ELECTRICITY AUTHORITY
TE MANA HIKO

INEFFICIENT PRICE DISCRIMINATION IN THE WHOLESALE ELECTRICITY MARKET – ISSUES AND OPTIONS

AN INITIAL RESPONSE TO THE WHOLESALE MARKET REVIEW

DISCUSSION PAPER

Executive summary

This issues paper should be read in conjunction with the Electricity Authority's review of competition in the wholesale electricity market, *Market monitoring review of structure, conduct and performance in the wholesale electricity market* (the Review). This paper is an immediate response to a significant observation from that review.

Relationship between the Review and this issues paper

The Review used a structure, conduct and performance methodology to explore competition in the wholesale spot market between 2018–2021 and the underlying determinants of high prices. The Review explores two hypotheses: the extent to which prices were elevated because of supply and demand fundamentals and the extent to which prices were elevated because they were not determined in a competitive environment.

The Review consults separately on the completeness and robustness of the approach used, and the observations it raises about competition in the wholesale electricity market competition in New Zealand. The Review, and instructions on how to participate in the consultation process, can be found here: https://www.ea.govt.nz/monitoring/enquiries-reviews-and-investigations/2021/wholesale-market-competition-review/.

The Electricity Authority (Authority) considers that one of the most pressing observations made in the Review is that the **price discrimination** implicit in the 'Tiwai contracts' between Meridian Energy, Contact Energy and New Zealand Aluminium Smelters (NZAS) raises the possibility that electricity may not have been allocated efficiently.[1] Generators are incentivised to subsidise the cost to NZAS of electricity through the Tiwai contracts when the cost of this support is more than offset by the higher prices paid by other consumers, arising because of the increase in total demand for electricity. This issues paper directly addresses this observation, but also relates to observations from the Review about high prices and barriers to renewable generation investment.

The Authority is addressing **inefficient** price discrimination in the wholesale market as a priority because there appears to be evidence to indicate that inefficiencies are potentially significant, with material implications for consumers and generators. The Authority is seeking feedback from interested parties on the potential efficiency and competition issues arising from price-discrimination practices in wholesale markets and proposes possible solutions. The Authority wants to address the risk of inefficient price discrimination as quickly as possible to protect the long-term interests of consumers.

Price discrimination in the wholesale market

In overseeing the wholesale electricity market, one of the Authority's goals, consistent with its statutory objective to promote the efficient operation of the electricity industry, is to promote efficient market prices that allocate electricity to parties that value it most highly. The Authority recognises that price discrimination is not always inefficient and can be a legitimate practice used by producers of goods and services to capture more of the gains from trading with consumers (as is also achieved, for example, by creating premium brands or customised offerings). It is also expected that consumers will pay different average prices for the electricity they consume if their consumption profiles differ (eg, peak-weighted versus baseload), and additionally if they agree to forego consumption in situations requiring demand response.

[1] For the sake of brevity, the rest of the document refers to Meridian Energy Ltd as Meridian and Contact Energy Ltd as Contact.

However, an electricity market segmented through **inefficient price discrimination** may fail to deliver efficient outcomes in at least three ways:

- consumers with relatively low valued uses of electricity may potentially consume too much electricity and other consumers with higher valued uses may consume too little[2]
- the benefits of consuming electricity may be less than the costs of producing it. This is a waste of finite resources
- resultant market prices may distort signals for investment in generation and electrification, thereby compromising the efficient transition to a low emissions economy.

Inefficient price discrimination alone justifies efforts to develop cost-effective policy interventions. The public policy concerns are amplified if inefficient price discrimination also results in large wealth transfers to suppliers (generators) from consumers who are not party to the contract. In the case of the Tiwai contracts, it appears that generators have effectively subsidised the price of electricity to the NZAS and, as a consequence, prices have remained higher for other consumers. The potential efficiency costs are estimated to be around $57 million to $117 million per year. The subsidisation of NZAS is estimated to be over $500 million over the contract's 4-year term. Generators may be willing to subsidise NZAS because its demand increases national prices and spot market revenues by as much as $850 million per year, more than offsetting the cost of the subsidy.

The Authority considers good market design should ensure that the incentives on generators are such that all participants can be confident that electricity is going to consumers with the highest valued use. When electricity is not allocated to consumers with the highest valued use, the adverse efficiency implications of segmentation can potentially be unwound if high- and low-value parties are able to re-contract in secondary markets. Market design can promote efficient allocations by facilitating direct competition for electricity between users, ensuring users are treated consistently, and removing artificial barriers that hinder welfare-enhancing trades.

