New Zealand Electricity Authority's Preliminary Decision on UTS

PREPARED FOR

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Executive Summary

1. Meridian has asked the Brattle Group to provide an economic assessment of the Electricity Authority's Preliminary Decision ("Authority's Decision")[1] that Meridian's conduct created an undesirable trading situation (UTS) in the New Zealand electricity market. The Authority's Preliminary Decision follows an investigation of a claim from market participants that, during a period between November 2019 and January 2020, Contact Energy and Meridian Energy caused a UTS by spilling water from their South Island hydro generation stations whilst simultaneously offering this generation in the spot market at prices above their short-run marginal costs (SRMC). The Authority's Preliminary Decision suggests that Meridian's conduct resulted in excess spill, higher prices, and the unnecessary dispatch of generation in the North Island.

2. In this report we review the Authority's Decision from an economic perspective. In doing so we (i) provide an overview of energy only markets; (ii) examine whether Meridian's behaviour departed from its strategy under normal market operations; (iii) provide a comparison with other relevant power markets in other countries; and (iv) recommend that the Authority act in accordance with regulatory precedent, or work with market participants to modify the market design.

Overview of Energy only markets

3. An energy only market is a competitive "price discovery" market in which generators submit offers through a process of competition ahead of real-time. The wholesale pool is a single market-clearing price market where dispatched generators receive the price offer that clears the market. The marginal generator whose offer clears the market receives their bid price, and the other infra-marginal generators receive a higher price than their bid.

Meridian's conduct was consistent with its trading strategy and with its past conduct

4. Meridian's conduct during the alleged UTS period was consistent with its trading strategy during normal market operations, and was a rational strategy

[1] The Electricity Authority, "The Authority's preliminary decision on claim of an undesirable trading situation, Claim submitted 12 December 2019 by Haast Energy trading, Ecotricity, Electric Kiwi, Flick electric, Oji Fibre, Pulse Energy Alliance, and Vocus," June 30, 2020, accessed at https://www.ea.govt.nz/dmsdocument/27018-preliminary-decision-2019-uts-claim, ("Authority's Decision").

for a profit maximising firm operating in a "price discovery" market. As usual, Meridian offered the majority of its generation at a price below $10/MWh, in order to meet its load requirements. Smaller tranches of energy were offered at higher prices, based on Meridian's expectations for market clearing prices, in order for Meridian to earn a profit. Lastly, the final portion of generation was offered at prices higher than the expected market-clearing prices to provide availability during an emergency. Meridian's offers were consistent with those in previous periods of high spill and with a workably competitive market.

Conclusions and recommendations

5. We conclude that Meridian's conduct was an expected response to the particular design and characteristics of New Zealand's energy only electricity market and the exceptional weather circumstances during the affected period. Meridian's behaviour reflected its environmental obligations whilst at the same time mitigating its commercial risks.

6. If the Authority intends to require generators to always offer at SRMC when spilling, it may also need to study alternative market design options that provide the opportunity for generators in New Zealand to recover their capacity costs. If the Authority wishes to change the conduct of generators in this manner, the correct way to do that is not through a UTS investigation but, rather, through consultation with market participants to consider ways that the design of the New Zealand power market might be modified.

I. Overview of Energy Only Markets

7. An energy only market, as currently exists in New Zealand, is a competitive wholesale market comprising a mandatory gross pool in which generators are required to bid a price for the energy they produce. Generators are then dispatched based on their bidding behaviour and receive a corresponding energy payment, based on the offer price of the marginal generator. That gross pool is a "price discovery" market in which generators submit offers through a process of competition ahead of real-time.

8. The wholesale pool is a single market-clearing price market where dispatched generators receive the price offer that clears the market, as opposed to a "pay as bid" market where generators receive the price that they bid for their generation. Consequently, the marginal generator whose offer clears the market receives their bid price, and the other infra-marginal generators receive a higher price than their bid.

9. As an energy only market design, there is no separate market or regulatory mechanism through which generators are compensated for providing capacity or reliability. In some market designs globally, generators instead recover their fixed operating and maintenance costs, capital costs, and a normal return on investment ("capacity costs") through the energy market. If energy prices in the market do not allow generators to recover their capacity costs, new entry will not occur as market prices will not be sufficient to attract new resources.

