when consumers willingness to pay exceeds the cost of output by producers. When goods are produced and consumed, some surplus benefit is realized in excess of the cost of production.

Accurate price signals are the key to achieving allocative efficiency. If prices are distorted upwards, consumers may respond by reducing their consumption. Similarly, suppressed prices will leave firms unwilling to produce. Both of these scenarios result in unrealized surplus, known as deadweight loss. With accurate price signals, trade will occur until the value of the last unit equals the cost of production.

Analysis

The Market Surveillance Administrator (MSA) completed a static efficiency analysis for the 2008 to 2011 period as part of the *2012 State of the Market Report*¹; a summary of their results are provided below. The AESO believed that an updated review of static efficiency was required to assess whether efficient market outcomes were being achieved in the period subsequent to the MSA review period. To address this need, the AESO developed a model to measure the static inefficiencies from the period 2013 to 2018. The AESO model uses hourly merit order snapshots and estimates of short-run marginal cost to determine whether generators were dispatched in the productively efficient order. To the extent that a lower-cost dispatch was available, the model will compare these two results to determine the amount of productive inefficiency.

The AESO model then estimates allocative inefficiencies using a perfectly competitive benchmark. This benchmark assumes that each generator offered their energy at short-run marginal cost. The market clearing price and quantity is then determined using the intersection of this perfectly competitive merit order and a price-responsive demand curve that is estimated using historical behaviour of loads. The allocative inefficiency is the lost value due to response from loads that otherwise would not have occurred if prices were set at the perfectly competitive level.

The results of this analysis are shown below in Table 1.

Table 1: Static inefficiency estimates, MSA and AESO data²

Year	Energy Market Transactions (\$million)	Average Supply Cushion (MW)	Productive Inefficiencies (\$million)	Allocative Inefficiencies (\$million)	Total Inefficiencies (\$million)	Percentage Inefficiencies (%)
MSA						
2008	\$6,462	968	\$39	\$12	\$51	0.78%
2009	\$3,488	1,267	\$27	\$4	\$31	0.89%
2010	\$3,740	1,325	\$36	\$6	\$42	1.11%
2011	\$5,935	1,425	\$32	\$17	\$49	0.82%
AESO						
2013	\$6,353	1,465	\$16	\$21	\$38	0.59%
2014	\$4,123	1,865	\$23	\$7	\$30	0.73%
2015	\$2,744	2,167	\$10	\$5	\$16	0.57%
2016	\$1,483	2,270	\$5	\$0	\$5	0.36%
2017	\$1,863	2,077	\$11	\$1	\$11	0.62%
2018	\$4,398	1,785	\$37	\$9	\$46	1.04%

¹ <https://resources.albertamsa.ca/uploads/pdf/Archive/2012/SOTM%20Final%20Report%2020130104.pdf>

² The calculation approach in this material has been updated relative to the calculation in the material the AESO presented in exhibit 347 submission to AUC proceeding 23757.

Findings of the MSA 2008 to 2011

The MSA found that average productive inefficiencies made up less than one per cent of average annual pool prices, with allocative inefficiencies being an even smaller fraction.³ They interpret this level to be consistent with effective competition. It is also noted that there is “no discernable trend” and that there was no increase associated with the release of the Offer Behaviour Enforcement Guidelines (OBEG).

The MSA conclude that the losses, while not the lowest possible, are low enough to be of little concern. In particular, dynamic efficiency gains do not need to be particularly large to offset the increase in static inefficiency due to the exercise of market power. Finally, the MSA stated that the transfer of funds from consumers to producers to recover fixed costs through the exercise of market power was working efficiently and that other market designs would likely be less efficient.⁴

Findings of the AESO 2013 to 2018

Table 1 shows the results of the AESO’s analysis. It is clear that static efficiency losses have remained low relative to pool prices. While these losses have fluctuated, there is no discernible trend across the years. In fact, on a percentage basis, static inefficiencies have been quite constant given the variation in market fundamentals between these years.

Static inefficiencies have remained at or below the one per cent level that the MSA had deemed to be acceptable according to their benchmark of effective competition. Therefore, a similar conclusion can be reached: dynamic efficiency gains can be modest and still justify this static inefficiency.

When discussing inefficiencies as a percentage of the market, the MSA included only productive inefficiencies. While this is a valid approach, the AESO considered both productive and allocative inefficiencies to ensure that allocative inefficiencies would not be omitted from any conclusions drawn from the analysis. Therefore, the MSA’s percentages have been updated so that all percentages in Table 1 show both productive and allocative inefficiencies. Productive inefficiencies have remained well below the one per cent benchmark previously applied by the MSA.

Dynamic efficiency review

Dynamic efficiency refers to the enhancement of surplus over time. This enhancement can come from quality and process improvements, cost savings, and other innovations. Dynamic efficiency is not as easily quantified as static efficiency and is impacted by many factors.

Entry and exit

The primary mechanism that leads to dynamic efficiency improvements is the free entry and exit of firms. Inefficient high-cost firms either innovate or become unprofitable and exit the market, leaving room for new firms to enter. This cycle depends critically on the accuracy of price signals. Firms make entry and exit decisions based on both the trend of direct price signals in the real-time market and the impact these signals have on the forward market. Prices distorted upwards may result in excessive entry, while suppressed prices may cause otherwise efficient firms to exit the market.

To facilitate efficient entry and exit, barriers to entry should be minimized. Barriers to entry arise when a fixed cost must be incurred by an entrant that is not incurred by incumbents. This fixed cost can be in the form of a capital start-up cost, or the cost associated with regulatory approval and compliance.

³ Ibid. pg 3 and 64.

⁴ Ibid. pg 65.

Analysis

The purpose of this approach is to observe whether the market is responding to sustained price signals by adding new supply when prices would suggest it would be profitable to be added. It is the ongoing cycle of entry and exit that leads to dynamic efficiency gains - a process that occurs over the long run. Therefore, these results are only meaningful when analyzing sustained price signals rather than any year in isolation.

The methodology for analyzing dynamic efficiency in this report is to compare the levelized cost of entry for a new generating unit with market prices over a number of years - both historical and forward-looking.⁵

The levelized cost of entry is determined using cost parameters of a simple-cycle aero-derivative gas turbine.⁶ This type of asset is the best representation of a marginal entrant, as it is relatively quick to build and scalable, as opposed to an asset like a combined-cycle unit that has an extended period of construction and is most cost effective on a large scale. These cost parameters are then used to determine the annual cost on a per MWh basis for an entrant that would run under different capacity factors from 0 per cent to 100 per cent. This metric is referred to here as the levelized unit electricity cost, or LUEC.

This LUEC is then compared to the conditional average price. Conditional average price curves represent the average price received if an asset operated in the percentage of hours in a year with the highest prices. So, a conditional average price at the 50 per cent mark is the average price received if the unit operated in hours with the highest 50 per cent of prices in that year, and the conditional average price at the 100 per cent mark would simply be the average price for the year. These price curves are determined using historical data where available, and constructed from forward prices otherwise.

The interpretation of these figures is that entry would be profitable in a given year for a simple-cycle unit operating at any capacity factor where the conditional average price curve is above the LUEC curve.

This assumes that the market participant is able to perfectly determine the distribution of prices over hours. In other words, if the market participant wanted to operate their asset 20 per cent of the time, the figures below would represent the costs and prices received if that unit operated in the 20 per cent of hours with the highest prices. For this reason, the analysis may inherently show an optimistic outlook for entry.

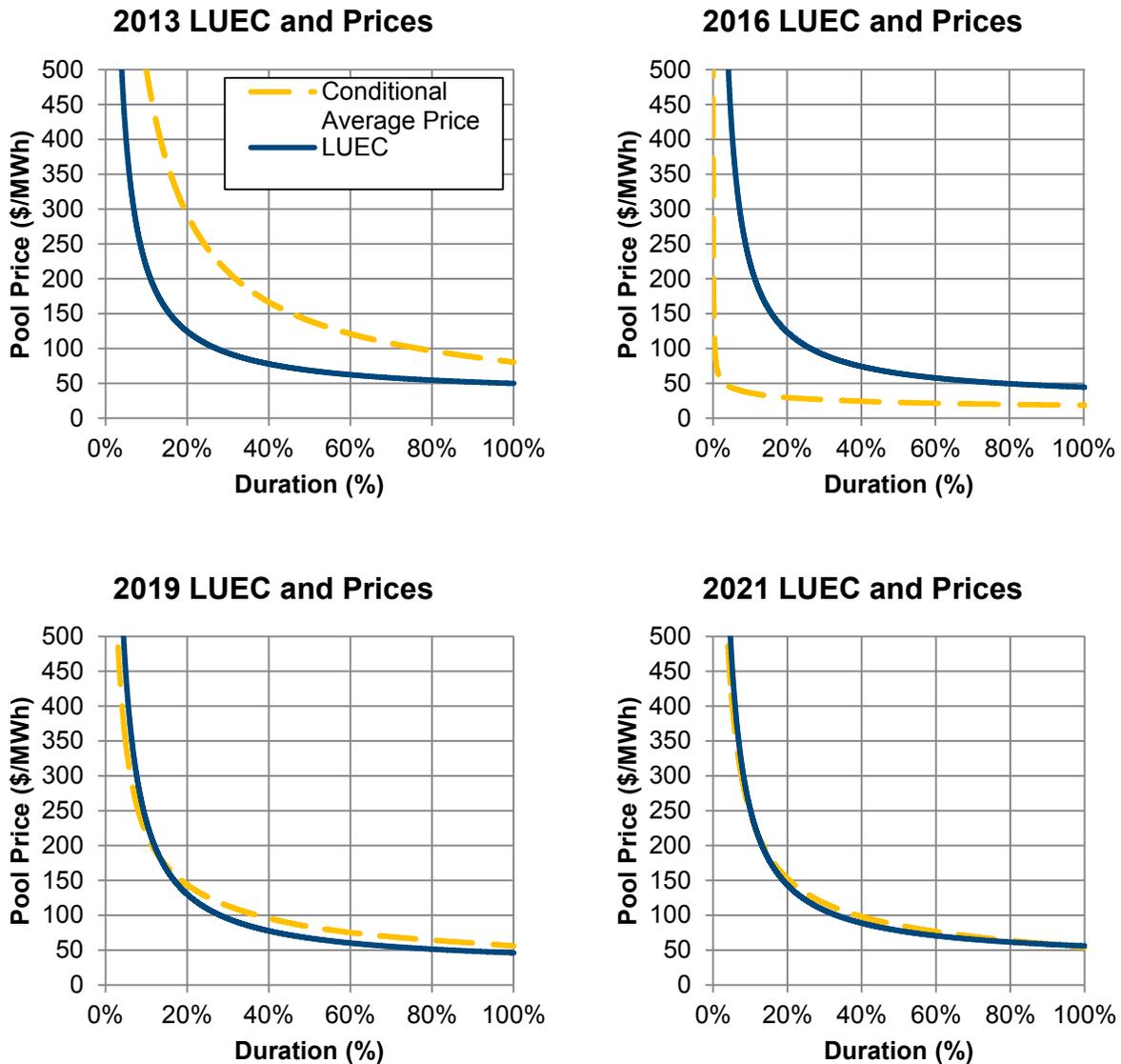
Results

The following figures show the comparison between the conditional average price and the LUEC for some representative years. The figures for all years from 2013 to 2021 can be found at the end of this section.