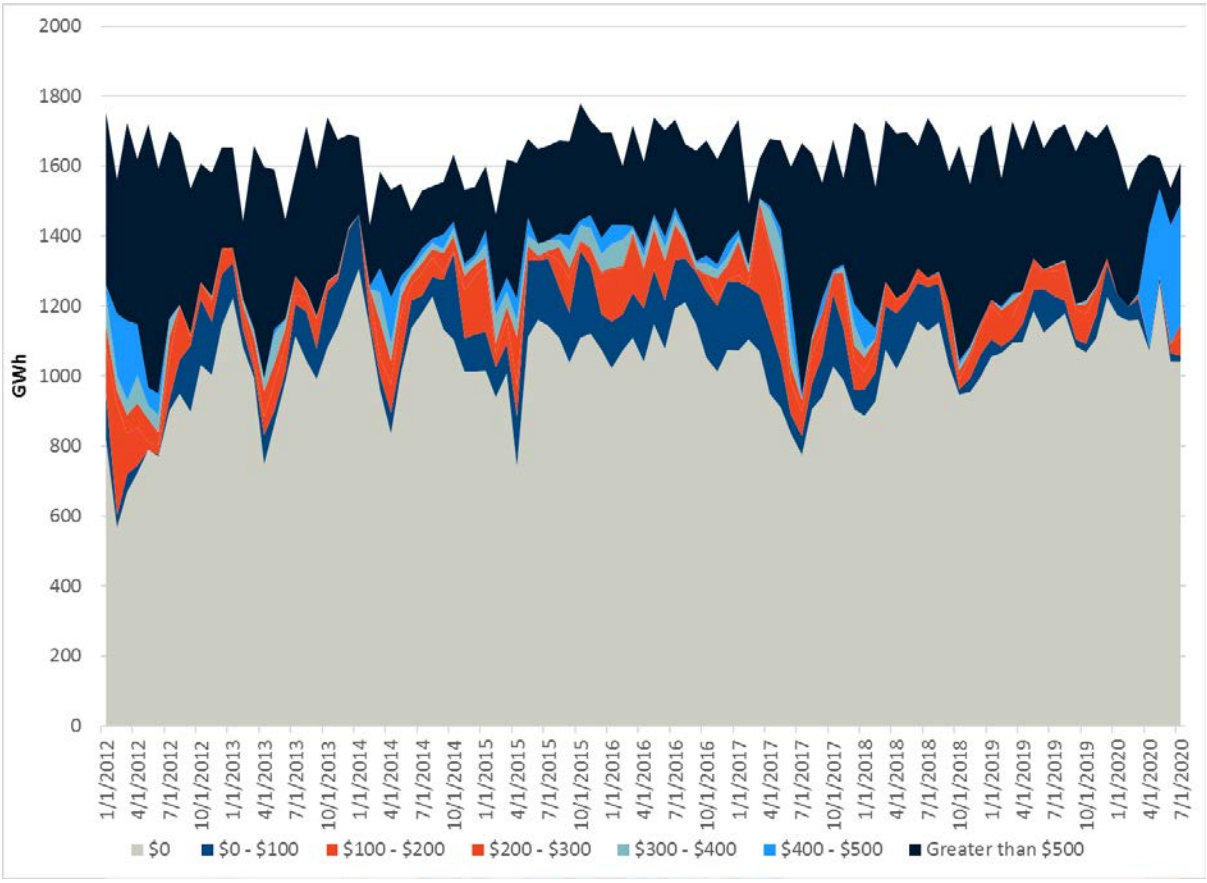
10. The experience in an energy only market may be contrasted with jurisdictions that have a capacity market to supplement the profits generators earn in the energy market. US jurisdictions with a capacity market include the New York Independent System Operation (NYISO), Independent System Operator of New England (ISO-NE), and PJM ISO, which serves customers in 11 US states and the District of Columbia. Several jurisdictions in Europe also have capacity markets, including the United Kingdom and Ireland.

11. The capacity mechanism in these jurisdictions remunerates generators for providing resource adequacy (i.e., the availability to generate when needed for system reliability) to the market. Capacity market revenues are added to support energy revenues at times of low prices. However, in energy only markets, efficient investment in generation capacity will not occur over time unless spot prices rise to levels sufficient to cover capital, maintenance, and other relevant costs.