⁵ This is similar to the approach used by the MSA in 2012 in their report *A Comparison of the Long-Run Marginal Cost and Price of Electricity in Alberta*, which was undertaken as part of the *State of the Market Report*.

⁶ Cost estimates are from the AESO's 2019 Long-term Outlook

Figure 1: Dynamic efficiency results



Observations

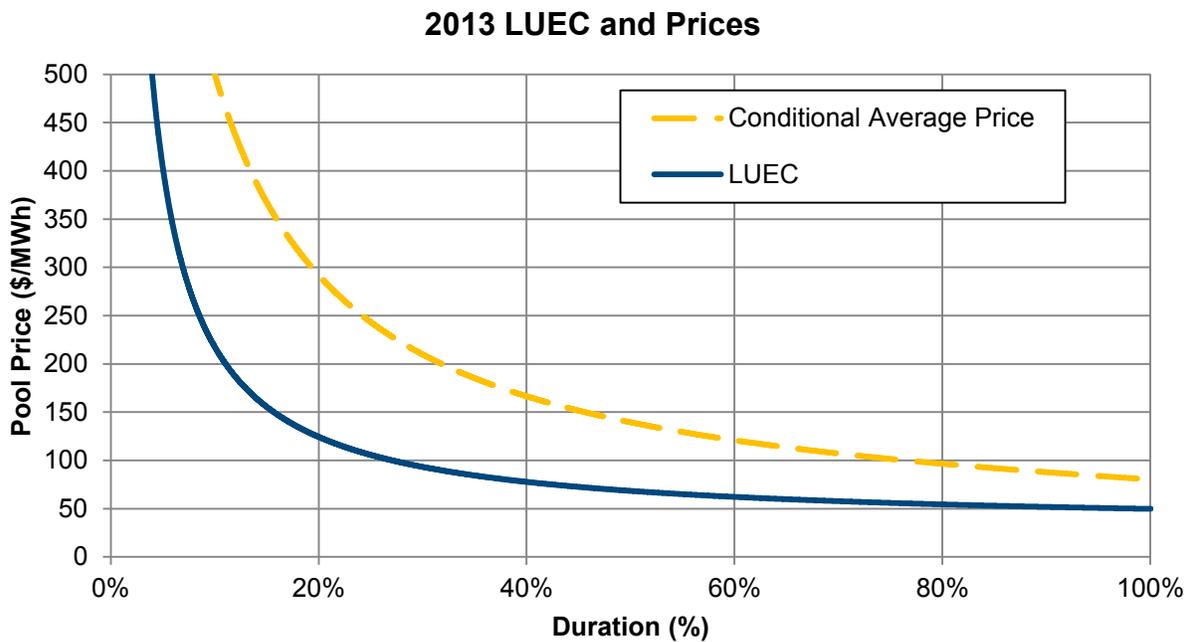
- There was opportunity for entry in 2013, which was captured by the entry of the Shepard unit and the Kearl cogeneration expansion. The changing price environment from 2013 to 2014 was also due the force majeure and subsequent return of Keephills 1, Sundance 1, and Sundance 2.
- Abundant supply in the years 2015 to 2017 was reflected in the low-price environment.
- Prices starting in 2018 and extending through 2021 are in line with LUEC. This signals that there may be the opportunity for entry in this time period.
 - The recent announcement of the 800 MW Suncor cogeneration expansion, along with potential coal-to-gas conversions, indicate that the market is responding to this new price outlook.

Conclusions

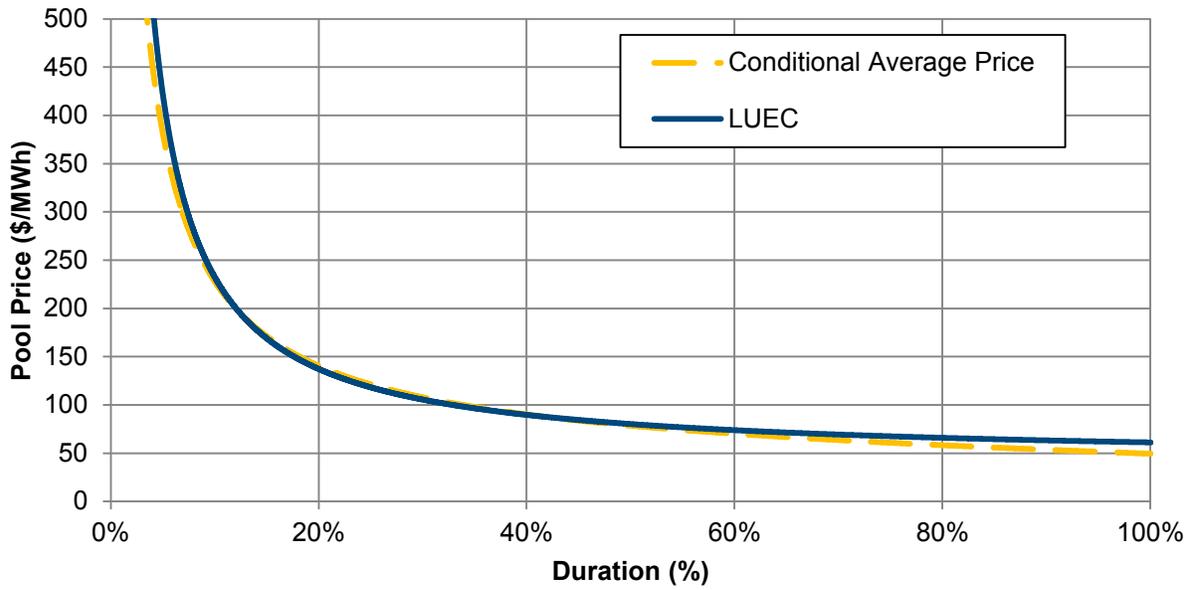
Historical price setting in Alberta's energy-only market has been efficient, exhibiting an acceptable amount of static efficiency losses. The period subsequent to the Balancing Pool period, 2018 and forward, has had increases in static inefficiencies but at levels that are lower than in the period 2008 to 2012.

The long-term signals provided by the energy-only market to attract new generation have been efficient. The market signaled that a new peaker plant would be able to recover fixed costs in 2013 and 2014 and new generation was added in 2015. During the 2015 to 2017 period the market was well supplied and the long-term cost recovery signal provided by the market indicated a new entrant would not be able to recover fixed costs. Currently the market is largely in balance but the 2021 forward prices are signaling that a new entrant could recover fixed costs. Coincidentally or in response to this signal, there have been announcements of significant new generation development that will be online by the end of 2023.

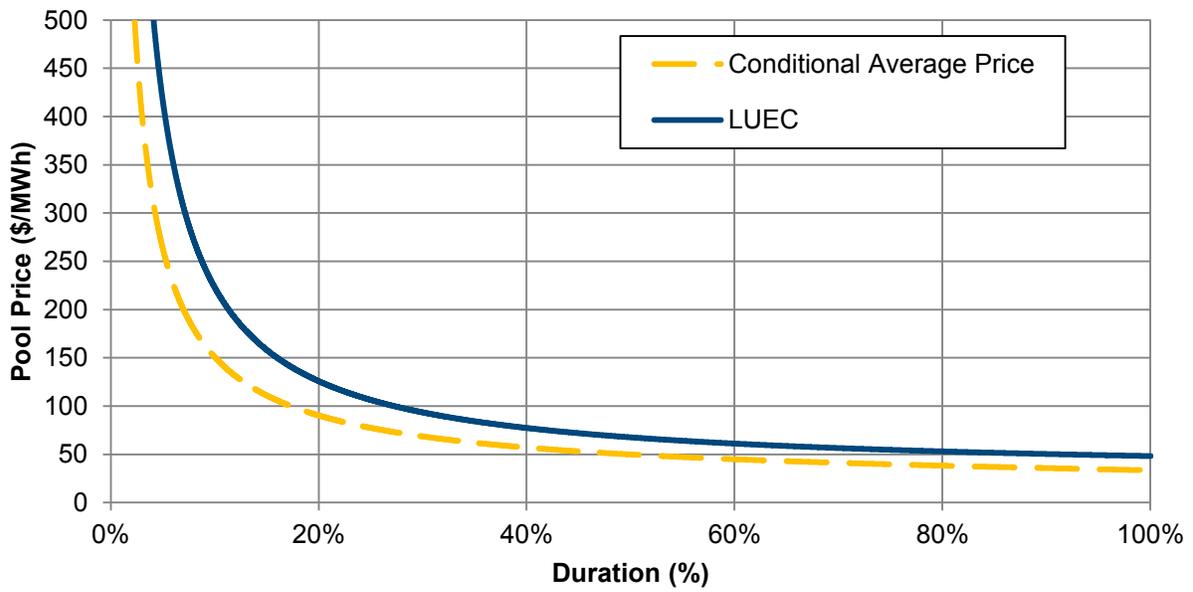
Figure 2: Full dynamic efficiency results for the time period 2013 to 2021