II. Meridian's offers were consistent with its past behaviour

12. In the context of New Zealand's energy only market, Meridian has, over the past several years, consistently employed the same bidding strategy. It typically offers its hydro generation into the pool in three main groups of tranches. The first group is offered at or near $0/MWh to ensure that it is picked up by the market, and is intended to be roughly equal to Meridian's contracted load requirements. This usually represents the majority of Meridian's hydro generation capacity. In the second group, Meridian offers a smaller amount of generation based on the availability and opportunity cost of water at various prices (typically less than $350/MWh). Such offers take into account market dynamics including Meridian's expectation of market clearing prices. The third group is offered at a price above Meridian's expectations of market-clearing prices, and represents generation Meridian does not want to produce due to water management concerns or revenue risks such as basis risk that might result from the binding of transmission constraints. These non-clearing tranches are still offered to the market so that they are available in emergency situations. This bidding strategy, and its consistent application by Meridian over the last eight years, is illustrated in Figure 1 below.

Figure 1: Meridian Monthly Generation Offers
(January 2012 – July 2020)



Source: Based on data provided by Meridian Energy.

13. Figure 1, created with offer data provided by Meridian, shows the first tranche in grey, which is offered at $0/MWh. The next several coloured sections of the chart (i.e., the navy, red, orange, turquoise, and light blue areas) show the generation offers based on Meridian's expectation of market prices. These offers range between $0/MWh and about $500/MWh. Finally the uppermost (dark blue) section shows the last tranche made available to the market for emergency use.

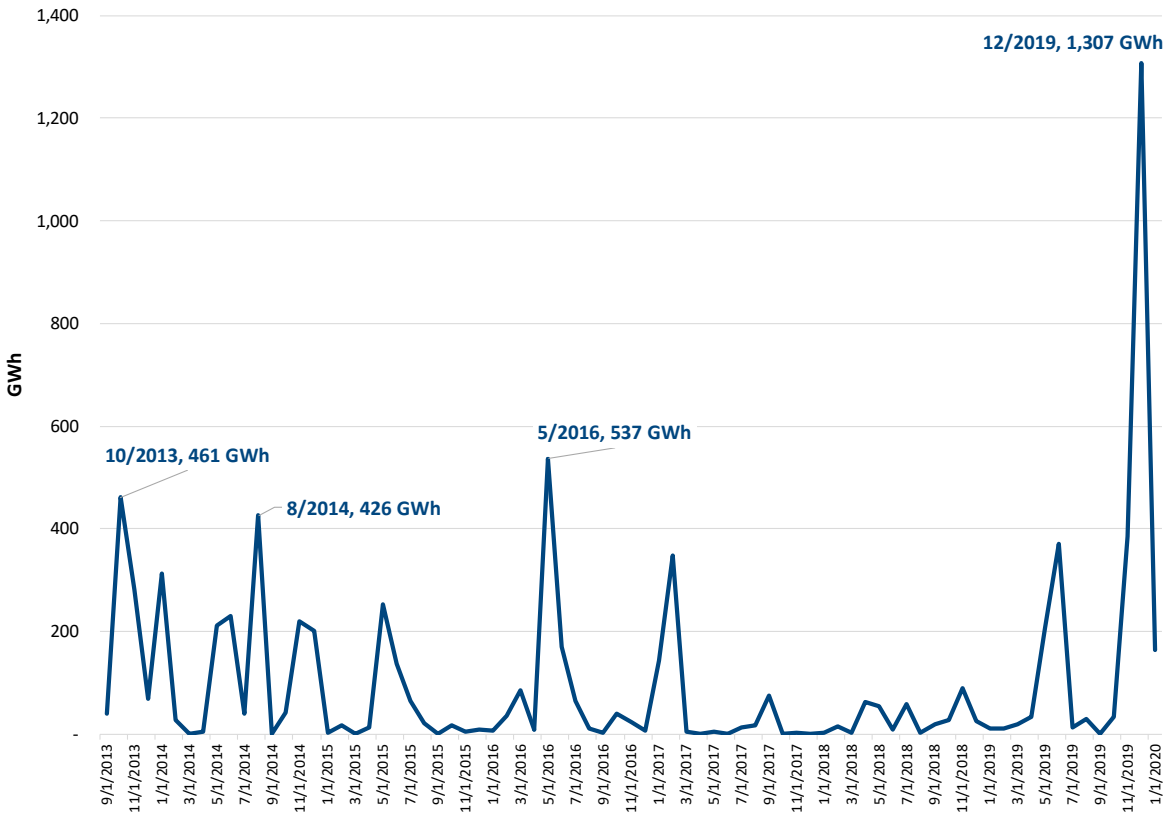
14. We have analysed Meridian's offers during the alleged UTS period to consider whether they were exceptional when compared with past spill episodes. Our analysis shows that Meridian's offers during December 2019 were comparable to its offers during previous periods of high spill over the past eight years. Moreover, Meridian's offers were consistent with its three-group offer strategy, described above.