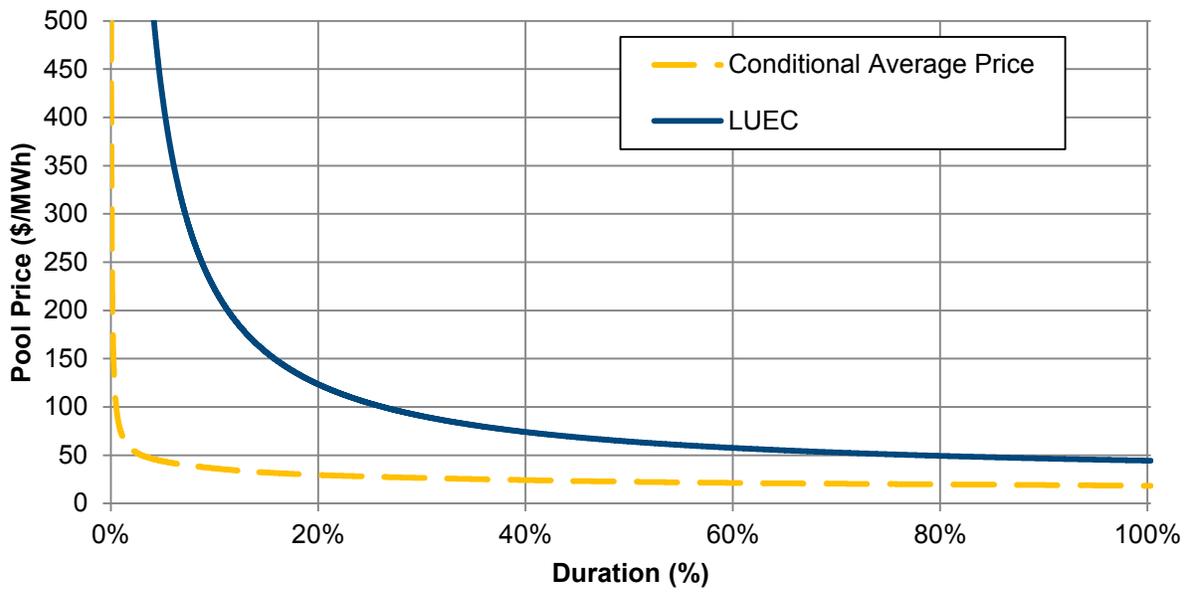
2014 LUEC and Prices



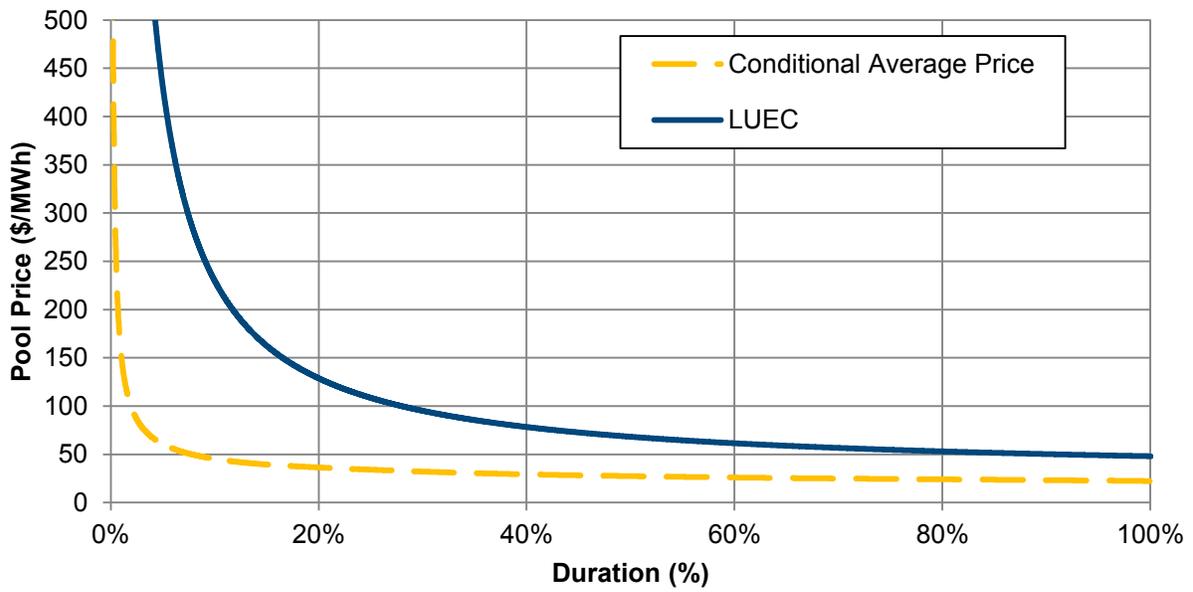
2015 LUEC and Prices



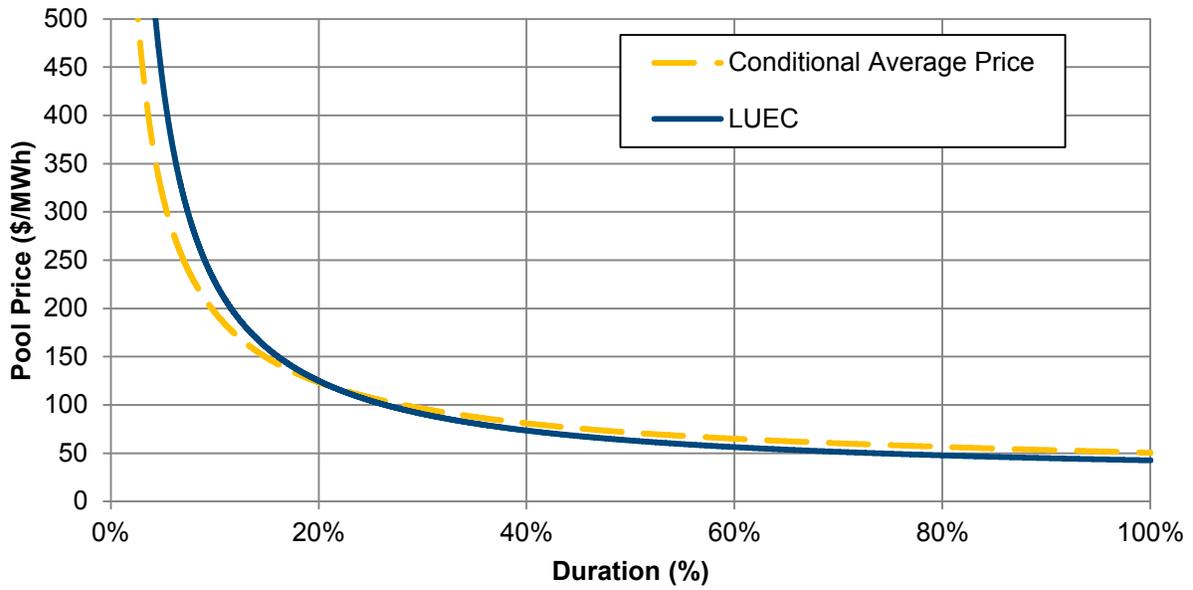
2016 LUEC and Prices



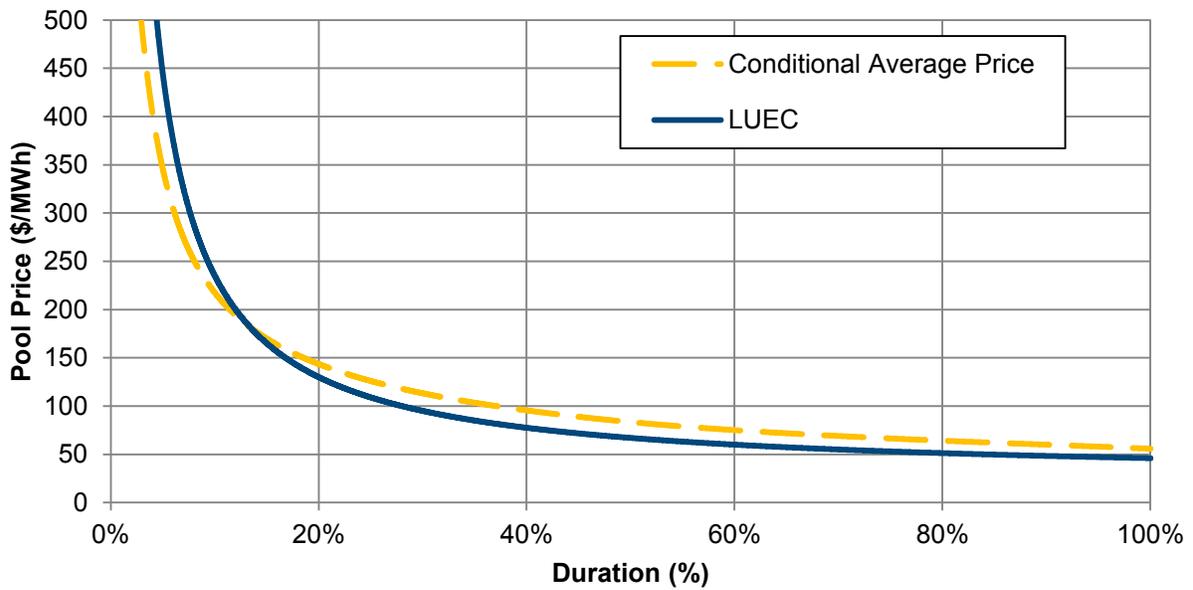
2017 LUEC and Prices



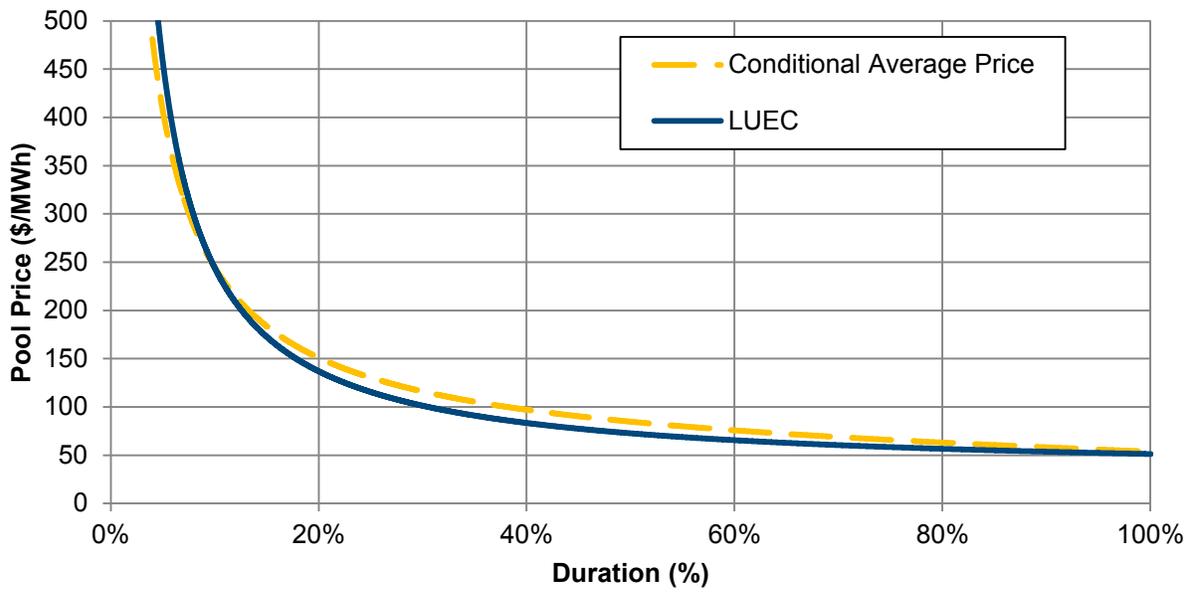
2018 LUEC and Prices



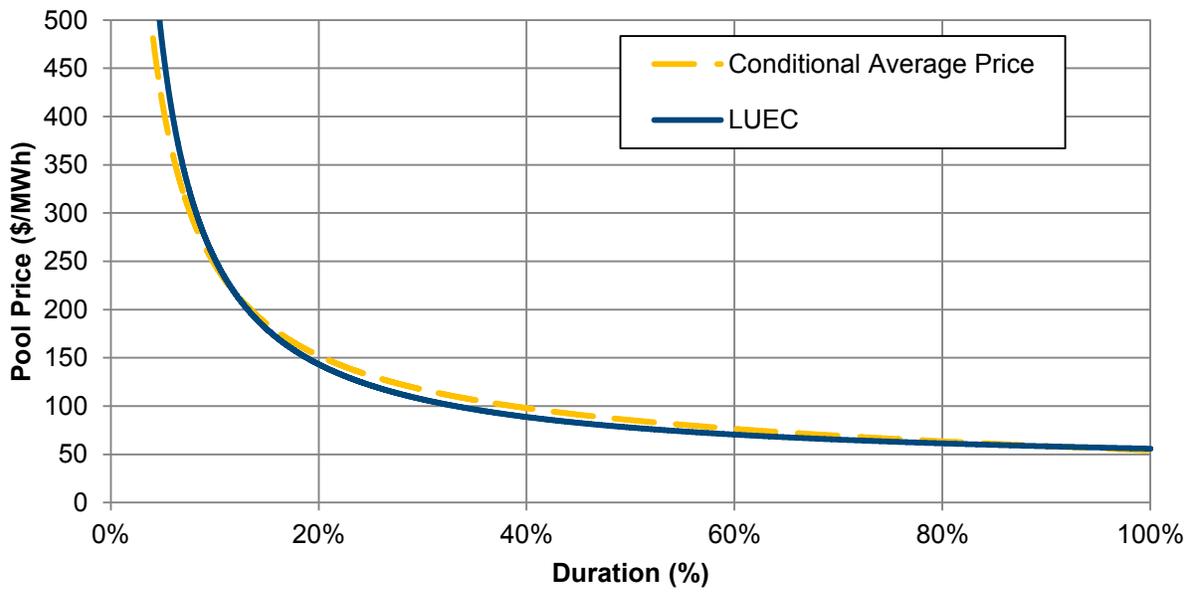
2019 LUEC and Prices



2020 LUEC and Prices



2021 LUEC and Prices



Appendix E:

Operating Reserve (OR) Market Review



Operating Reserve (OR) Market Review

This appendix provides additional detail on the analysis undertaken in regards to the operating reserve (“OR”) market. The first section lays out background information on the market. The subsequent section provides an overview of the concentration on a historical, current, and forward-looking basis. The final section reviews some examples of the exercise of market power in this market.

What is OR

All electricity system operators are required to maintain operating reserves to maintain reliability in the event of a contingency (for example, a large generator or intertie tripping offline) or to manage minute-to-minute system fluctuations. In Alberta, different markets are operated for each type of OR product. The OR market consists of three products: regulating reserves, spinning reserves, and supplemental reserves. The categories of reserves are based on their operating characteristics:

- Regulating: reserves that can respond automatically through automatic generation control to increase or decrease energy output
- Spinning: reserves that are synchronized and can therefore provide energy immediately in response to a frequency deviation
- Supplemental: reserves that can provide energy (or reduce demand) within 10 minutes of receiving a dispatch

Each reserve market also has “active” and “standby” products. Each reserve market settles for on-peak, off-peak, and super-peak AM and PM (active regulating reserve only) blocks. A market participant must qualify its facility to provide each type of reserve based on the technical requirements in each category (regulating, spinning, or supplemental) and the capability of its generating resource (or load) before it can participate in the market.

The OR markets clear ahead of the delivery day. The AESO places a bid (price and volume) into each market, based on a forecast of reserves needed for the following day. Each market participant with a qualified facility may submit an offer into the market.

Once offers and bids have been placed, each market closes in sequence; commencing with active regulating on- and off-peak, then with active regulating super-peak, active spinning, active supplemental and finally followed by standby regulating, spinning, and supplemental.¹ Prices are set in each market using an “equilibrium price” formula in the active market and a “blended price” formula in the standby market.²

In the active OR markets the equilibrium price is paid out relative to the price of energy (indexed), so that participants are paid the sum of the pool price and the active OR price for the OR product they are contracted to provide (OR products are often traded at a discount to pool price so the sum is often a value

¹ reference: <https://www.aeso.ca/assets/documents/ID-2013-005R-Operating-Reserve.pdf>

² The price formulas are provided in <https://www.aeso.ca/assets/documents/ID-2013-005R-Operating-Reserve.pdf>

less than the pool price).³ The OR price compensates providers for the opportunity cost of providing reserves rather than providing energy (any energy provided in response to a dispatch is paid the corresponding pool price).

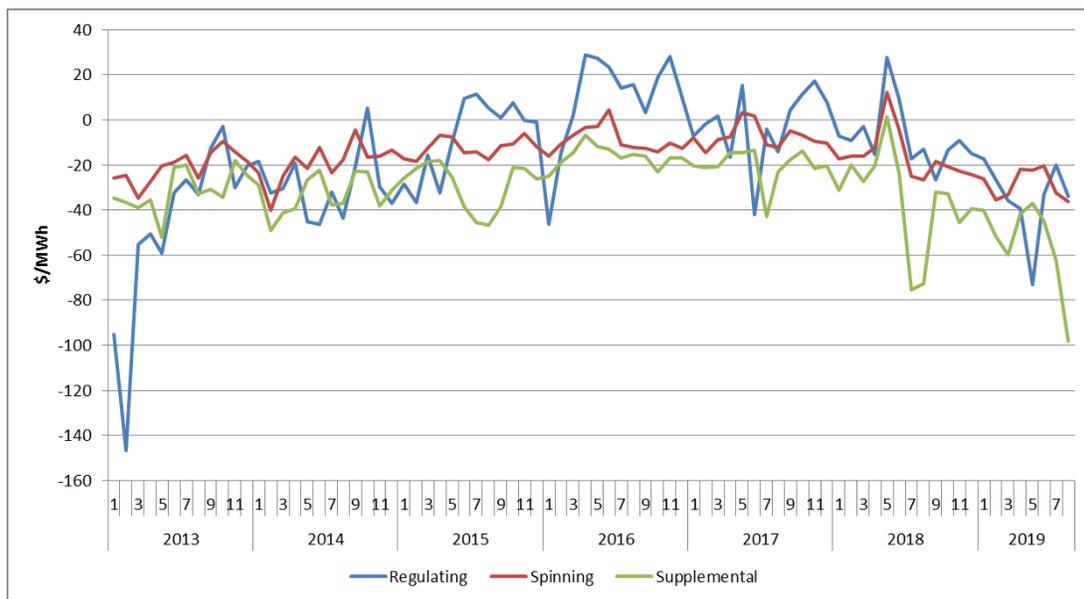
OR market background

OR market value

The total value of the OR market has ranged from approximately \$50M to \$250M per year, across all products. The variation is primarily driven by variation in the energy pool price, since the price of active OR products are directly indexed to the price of energy.

Figure 1 displays the cleared price of active OR products from 2013 to 2019 and represents the index price. Figure 2 displays the settled price, which represents the final price paid (index price plus pool price). In general the cleared price has been at a discount to the pool price (displayed as a negative value in Figure 1), although there are times when it has cleared as a premium. In more recent periods the price of the regulating reserve product has generally cleared above the spinning price, which in turn has cleared above the supplemental price. This result is expected because the regulating reserve product is typically a higher-value service than spinning or supplemental, and spinning is a higher-value service than supplemental.

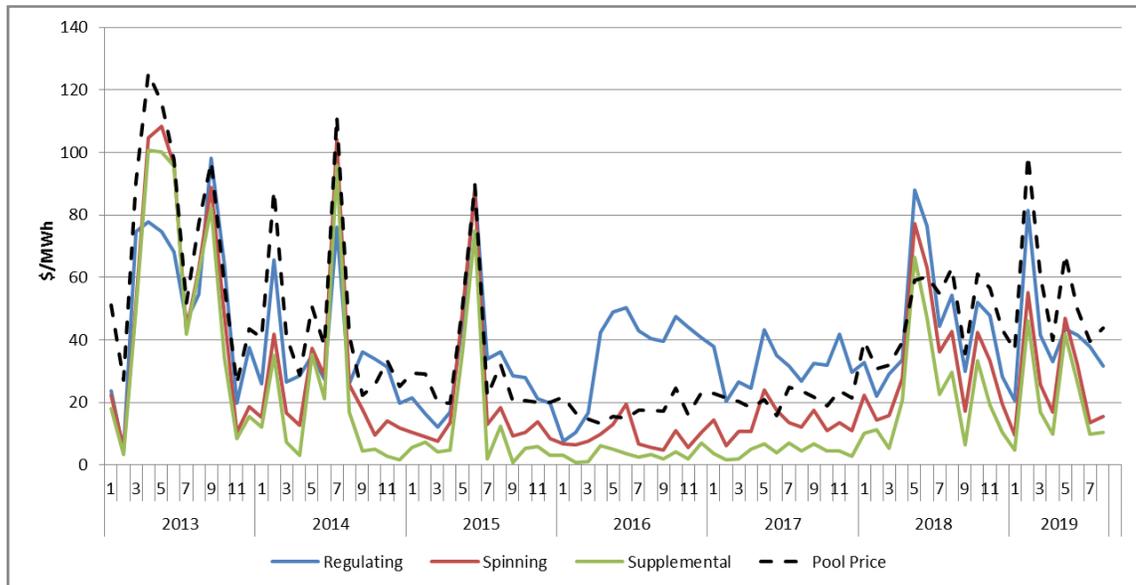
Figure 1: Cleared OR prices (active) monthly average 2013 to 2019



³ In the standby market participants receive their offered premium in exchange for the right for the AESO to call on them to provide reserves on the delivery day. In the event they are called upon (activated), they will receive their offered activation price.

Because the OR price is indexed to the energy price, part of the variation in the OR price is explained by variation in the energy price, which is demonstrated in Figure 2. For example, the period during which the Balancing Pool possessed significant market share (as discussed in Appendix B) exhibits generally lower-settled OR prices compared to other periods, because of lower energy prices at those times. The pre-and post-Balancing Pool periods exhibit much more variation in settled prices, as there is much more variation in the energy price.

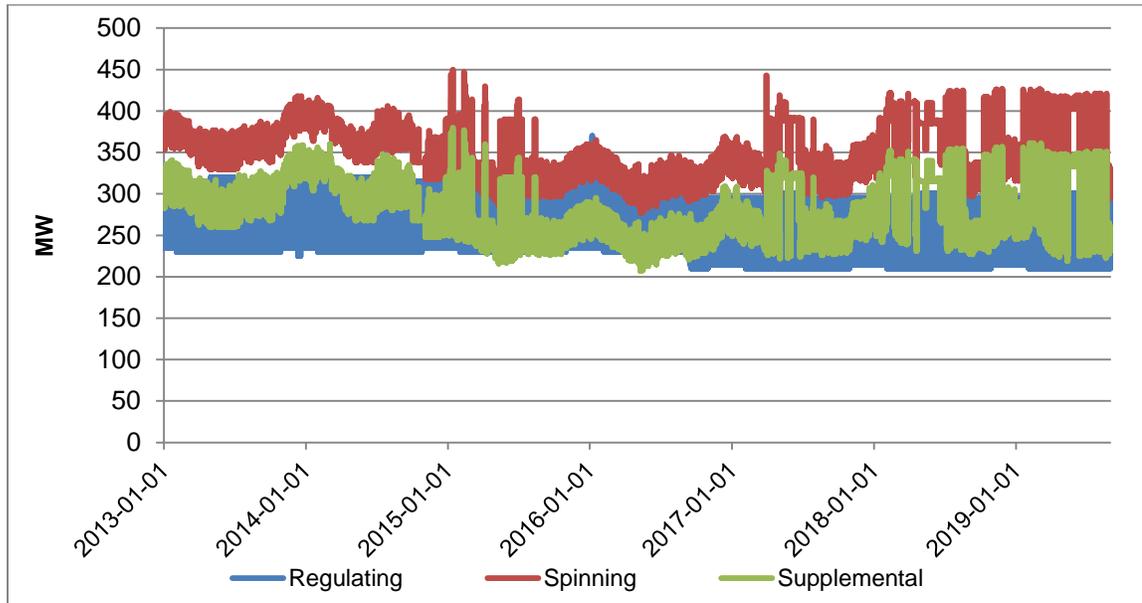
Figure 2: Settled OR prices (active) monthly average 2013 to 2019



OR market demand

The OR market is smaller than the energy market in terms of total volume of trade and number of participants. Figure 3 shows the range of the AESO bid volumes for each market from 2013 to 2019. The AESO bid volumes for both standby and active products have been combined to show the total demand from the AESO across both products. The range of bid volumes reflects the range between the AESO's on-peak and off-peak demand. In general, for on-peak periods the AESO has purchased up to 370 MW of regulating reserves, up to 450 MW of spinning reserves, and up to 380 MW of supplemental reserves, for both standby and active markets. The AESO's bid volume has not varied significantly across the period 2013 to 2019. The month-to-month variation in the AESO's bid volume reflects variation in expected import levels.