15. The Authority's preliminary conclusion is that Meridian's spill and offer conduct during 3-18 December created a UTS. In order to evaluate the validity

of this conclusion, it is important to compare Meridian's spill and price offers during the alleged UTS period to previous spill episodes.

16. We first examined Meridian's previous spill episodes. Figure 2 shows Meridian's monthly spill data over a period of seven years. It shows there were four outlier periods of spill during this period. The December 2019 spill was more than twice the amount of previous spills in 2013, 2014 and 2016. This is consistent with Meridian's claim that the weather during 2019 was exceptional, causing Meridian to spill significantly more water than it has ever done.

Figure 2: Meridian Monthly Hydro Spill (September 2013 – January 2020)



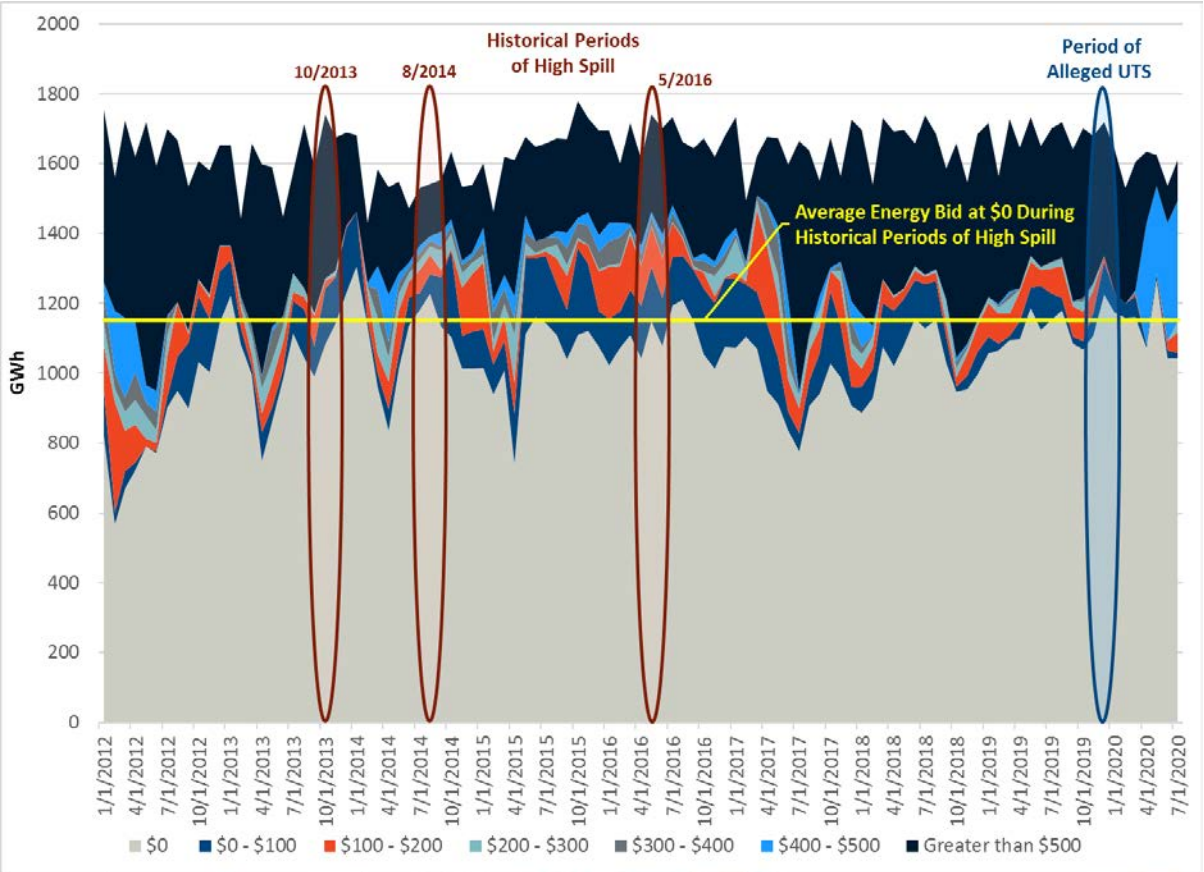
Source: Based on data provided by Meridian Energy.