Figure 3: AESO OR bid volume (active and standby) 2013 to 2019



Supply and market share

The AESO’s demand for reserves is met by several assets that are controlled by relatively few participants, particularly in the smaller, more concentrated reserve product markets (regulating and spinning). In the regulating reserves market, for example, 18 assets have been contracted (cleared in the market) to provide reserves since 2013. Twelve of those assets are controlled by the four largest participants. By comparison, in the supplemental reserves market there are 33 participants who have contracted 47 assets to provide supplemental reserves since 2013. The total number of assets offering in the regulating and spinning reserve markets has remained relatively stable over time, with an increase in the number of participating assets most prevalent in the supplemental reserves market since 2013.

Table 1 shows the total volume of qualified capacity by the top four participants in each market. An important note about the qualified volumes: a MW that is qualified to provide one product is also qualified to provide another product with less strict technical requirements. For this reason, the total qualified volume is less than the sum of qualified volume in each type of OR product. Further, for reliability reasons no asset can provide more than 80 MW of any OR product unless it has an exception. All the hydro assets have such an exception, as well as a handful of thermal assets, with the exceptions reflecting the physical capabilities of the facilities.

The hydro assets which are currently subject to a financial power purchase arrangement (PPA) with the Balancing Pool are shown separately as “TransAlta Hydro”. These are shown separately from TransAlta’s other thermal assets because the hydro PPA creates incentives in the OR market that differ from the remainder of the market.⁴

⁴ The hydro PPA acts as a form of market power mitigation since it creates a financial incentive for TransAlta to contract a certain portion of energy and reserves in each month (specified under the confidential terms of the agreement between TransAlta and the Balancing Pool). The financial incentives under the contract limit the benefit from strategic behaviour (such as physical and economic withholding) that would otherwise exist because pursuing alternative offer strategies may result in financial payments through the PPA. Given this contractual structure the assets subject to the hydro PPA are offered primarily as price takers in the OR markets.

Table 1: Market participants by qualified volume (MW) as of 2019

	Total* (Qualified MW)	Regulating (Qualified MW)	Spinning (Qualified MW)	Supplemental (Qualified MW)
ATCO	694	215	694	694
ENMAX	464	320	374	464
TransAlta	160	150	160	160
TransAlta Hydro	650	398	432	500
Balancing Pool	476	298	400	400
Other	1,840	228	914	1,840
Total	4,284	1,609	2,974	4,058

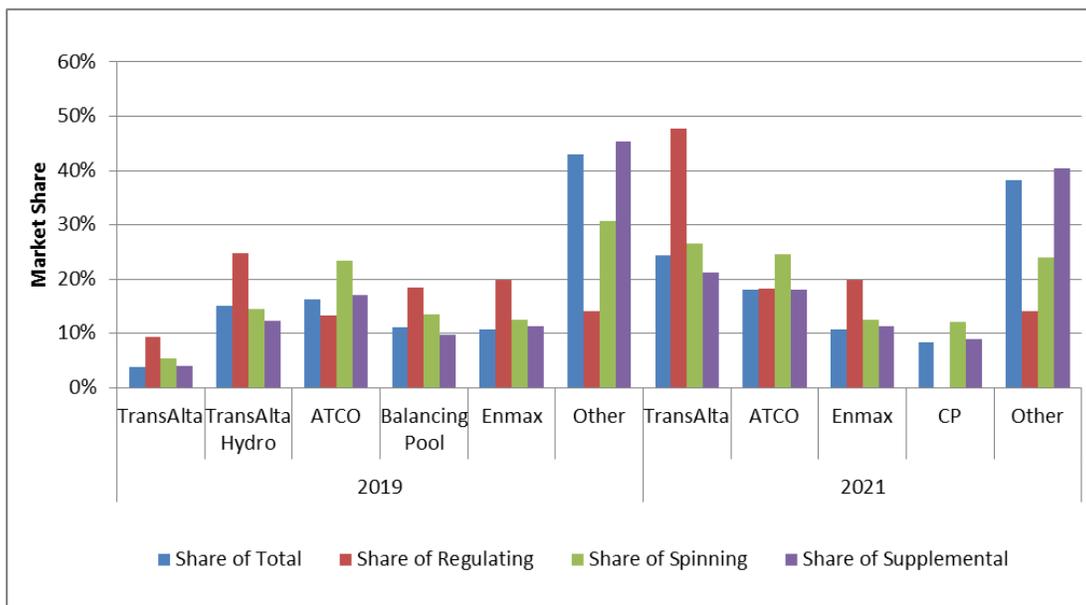
**The total is less than the sum across the three markets, as a MW that is qualified for regulating will also be qualified for spinning and supplemental.*

The hydro assets which are subject to the PPA make up a significant portion of the largest supplier's reserve market portfolio. For example, in the regulating reserves market, TransAlta Hydro has 25 per cent of the qualified volume. Given the significance of the hydro PPA to the OR market share, the coming expiration of the PPA will have an impact on qualified market share. All the current PPAs are set to expire by 2021, and the assets and associated offer control will be returned to the original, pre-deregulation owners. Following this change, market concentration in the OR markets is expected to increase.

To illustrate this, Figure 4 shows the qualified capacity concentration levels before and after the expiration of the PPAs. The shares of qualified capacity are calculated based on the current total qualified capacity (i.e., with the assumption that no additional entry occurs) associated with the ownership that will be in place once the PPAs have expired.⁵

⁵ TransAlta announced strategic investment by Brookfield Renewable Partners in March 2019 (<https://www.transalta.com/investors/press-releases/transalta-announces-strategic-investment-by-brookfield-renewable-partners/>). The current assumption is that offer control for hydro assets will remain with TransAlta.

Figure 4: Market share by qualified volume (%) 2019 and post-PPA expiry



The change in shares of qualified capacity following the expiration of the PPAs will be significant. The share of qualified capacity increases for the largest participants. The largest share of qualified volume belongs to TransAlta in every market. Specifically, TransAlta will have 48 per cent of the qualified MWs in the regulating reserves market and a smaller, but similarly significant share of the spinning reserves qualified volumes at 27 per cent. Shares of the qualified volumes in the supplemental reserves market will remain low among the largest participants.

Market share of top four OR market participants

The volume of capacity that is qualified to provide reserves is informative insofar as projecting changes in concentration once the PPAs expire, but it is not sufficient to explain pricing outcomes in the OR market. Unlike in the energy market, there is no must-offer requirement to offer qualified reserve volume. For this reason the qualified capacity at the market’s disposal cannot be counted on to discipline market outcomes, as it may not be offered each day.

The volumes that are contracted in the market are more fundamental to the role of concentration in the price outcomes, since those are the volumes that set price. Prices have most often remained low even with the high concentration in the qualified capacity, as there is typically more than enough offers from qualified capacity to meet the AESO’s bid in any given market.

The market share of the largest participant is much higher when considering contracted volumes. Specifically, regulating reserves market share is dominated by the hydro assets held by TransAlta (more than 60 per cent of the market in some months, and an average of 29 per cent to 47 per cent over time across each market), pointing to the important role of the hydro assets in market outcomes observed over time.

Information on market share of the top four companies based on contracted active volumes is summarized from 2013 to 2019 in Table 2, and presented over time in Figures 5, 6 and 7 that follow.

Table 2: Market participant share by contracted volume (%) 2013 to 2019

	Total (contracted MW as percent of total contracted MW)	Regulating (contracted MW as percent of total contracted MW)	Spinning (contracted MW as percent of total contracted MW)	Supplemental (contracted MW as percent of total contracted MW)
ATCO	19%	11%	22%	22%
ENMAX	10%	21%	8%	3%
TransAlta	2%	0%	3%	4%
TransAlta Hydro	39%	47%	41%	29%
Balancing Pool	2%	1%	3%	0%
Other	28%	19%	24%	42%