17. Figure 3 below compares Meridian's offers during December 2019 with the other three episodes of the highest spill in the last seven years. Our analysis shows that Meridian's offers in December 2019 were consistent with its offers during those previous periods of high spill, and therefore consistent with Meridian's strategy and their normal market operations for the last several years. This is indicated by the horizontal yellow line showing that the amount

of generation offered at $0/MWh in December 2019 was comparable to the amount offered in the three historical periods of high spill.

18. On closer inspection, in 2019 Meridian actually offered a higher amount of generation at $0/MWh compared with previous spill periods. In December 2019, Meridian offered 1,225 GWh of energy at $0/MWh, which was 6% higher than the average of 1,152 GWh offered at that price range during the previous three spill periods. As a consequence of its strategy, Meridian produced more generation in December 2019 than in any previous December in Meridian's history.

Figure 3: Meridian Offers during Alleged UTS vs Historical High Spilling



Source: Based on data provided by Meridian Energy.

III. Market design in other energy only jurisdictions

19. If the Authority wishes generators to behave differently, or to achieve different market outcomes, this should be achieved through changes in market design rather than through a UTS investigation.

20. Other energy only markets have developed mechanisms for allowing generators to recover their capacity costs which might be informative in such a reivew. Two well-established markets in North America illustrate how an energy only market can be designed to ensure long-run investment and plant retirement decisions are efficient, without sacrificing short-term market efficiency. These are the markets administered by the Electric Reliability Council of Texas (ERCOT), which serves most of the U.S. state of Texas, and the Alberta Electric System Operator (AESO), which serves all of the Canadian province of Alberta. We describe these different market approaches below.

A. ERCOT

21. The ERCOT market is structured to achieve high prices during tight supply conditions, usually during periods of peak summer load. Marginal generation resources in the market anticipate that they will be able to recover their capacity costs during these high-priced hours. If resources are able to recover their capacity costs, it will attract new resources into the market and the reserve margin will increase. If resources do not recover their capacity costs in those hours, they eventually will exit the market and the reserve margin (i.e., excess capacity for reliability purposes) will decrease. In this way, the reserve margin in ERCOT, and therefore the level of resource adequacy and reliability, is determined by market outcomes.

22. The ERCOT market differs from most other jurisdictions that have a regulated reserve margin based on a targeted level of resource adequacy and reliability. The regulated reserve margins are generally implemented through a mandate on utilities to own a certain amount of capacity or through a capacity compensation mechanism (e.g., a capacity market or government-backed contracts for capacity) that pays resources to be available up to the desired reserve margin.

23. ERCOT's market design has two features that help it achieve high prices during peak load conditions. First, price-responsive demand resources (DR) are very active in the ERCOT market and when on the margin, they set price well above the SRMC of most conventional generation resources in the market. The bid price of DR is typically well above the variable cost of conventional generation resources, implying that conventional resources earn significant profit margins when DR sets the price in the market.

24. Second, ERCOT employs an administrative scarcity pricing regime that sets prices at high levels when the market is short of reserves or energy. The administrative prices are based on the value of lost load (VOLL) and the

likelihood of having to curtail load caused by being short of reserves (the likelihood is 100% if the market is short on energy).[2] The administrative shortage pricing regime in ERCOT allows prices to reach $9,000/MWh when there is a large shortage of operating reserves.[3]

25. The market design and structure in ERCOT enables prices to rise to levels well above the SRMC of conventional resources when there is a shortage of generation in the market. ERCOT's market design implies that resources should be offering at their SRMC with the anticipation that they will earn profit margins during tight supply conditions. If they do not earn profit margins during tight supply conditions, it is a signal that resources should exit the market.

26. The ERCOT market design therefore contains a market power mitigation regime that caps offers from resources at their SRMC when they have market power. Specifically, when a resource's supply is necessary to solve a transmission constraint in the market, its offer is mitigated to an estimate of SRMC. If a generator is not found to have market power, they are free to offer as they would like into the market. The ERCOT approach can be summarized as mitigation to SRMC for resources that have market power, but relying on DR setting the price of power in tight supply hours and scarcity pricing during operating reserve shortages to allow resources to recover their capacity costs.