Figure 5: Active regulating reserves contracted market share 2013 to 2019

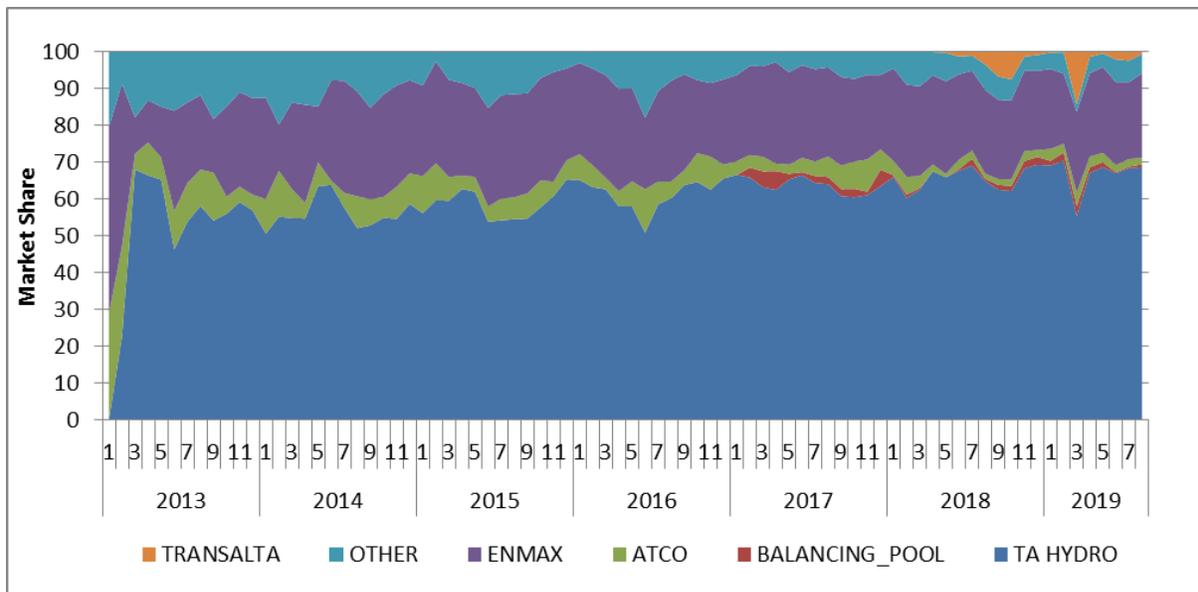


Figure 6: Active spinning reserves contracted market share 2013 to 2019

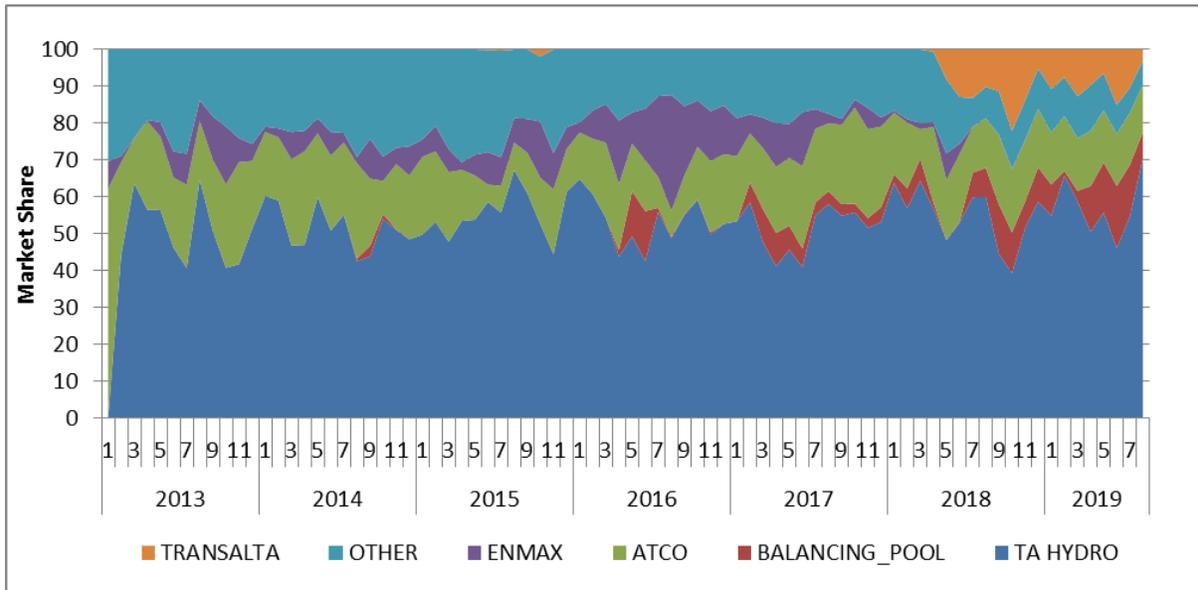
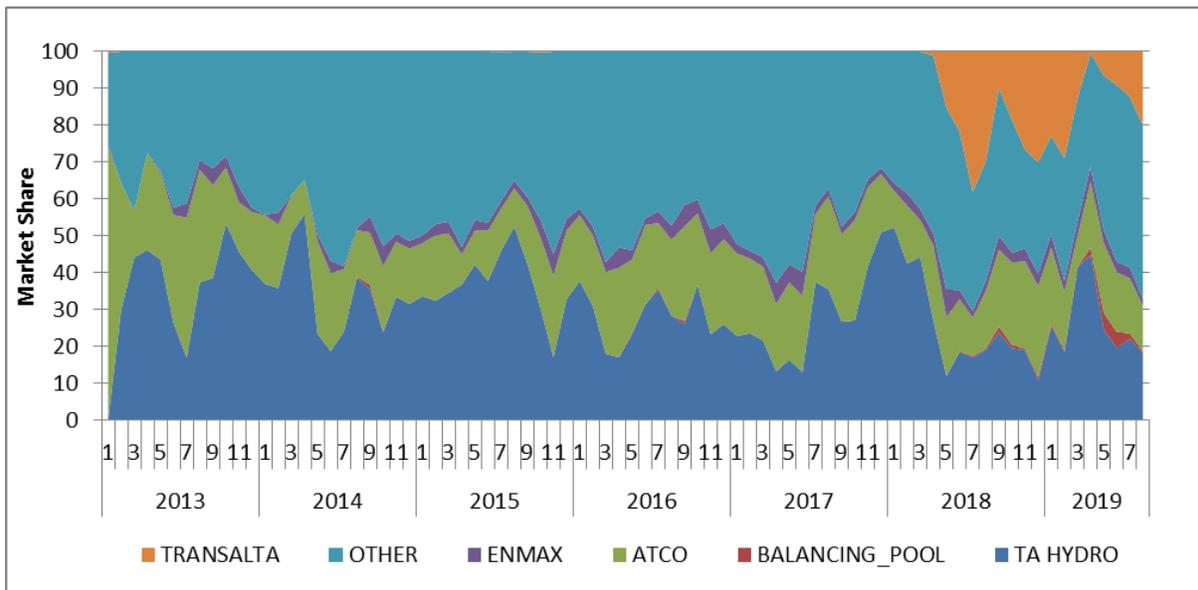


Figure 7: Active supplemental reserves contracted market share 2013 to 2019

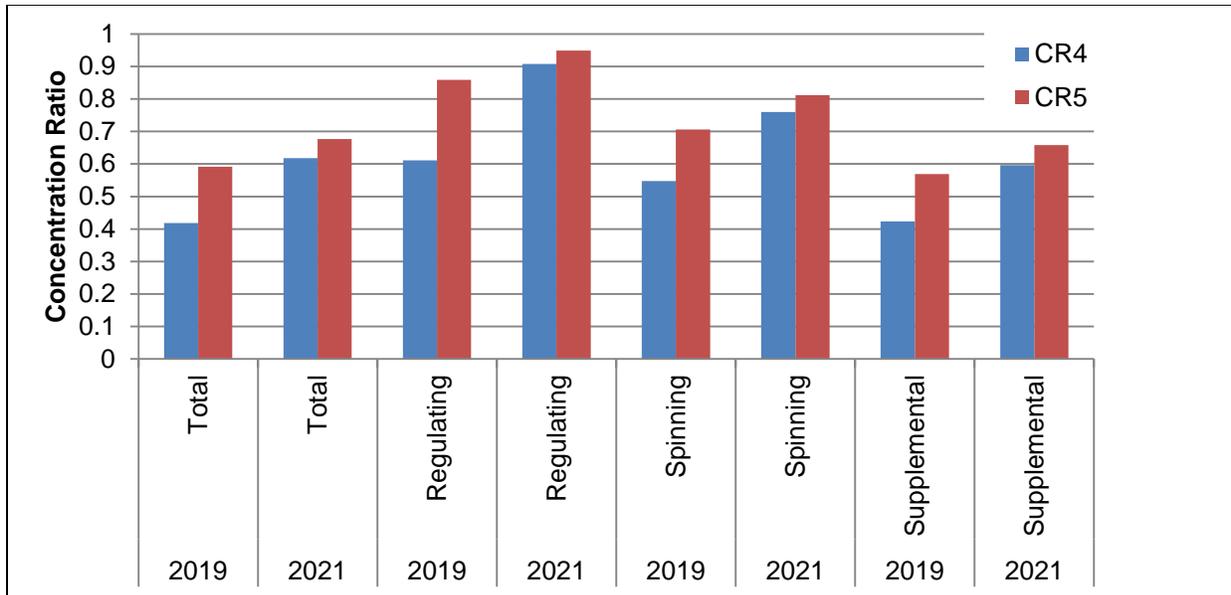


Concentration ratio

Concentration ratios describe the combined market share of offer control of the largest firms in a market. Figure 8 shows the concentration ratio for the largest four (CR4) and the largest five (CR5) market participants based on their qualified capacity in each market. The concentration ratio shown is calculated based on current offer control over qualified capacity and, as above, based on the ownership and offer control that is expected following the expiration of the PPAs. The most concentrated market is the

regulating reserves market, which is expected to become more concentrated following the expiration of the PPAs.

Figure 8: Concentration ratio: Qualified capacity 2019 and 2021 (post-PPA expiry)



Conclusions

The hydro PPA is a fundamental influencer in outcomes in the OR market, and has impacted cleared OR prices since the market’s inception. For example, in a report published in January 2004 the Market Surveillance Administrator (MSA) observed that the hydro PPA created incentives for the owner to act in ways that resulted in aberrant market outcomes.⁶ Another more recent example occurred in May 2018 when a series of events contributed to high energy and OR prices. During this month cleared OR prices were higher than what had been previously observed, with all three OR products clearing at a premium to the energy price. It appears that strategic offering behaviour on the part of a limited set of market participants contributed to the higher OR prices.⁷

It is not expected that the operations of the hydro facilities will change when the hydro PPA expires as the regulatory and environmental requirements to maintain river flow will not change, but the financial incentives will change significantly. With the expiry of the PPA the financial benefits of all OR sales from the hydro assets will be for the owner’s benefit.

At the same time the PPA generation owners’ share of capacity qualified to supply OR will increase due to the return of the PPA asset offer control to these firms.

While changes to concentration on their own do not imply that market power will be exercised, the effects of concentration and limited participants become a factor in setting prices when there are some facilities

⁶ <https://resources.albertamsa.ca/files/SpinningReserveMarketEventReport012304.pdf>

⁷ <https://resources.albertamsa.ca/uploads/pdf/Archive/000000-2018/2018%2008%2003%20MSA%202018%20Q2%20Quarterly%20Report.pdf>

that are unable to participate (for example, due to outages) that may limit the available capacity for a limited period of time. There have been examples of such circumstances throughout the market's history that may provide an indication of potential future behaviour. The AESO has the ability to monitor the OR market to assess changes to behaviour and outcomes in this market. Should market outcomes change sufficiently the AESO has the ability to make market design changes within the current framework, with the goal of expanding the competitive playing field and strengthening competition.

Appendix F:

Stakeholder Comments Summary



Stakeholder Comments Summary

This appendix provides the Stakeholder Comments Summary below that was posted on the AESO's website on Nov. 5, 2019.

The AESO considered the input stakeholders provided in developing its advice to the Minister of Energy. Of note, the AESO does not share the view that the 30 per cent offer control threshold in the *Fair, Efficient and Open Competition Regulation* (FEOC Regulation) requires review. From the limited issues identified from the analysis discussed in this report, as well as the robustness of the mitigation framework as a whole, revision to this singular aspect is not warranted at this time.

Market Power and Market Power Mitigation Update to Stakeholders

Introduction

On July 25, 2019 the AESO received direction from the Alberta Minister of Energy (the "Minister") to provide advice regarding market power and market power mitigation by Nov. 29, 2019.

In providing its advice to the Minister on this matter, the AESO wishes to ensure that it has considered the perspectives of the Market Surveillance Administrator (MSA), market participants and other interested parties ("stakeholders"). The AESO put out a request for information to seek input from stakeholders regarding market power and market power mitigation in the context of Alberta's energy-only and ancillary services markets.

The AESO thanks all those who submitted their feedback. Each submission was reviewed in detail and the input received will be considered in developing the AESO's advice to the Minister regarding market power and market power mitigation.

Summary of Stakeholder Feedback from Market Power Mitigation Comment Matrix

On Oct. 8, 2019 the AESO posted on www.aeso.ca a letter requesting input from stakeholders on market power and market power mitigation by Oct. 29, 2019.

Respondents

A total of 19 submissions were received from stakeholders including:

- 13 power industry
- 4 associations/organizations
- 1 individual
- 1 agency

The AESO summarized the feedback received from stakeholders into the following sections:

1. Effectiveness of historical approach in the energy market
2. Future changes to the energy market
3. Effectiveness of historical approach in markets for operating reserve
4. Future changes to markets for operating reserve
5. Criteria for change
6. Roles of MSA and AESO

1. Effectiveness of historical approach in the energy market

The majority of stakeholders were generally aligned in the view that the historical approach to market power mitigation in the energy market has been effective. Supporters of the historical approach highlighted that the energy-only market to date has:

- produced fair and reasonable prices for generators and consumers,
- fostered effective competition,
- provided reliable power by attracting efficient investment,
- allowed prices to reflect market fundamentals, and
- disciplined the undue exercise of market power.

It was emphasized that these outcomes occurred as the result of a strong framework (including the *Electric Utilities Act* (EUA), fair, efficient, and open competition (FEOC) regulation, the MSA, and the Alberta Utilities Commission (AUC)) that defined an environment where market participants could engage in robust competition and rely on market forces to drive short- and long-term decisions.