27. The independent market monitor summarizes the approach to market power mitigation by stating that "[e]conomic theory dictates that suppliers in perfectly competitive markets will offer at prices equal to their marginal costs (i.e., the incremental costs incurred to produce additional output). Importantly, these costs include more than direct financial costs, including risk and opportunity costs. However, mitigated offers are based on ERCOT's verifiable costs, which does not always reflect resources' full marginal costs."[4]

28. The reliance on shortage pricing to drive efficient long-term investment decisions and establish the reserve margin is summarized by the IMM as follows:

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2 Judy Chang *et al.*, "Shortage Pricing in North American Wholesale Electricity Markets," prepared for the Alberta Electric System Operator, January 26, 2018, pp. 14-15, accessed at http://www.aeso.ca/assets/Uploads/4.3-Brattle-Paper-Shortage-Pricing.pdf.

3 *Id.*, p. 15.

4 Potomac Economics, Independent Market Monitor for ERCOT, "2019 State of the Market Report for the ERCOT Electricity Markets," May 2020, p. 24.

> [t]he increase in the frequency of sustained shortages is consistent with the declining reserve margin in recent years. This existence of operating shortages is not a concern. In an energy only market, shortages play a key role in delivering the net revenues an investor needs to recover its investment.[5]

B. AESO

29. The AESO power market takes a slightly different approach than ERCOT, and provides an alternative energy only market design to compare with New Zealand. Similar to ERCOT, the AESO relies on an energy only market and ancillary services payments to provide generator revenues that are adequate to sustain a sufficient reserve margin and maintain system reliability. The AESO market takes a different approach than ERCOT in their market power mitigation philosophy and in the rules for price formation in shortage hours.

30. The market power mitigation philosophy in Alberta is governed by the Fair, Efficient and Open Competition (FEOC) regulation implemented by the Provincial government.[6] The FEOC regulation prohibits the restriction or prevention of competition through collusion or predatory pricing, manipulating the market, providing false information, or physically withholding from the market (i.e., not offering available resources to the market).[7] While the regulation prohibits movement of prices away from a "competitive electricity market outcome,"[8] it does not mandate that resources offer at their SRMC, nor does it mandate that the AESO mitigate offers to SRMC if a resource is found to have market power.

31. The implication of the FEOC regulation is that the market power mitigation measures taken by the AESO are not as heavy handed as they are in ERCOT or other markets. Specifically, there are no ex ante mitigation measures taken in Alberta, unlike the offer restrictions implemented by ERCOT on certain resources. Another important distinction from the ERCOT approach, is that Alberta does not allow prices to rise to very high levels during tight supply conditions. In fact, the Alberta market has a $1,000/MWh price cap in the

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5 *Id.*, p. 18.

6 Alberta Regulation 159/2009, *see* https://www.qp.alberta.ca/documents/Regs/2009_159.pdf.

7 Alberta Regulation 159/2009, Section 2.

8 Alberta Regulation 159/2009, Section 2(k).

energy market.[9] Therefore, the approach in Alberta relies on prices rising above SRMC in many hours of the year to allow generators to recover costs and earn a profit, not just during tight supply hours as in ERCOT.

32. In Alberta, the Market Surveillance Administrator (MSA) has found that competitive outcomes include situations where market prices rise above SRMC in many hours of the year. For example, in the market report for the first quarter of 2020, the MSA indicated that the market in Alberta was competitive, which was consistent with a supply curve that contained many offers well above SRMC.[10] The Provincial government in Alberta ordered a review of the market power mitigation regime last year, and the AESO found that the energy market is competitive and that the current market power mitigation regime functions well and should be maintained. The government agreed with the AESO's assessment, and no changes are scheduled for mitigation regime.[11]

33. As part of its review of the market power mitigation regime, the AESO wrote to the Minister :

> 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

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9 The Alberta Electric System Operator, "Market Power Mitigation Advice to Minister," November 29, 2019, p. 5, accessed at https://www.aeso.ca/assets/Uploads/AESO-Market-Power-Mitigation-Report-Nov-29-2019.pdf.

10 Alberta Market Surveillance Administrator, "Quarterly Report for Q1 2020," pp. 6-7, May 14, 2020, accessed at https://static1.squarespace.com/static/5d88e3016c6a183b1bcc861f/t/5ebd9f94d44bf12c2b797462/1589485467616/MSA+Q1+Quaterly+Report+2020.pdf.

The MSA states that "[i] n the Alberta power pool, the shape of the market supply curve is generally characterized by greater than half the total quantity of offers being made at $0/MWh (often reflecting must-run conditions), most of the rest of the offers being at or around short-run marginal cost (mostly in the $15/MWh to $40/MWh range), and finally up to 1,000 MW of offers being made at prices above short-run marginal cost or at high levels of opportunity cost. Reductions in supply, say, due to outages or reduced imports, result in the market supply curve shifting to the leftward. Increases in the offer prices of supply, all else equal, result in the market supply curve shifting upward" (p. 6). The MSA continues to state that during a cold week with tight supply conditions "there was a meaningful amount of generation offered at prices around $250/MWh and a significant amount offered at prices above short-run marginal cost" (p. 7). The MSA does not identify any of this behaviour as anti-competitive or against the FEOC regulation.

11 "Market power mitigation," The Alberta Electric System Operator, accessed August 12, 2020, https://www.aeso.ca/market/market-updates/letter-of-notice-for-stakeholder-input-on-market-power-mitigation/.

> 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[.][12]

34. The above explanation from the AESO gives a concise and clear indication of what the market structure in Alberta is intended to accomplish, and how it differs from ERCOT's approach. The Alberta market design provides for no ex ante mitigation of detected market power, allowing generators to offer above SRMC in at least some portion of the year. This allows generators to recover their capacity costs through the energy market, even without allowing for very high prices in tight supply conditions (due to the $1,000/MWh price cap in Alberta). This contrasts with ERCOT's approach that is heavier handed in ex ante mitigation of perceived market power abuse, but allows for very high prices during shortage conditions so that generators can recover their capacity costs during those tight supply hours.

IV. Parallels between New Zealand and other markets

35. The Authority appears to be concerned about the price that Meridian was offering at. Assuming for present purposes that price was above short run costs during the alleged UTS period, we find significant parallels with the experience in Alberta which suggest that generators should not be forced to offer at their SRMC. If the Authority plans to mitigate generators' offers to SRMC, it should

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[12] The Alberta Electric System Operator, "Market Power Mitigation Advice to Minister," November 29, 2019, pp. 4-5.

also consider whether to create a separate market that compensates generators for providing reliability.

36. The Commerce Act 1986 in New Zealand captures this logic in its treatment of temporary market power. The Commerce Act, in Section 36, prohibits unilateral actions that harm the competitive process, but stops short of empowering the Commerce Commission to take action against a firm if its offers temporarily deviate from the long run outcomes expected in a workably competitive market, even though such pricing harms consumers in the short term.[13] This is consistent with the logic of the FEOC regulation in Alberta, which enforces several prohibitions on anti-competitive behaviour, but does not mandate resources to offer at SRMC or provide for the AESO to ex ante mitigate offers to SRMC if the generator is perceived to have market power.

37. If Meridian's offers are deemed to constitute a UTS, the Authority would need to consider the broader implications of that determination for the long-run efficiency and competitiveness of the New Zealand market, including the regulatory uncertainty that would create adverse effects on generation investment.

V. Conclusions and recommendations

38. We have demonstrated that Meridian's offer behaviour during the alleged UTS in December 2019 is consistent with its offer strategy under normal market operations, which have never previously been found to create a UTS.

39. Meridian's offer strategy is as-expected in the context of the energy only design of the New Zealand electricity market. It is also consistent with the workably competitive logic of the Commerce Act of 1986, which is aimed at achieving long-run efficiency.

40. By way of contrast, instead of simply focusing on short-run efficiency, other energy only markets allow generators the opportunity to recover their capacity costs through energy market revenues. This is achieved in ERCOT by allowing prices to rise well above SRMC in a small portion of hours. This approach is consistent with mitigating offers to SRMC in most hours, since generators earn high margins during tight supply conditions. The Alberta energy only market follows a different approach that allows prices to rise above SRMC in a larger share of hours.

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[13] Commerce Act 1986, s 36.

41. If the Authority wishes to change precedent and force generators to offer at SRMC under selected circumstances, there are other market design changes that may need to be considered to ensure that generation resources can recover their capacity costs. The Authority would need to study different design options or modifications best suited for the New Zealand market. A change in the New Zealand energy only market design is best achieved through a comprehensive review of market design options, rather than through a UTS investigation.

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