While most submissions were supportive of the historical approach, some common criticisms were raised by multiple parties:

- First, there was a concern that the historical success of the energy-only market was driven by the existence of the power purchase arrangements (PPAs). The virtual divestiture of these assets changed the incentives of market participants, and therefore it is difficult to distinguish whether historical outcomes were due primarily to the presence of the PPAs or the market power mitigation framework.
- Second, some parties raised concerns that ex-post enforcement was not applied in a fair and equal manner to all market participants. In particular, it was suggested that government agencies were not subject to the same enforcement standards as other parties, and that downwards price influences were not treated with the same rigor as upwards price manipulation.

2. Future changes to the energy market

While most stakeholders agreed that the historical approach performed well, there was a greater range of opinions regarding the need for an updated approach moving forward. The model of ex-post enforcement was still preferred, with modifications to the historical approach suggested by some stakeholders:

- Re-evaluation of the 30 per cent market share offer control threshold set out in the FEOC regulation. This threshold could be modified directly, or market participants that approach the threshold could be subject to increased mitigation measures (e.g., forward contracting requirements, participant-specific mitigation plans, etc.).

- Clarification and stability regarding the treatment of unilateral economic withholding. The MSA's Offer Behaviour Enforcement Guidelines could be reinstated and subject to a more formal and transparent process or the practice of unilateral economic withholding could be enshrined in legislation such as the FEOC regulation.

Most stakeholders believed that the expected future market conditions were not different enough from historical conditions to warrant a drastically revised approach to market power mitigation. However, some stakeholders had significant concerns that the expected increase in market concentration and expiry of the PPAs would require substantial reforms. As a result, a minority of stakeholders suggested that implementation of an ex-ante mitigation framework would be appropriate.

3. Effectiveness of historical approach in markets for operating reserve

Most stakeholders stated that, similar to the energy market, the historical approach in place for market power mitigation in the operating reserve (OR) market (the combination of legislation, regulation and market rules) has been effective in creating a competitive OR market.

Stakeholders had some different views on the role of participation limits in the market. Some viewed the 80 MW threshold per asset for participation in any one market as an effective form of mitigation that limits market power while others questioned it as an unnecessary restriction on competition.

Stakeholders did not pinpoint any areas of concerns or issues that have emerged relating to market power in OR apart from the early structure of the hydro PPA. The initial format of the hydro PPA interfered with rational price setting in the market and this concern was remedied when the PPA was revised in 2004.

Stakeholders noted that the energy and OR markets are related and that the threat of entry into the OR market was a factor in competitive outcomes, as rents from high prices due to an exercise of market power would attract new entrants.

Stakeholders remarked that the OR market has been effectively competitive and the use of competitive processes to procure operating reserve is sound and should be continued.

4. Future changes to markets for operating reserve

Several stakeholders stated that no changes are needed to the OR market because there have not been concerns with the current approach. The current mechanisms are simple and transparent and are operating efficiently and consultation and implementation of a new design will be costly.

Stakeholders noted that the backstop of ex-post investigation and enforcement is already in place and sufficient to handle any future issues of market power and anti-competitive conduct that could arise. Stakeholders recognized that the expiry of the PPAs, and in particular the hydro PPA, will likely have an impact on the energy and OR markets but competition will continue.

With regard to all of these competitive considerations, several stakeholders saw no need to adopt additional mitigation measures in the OR market.

For those who did see a potential for changes, stakeholders noted that they should be consistent with the market philosophy of ensuring fair, efficient, and open competition, and that any changes should target a specific need. Several specific changes were identified including an auction to provide some portion of reserves through a contractual arrangement, enhancing efficiency by jointly optimizing both energy and OR products, and ensuring the market rules are not limiting entry to the current market. All suggestions suggested the goal was to encourage and support competition.

Clarity and transparency were mentioned as key to the success, so that any changes result in a simple, understandable framework in which participants know with certainty what is and is not permissible.

Other stakeholders remarked that the marketplace needs additional information on the historical performance of the OR markets, including the post-PPA period, and that the AESO should evaluate and report on the efficiency of day-ahead procurement of OR.

5. Criteria for change

Stakeholders commented that Alberta's energy-only market structure is unique, few jurisdictions are directly comparable. Market design alternatives should be evaluated solely on their applicability to Alberta's specific market structure.

In Alberta energy prices must provide appropriate pricing signals to either incent or deter new generation. Prices must be sufficiently high to allow generators to recoup their cost and earn a reasonable rate of return (or risk early retirement). The energy-only market is fundamentally different from the capacity markets found in many jurisdictions limiting the extent to which their approach to mitigation is compatible with Alberta.

Stakeholders identified that Alberta's market is unique even in comparison to other energy-only markets. Alberta is a small market with little in common with other jurisdictions. Demand is met by several large individual players. There is a high load factor. Alberta has a congestion-free transmission policy. Alberta's market is not as highly regulated as in other jurisdictions, but the regulatory environment has not been stable.

Stakeholders provided an extensive list of criteria with which to evaluate potential changes to the mitigation framework, which can be summarized in the following categories:

- **Support competition:** Maintain a competitively driven energy price (allowing for dynamic and static efficiency to be reflected in the price). Competition should be encouraged as it provides the most efficient results. The framework should reflect that Alberta uses an energy-only market and recognize that proper pricing signals are of vital importance to the success of the market. The market should continue to promote dynamic efficiency and provide generators the opportunity to earn a fair return to ensure future investment. The framework should create a market that provides proper incentives to both existing and potential new entrants to the market through clear market signals. The historical approach has delivered on both reliability and competitive price outcomes, and can continue to do so. The focus should be on measures that promote competition, rather than administrative measures that interfere with the market.
- **Maintain stable framework:** Allowing the market to continue operating as intended and avoiding regulatory interference will help restore investor confidence in the Alberta electricity market. Policy certainty should be prioritized in evaluating any changes to the mitigation framework. Very important criteria is maintaining regulatory stability with as little regulatory burden as possible. If there is a valid concern around market power that should be addressed, any solution should fit within the existing market structure.
- **A mitigation framework should be fair, transparent, simple and clear:** There should be low administrative burden and stable rules. There should be clarity and transparency in design, market rules and interpretations of legislative/regulatory mandates by agencies. The framework should be practical, and allow execution without creating excessive administrative burden. Simple designs are

preferred. If there is an issue, any changes should be carefully considered, targeted, and specific to the issue.

- Any mitigation measures that are introduced should be considered and coordinated within the market framework as a whole: Market power mitigation should be limited to circumstances where it can be demonstrated that interference in the market is warranted, or else risk creating unintended consequences. Mitigation measures that are introduced could cause a number of other market design elements to be redesigned, which would increase complexity and potentially add costs. Changes should be considered against criteria that evaluates broader context and not simply follow a bright-line test. For example the FEOC regulation provides the context of fair, efficient, and open competition; these have been and continue to be effective criteria for the market. Market rules and any additions to the mitigation framework should not interfere with Alberta’s competitive retail market.

6. Roles of MSA and AESO

Stakeholders submitted a wide range of opinions regarding the appropriate roles for both the AESO and the MSA in the market power mitigation framework. These suggestions vary in their specificity and they relate to market power mitigation in differing degrees. Some of the suggested roles are listed below in no particular order:

AESO

- Implementation of government policy
- Ongoing assessment of dynamic efficiency
- Enabling and fostering competition
- Designing rules
- Designing rates
- Designing markets
- Collecting and dispensing information
- Administering databases and information systems
- Informing government and market participants
- Developing technical standards
- Procuring operating reserves
- Supporting public interest
- Reducing regulatory burden
- Operating the electric system
- Administering the energy and ancillary services markets
- Stakeholder consultation
- Supporting policy
- No role

MSA

- Enforcement of the FEOC regulation
- Ex-post monitoring for anticompetitive conduct
- Enforcement of AESO rules
- Investigations into market participant conduct
- Assessment that the market design achieves desirable outcomes
- Reporting on market outcomes

The submissions of many stakeholders could be summarized as having the AESO responsible for market design, policy implementation, and ongoing operation, while the MSA is responsible for ongoing monitoring, enforcement, and investigations. Many stakeholders specifically emphasized that the MSA should not be responsible for market design or the design of rules and guidelines.

A common theme of submissions was increased clarity regarding the roles of agencies, regardless of the roles themselves.

Appendix G:

Mitigation Approaches in Other Jurisdictions



Mitigation Approaches in Other Jurisdictions

The AESO reviewed the mitigation approaches used by other electricity markets within the US, Australia and New Zealand. The review was conducted to understand the mitigation approaches of the other jurisdictions and whether there were elements of those frameworks that would be appropriate for inclusion in Alberta’s market power mitigation framework. Capacity markets are included but are not directly comparable to energy-only markets due to the way the capacity payment is meant to provide fixed-cost recovery.

Jurisdiction	Mitigation Framework	Energy Market Pricing
Energy-only Market – Ex-post mitigation		
New Zealand¹	<p>Discretion to investigate The Electricity Authority (EA) code provides discretion for the [MSA] to declare ‘undesirable trading situations’</p> <p>Time limitation The EA cannot initiate an investigation after more than 10 business days after the situation occurred</p> <p>Retroactive pricing EA may retroactively impose administered pricing</p> <p>Safe harbor for pivotal suppliers EA code defines ‘pivotal’ and provides a safe harbor for pivotal suppliers, which are generalized as:</p> <ul style="list-style-type: none"> - offers are deemed okay if a suppliers offers do not result in a price increase inconsistent with prices in an immediately preceding trading period or other comparable trading or - the generator’s offers are generally consistent with offers it has made when it has not been pivotal; or - the generator does not benefit financially 	<p>Offer cap No Offer cap</p> <p>Price cap with stop loss A price cap based on the value of lost load with a stop loss.</p> <p>If scarcity pricing is triggered, a generation weighted average spot price (GWAP) will first be calculated for the regions. If the GWAP is lower than \$10,000 NZD/MWh, all prices within the affected region(s) will be scaled up to NZ\$10,000 /MWh.</p> <p>If the GWAP based is more than \$20,000/MWh, all prices will be scaled down so that GWAP is NZ\$20,000/MWh.</p> <p>A pricing mitigating mechanism will halt the application of scarcity pricing if the average price over any rolling seven day period is greater than NZ\$1,000/MWh.</p>

¹ <https://www.ea.govt.nz/code-and-compliance/the-code/>

Jurisdiction	Mitigation Framework	Energy Market Pricing
Australia National Energy Market	<p>Defined terms Distinguish ‘substantial market power’ and ‘transient pricing power’.</p> <p>Define <i>substantial market power</i> as the ability of a generator or group of generators to increase annual average wholesale prices to a level that exceeds LRMC, and sustain prices at that level due to the presence of significant barriers to entry.</p> <p>Define <i>transient pricing power</i> as the ability to increase prices above estimates of costs for short periods of time. Transient pricing power, manifested through occasional price spikes, is an inherent feature of a workable competitive wholesale market and is only a concern if it occurs frequently enough to lead to average annual wholesale prices above LRMC of generation.²</p> <p>Reporting National Electricity Law requires the AER to monitor the wholesale market and report on its performance at least every two years, including whether there is ‘effective competition’.</p> <p>The 2018 AER report concludes that while participants exercise market power, often it is only transient. AER does not have conclusive results of the exercise of substantial market power, but will closely monitor offer behaviour, fuel costs, changes to generation mix, and physical issues in states where electricity dispatch offers have increased.³</p>	<p>Price cap with stop loss EUE based price cap of AUS\$14,700/MWh (2019-2020)⁴</p> <p>Price cap lowered to AUS\$300/MWh if Cumulative Price Threshold (CPT) of AUS \$221,100 (2019-2020) is reached. That is – if the sum of spot prices for the previous seven days reaches the CPT, the market has provided the fixed cost recovery required for a peaker plant, and the price cap is lowered to \$300/MWh.⁵</p>

² <https://www.aemc.gov.au/sites/default/files/content/b0feca33-0630-45e8-9bfc-54dfa262acd0/Final-Determination.PDF>

³ <https://www.aer.gov.au/wholesale-markets/market-performance/aer-wholesale-electricity-market-performance-report-2018>

⁴ <https://aemo.com.au/Market-Notices?searchString=68807>

⁵ https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Dispatch/Policy_and_Process/Operation-of-the-administered-price-provisions-in-the-national-electricity-market.pdf

Jurisdiction	Mitigation Framework	Energy Market Pricing
Texas ERCOT⁶	<p>Defined terms ‘Market power abuse’ and ‘withholding of production’ are defined in Texas Public Utility Code and are unacceptable behaviours</p> <p>Exceptions to market power Market power mitigation does not apply to ‘small fish’ - suppliers controlling less than 5% of installed capacity⁷</p> <p>Control limitations Installed capacity limit is 20%</p> <p>Mitigation plan Allows voluntary mitigation plan which when approved by the Public Utilities Commission provides an absolute defense against allegations of market power abuse.⁸</p>	<p>Offer cap High system wide-offer cap (HCAP) - \$9,000/MWh Low system-wide offer cap (LCAP)– greater of \$2,000/MWh and 50 times the natural gas price index⁹</p> <p>Price cap An operating demand curve with the cap set at the value of lost load: \$9000/MWh</p>
California CAISO¹⁰	<p>Three pivotal supplier test Local market power mitigation based on assessment and designation of transmission constraints as competitive or non-competitive.</p> <p>Suppliers choose method of calculating default energy bid – variable cost option, negotiated rate option, or LMP option.</p> <p>Pivotal supplier’s incremental bids that relieve a binding transmission constraint are subject to mitigation.¹¹</p> <p>CAISO market design assumes there are competitive conditions in the CAISO balancing area at the system level.¹²</p>	<p>Offer cap \$1,000/MWh</p> <p>Price cap None, but highest shortage price is \$1,000/MWh¹³</p>

⁶ TPUC code, chapter 25, <https://statutes.capitol.texas.gov/Docs/UT/htm/UT.39.htm>

⁷ <https://www.puc.texas.gov/agency/ruleslaws/subrules/electric/25.504/25.504.pdf>

⁸ <https://www.potomaceconomics.com/wp-content/uploads/2019/06/2018-State-of-the-Market-Report.pdf>

⁹System-wide offer cap set at HCAP at beginning of each calendar year and maintained at this level until the peaker net margin during a calendar year exceeds a threshold of three times the cost of new entry of new generation plants. <https://www.puc.texas.gov/agency/ruleslaws/subrules/electric/25.505/25.505.pdf>

¹⁰ CAISO Tariff Section 39 updated April 1, 2019, retrieved from: <http://www.caiso.com/Documents/Section39-MarketPowerMitigationProcedures-asof-Apr1-2019.pdf>

CAISO Business Practice Manual for Market Instruments V55, retrieved from: https://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Instruments/BPM_for_Market%20Instruments_V55_redline.pdf

¹¹ <https://www.aeso.ca/assets/Uploads/4.2-Brattle-Paper-Mitigation.pdf>

¹² <http://www.caiso.com/Documents/SystemMarketPowerAnalysis-May6-2019.pdf>

¹³ <https://www.aeso.ca/assets/Uploads/4.3-Brattle-Paper-Shortage-Pricing.pdf>

Jurisdiction	Mitigation Framework	Energy Market Pricing
Capacity and Energy Markets		
Eastern US - PJM Inter-connection LLC	<p>Three pivotal supplier test Uses a 3 pivotal supplier (TPS) test to identify pivotal suppliers</p> <p>Pivotal supplier mitigation Suppliers that fail the TPS test are subject to offers to a maximum reference price, i.e. an offer price level that includes only verifiable resource marginal costs. The independent market monitor is allowed to verify these costs¹⁴</p> <p>PJM imposes mitigation on entire generating unit of pivotal supplier's incremental offer.¹⁵</p> <p>Day-Ahead Market - offer caps are applied at the time of commitment and apply for the length of time the unit is scheduled in the Day-Ahead Market at the schedule that results in the lowest overall system</p> <p>Real Time Market – offer caps are applied at the time of commitment and apply at the schedule that results in the lowest dispatch cost¹⁶</p>	<p>Offer cap Offer cap \$1,000/MWh, or cost-based incremental energy offer capped at \$2,000/MWh for purpose of dispatch and calculating locational marginal price.¹⁷</p> <p>Price cap Shortage pricing capped at \$3,700/MWh¹⁸</p>

¹⁴ <https://www.pjm.com/-/media/documents/manuals/m15.ashx>

¹⁵ <https://www.aeso.ca/assets/Uploads/4.2-Brattle-Paper-Mitigation.pdf>

¹⁶ <https://www.pjm.com/-/media/documents/manuals/m11.ashx>

¹⁷ If verified cost-based incremental energy offer exceeds \$2,000/MWh, a resource may be eligible for a make-whole payment. <https://www.pjm.com/markets-and-operations/energy/energy-offer-verification.aspx>

¹⁸ <https://www.pjm.com/-/media/documents/manuals/m11.ashx>

Jurisdiction	Mitigation Framework	Energy Market Pricing
North Eastern US - ISONE	<p>RSI combined with conduct and impact tests Conduct and impact tests apply to a market participant that is determined to be a pivotal supplier</p> <p>Conduct test Non-constrained areas: suppliers must offer at the lower of 400% of their reference price or \$100/MWh above their reference price Constrained areas: suppliers must offer at the lower of 150% of their reference price or \$25/MWh above their reference price otherwise they fail conduct test</p> <p>Impact test Non-constrained areas: the supply offer cannot raise the clearing price by more than the lower of 200% or \$100/MWh Constrained areas: the supply offer cannot raise the clearing price by more than the lower of 50% or \$25/MWh¹⁹</p> <p>Failing both the conduct test and the impact test results in the resource's offer being replaced by its reference price.²⁰</p>	<p>Offer cap Offer cap currently \$1,000/MWh, March 2020 implementation of verified cost-based incremental energy offers up to \$2,000/MWh²¹</p> <p>Price cap Fixed penalty factors for depletion of each type of reserve²²</p>

¹⁹ https://www.iso-ne.com/static-assets/documents/regulatory/tariff/sect_3/mr1_append_a.pdf

²⁰ Reference price calculated by IMM, based on the following order: The lower of the mean and median of a resource's accepted offers in the last 90 days. This can be adjusted by fuel price if it is relevant. 25th percentile LMP at the resource's node during which the resource was dispatched at in the last 90 days. This can also be adjusted by fuel price if it is relevant. A fundamental ground-up calculation based upon plant characteristics, verifiable costs, and opportunity costs

²¹ Per FERC Order 831 <https://www.iso-ne.com/participate/support/customer-readiness-outlook/>

²² Section III.2.7A: https://www.iso-ne.com/static-assets/documents/2014/12/mr1_sec_1_12.pdf

Jurisdiction	Mitigation Framework	Energy Market Pricing
New York - NYISO	<p>Conduct and impact tests</p> <p>Conduct test Non-constrained area: the resources' offers cannot exceed its reference price by the lower of 400% of the reference price or \$100/MWh more than the reference price. Constrained area: conduct test based on the lower of non-constrained area thresholds and a formula where higher historical market prices increase the threshold and higher historical constrained hours decrease the threshold.²³</p> <p>Impact test Non-constrained area: the resource's offer price may not raise the clearing price by the lower of 200% or \$100/MWh more than the reference price. Constrained area: threshold determined in accordance with formula specified in the conduct test.</p> <p>Failing both the conduct test and the impact test results in the resource's offer being replaced by its reference price.²⁴</p>	<p>Offer cap Offer cap \$1,000 USD/MWh, with no more than \$100 USD/MWh adder. If supported by cost the offer can be no more than \$2,000 USD/MWh</p> <p>Price cap No price cap, but prices are limited by shortage costs. Operating Reserve Demand Curve for each operating reserve requirement²⁵</p>

²³ Section 23.3.1.2.2.1 <https://nyisoviewer.etariff.biz/ViewerDocLibrary/MasterTariffs/9FullTariffNYISOMST.pdf>

²⁴ Reference price calculated by NYISO based on the following order: The lower of the mean and median of a resource's accepted offers in the last 90 days for hours between 7 am and 10 pm on working weekdays. This can be adjusted by fuel price if it is relevant. 50th percentile LMP at the resource's node during which the resource was dispatched at in the last 90 days. This can also be adjusted by fuel price if it is relevant. A fundamental ground-up calculation based upon plant characteristics, verifiable costs, and opportunity costs.

²⁵ <https://www.nviso.com/documents/20142/2923301/ancserv.pdf/df83ac75-c616-8c89-c664-99dfea06fe2f>

Jurisdiction	Mitigation Framework	Energy Market Pricing
Midwest US - MISO	<p>Conduct and impact tests</p> <p>Conduct test: Broad Constrained Area: threshold is the lower of 400% of the reference price or \$100/MWh above each generating unit's reference level. Offers below \$25/MWh are not considered economic withholding.</p> <p>Narrow Constrained Area: threshold is net annual fixed costs of a new peaking generator divided by the total number of hours over the prior 12 months during which a binding transmission constraint occurred in the constrained area</p> <p>Impact test: Broad Constrained Area: threshold is the lower of an increase of 200% or \$100/MWh in applied to the energy LMP.</p> <p>Narrow Constrained Area: threshold is the net annual fixed costs of a new peaking generator divided by the total number of hours over the prior 12 months during which a binding transmission constraint occurred in the constrained area applied to the energy LMP.</p> <p>Failing both the conduct test and the impact test results in the failing offers being replaced by the reference level price.²⁶</p>	<p>Offer cap Offer cap currently \$1,000/MWh.</p> <p>Effective December 1, 2019, subject to FERC approval, implementation of verified cost-based energy offers up to \$2,000/MWh.²⁷</p> <p>Price cap Operating reserve demand curve with cap set at VOLL \$3,500/MWh²⁸</p>

²⁶ Reference levels selected in order of precedence as: Offer-Based, LMP-Based, Cost-Based, Estimated, or Averaged. See MISO Market Monitoring and Mitigation Business Practices Manual, BPM-009-r15, Effective Date: July 9, 2019

²⁷ <https://www.misoenergy.org/stakeholder-engagement/issue-tracking/increase-the-energy-offer-cap/>

²⁸ https://www.potomaceconomics.com/wp-content/uploads/2018/07/2017-MISO-SOM_Report_6-26_Final.pdf

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