The Tiwai contracts are used to highlight the potential for inefficient price discrimination

The Tiwai contracts (and the offers made prior) provide a potential illustration of how price discrimination may, in some cases, not be in the longer-term interests of consumers. The potential price discrimination issue raised by the Tiwai contracts could also arise with any other large purchaser of electricity. The Authority wants to ensure that contracts involving price discrimination, particularly major contracts, are efficient and in the long-term interests of consumers. The Authority wants to consider and resolve whether policy interventions are required to address inefficient price discrimination before any renegotiation of the Tiwai contracts in 2024, or the negotiation of any longer-term contracts with other large users (eg, data centres or hydrogen plants).

In July 2020, Rio Tinto, the majority owner of NZAS, announced that it was terminating its electricity contract with Meridian and planned to wind down operations following its strategic review.[3] Rio Tinto's announcement indicated it was unfortunate that it could not 'secure a power price reduction aimed at making NZAS a financially viable business'. This suggests that NZAS's

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2 The rest of the paper uses 'highest willingness to pay' interchangeably with 'highest valued use'.

3 See the 9 July 2020 announcement by Rio Tinto, available at https://www2.asx.com.au/markets/trade-our-cash-market/announcements.rio.

willingness to pay (WTP) for electricity (and transmission) at that time fell below the amounts already being paid. The variance between contract and forward prices appears to be significantly larger in the most recent update of the contract, amplifying doubts about the efficiency of the contracts.

The Authority emphasises that it wants to support efficient decision-making by parties based on the information they have available to them when decisions are made. Independent, third-party modelling conducted in mid-2020 suggested the financial viability of the Tiwai Point smelter was questionable, largely due to low aluminium prices.[4] The strong improvement in NZAS's profitability that has occurred after the offers were made and contracts signed, due to changes in aluminium prices, which are known with hindsight, is not directly relevant for the efficiency of the price discrimination negotiated in the current contracts.

The Authority's analysis of the Tiwai contracts is not part of any current compliance investigation. All parties to the agreement appear to have acted rationally given their respective commercial incentives. The Commerce Commission separately opened a preliminary enquiry of the Tiwai contracts (both between Meridian and NZAS and between Meridian and Contact) and decided to make no further enquiry under the Commerce Act 1986.

Nonetheless, given its own mandate and the potential inefficiencies from price discrimination, the Authority has decided to explore whether long-term outcomes for consumers could be better served through a market design that provides greater assurance that inefficient price discrimination will not occur, both with respect to any **future** Tiwai contracts and in other contexts. It does not appear that the Authority would be able to unwind the Tiwai contracts even if they were definitively found to be inefficient.

The Authority is using the contracts to illustrate the **potential** for an inefficiency that may be worth addressing. The Authority has not determined that the Tiwai contracts (and the offers made) were inefficient at the time they were negotiated. The value from NZAS consuming electricity could have been sufficiently high, such that electricity has gone to the consumers that value it most highly. It may simply be that NZAS had (and has) a strong negotiating position, which enabled it to secure electricity at a price well below prevailing forward prices at the time the contract was signed. However, there is evidence that the arrangement could be inefficient with substantial adverse impacts for other consumers:

- **Contract price may be below alternative uses:** At the time offers were made to NZAS, the contract price per megawatt hour (MWh) was significantly below forward prices for the term of the contract. Generators likely could have sold the electricity for a higher load-weighted average price to other parties. Such a price differential raises the possibility that NZAS does not have a sufficiently high-valued use to justify its consumption of electricity. If the value of NZAS's electricity consumption is lower than the cost of production and lower than unserved consumers' WTP, the Authority's modelling suggests a potential efficiency loss of $57 million to $117 million per year.
- **The benefit of NZAS consuming electricity may be less than the cost of producing it:** The potential subsidy to NZAS is approximately $125 million to $150 million per year. The extent to which water used to generate electricity for NZAS would be stranded, if NZAS exits the market, affects the assessment of any subsidy relative to market prices, and would reduce any efficiency loses attributable to the arrangements. However, the Authority notes that transmission constraints in the Clutha-Upper Waitaki line are being alleviated, with the aim of greatly diminishing the extent to which water is stranded

[4] See independent 'Tiwai-ometer' modelling available from Enerlytica by subscription.

beyond mid-2022, which was known at the time the contracts were signed in January 2021.

- **The Tiwai contracts materially impacts pricing of electricity:** At 13 percent of national electricity demand, the Tiwai contracts have significant implications for national prices and for the revenue generators receive on their entire generation portfolios. The impact on forward prices of NZAS's decision to stay implies that spot market revenues would be higher than otherwise by as much as $2.6 billion over the first 3 years of the contract (see the executive summary of the Review). These price effects are sufficiently large that they may encourage generators to agree uneconomic terms with NZAS, to ensure that it continues to operate even if it involves providing NZAS with a large subsidy.
- **All large generators have commercial incentives to encourage NZAS to stay, even if it means providing the smelter with preferential pricing:** All large generators, not just those that are a party to the Tiwai contracts, benefit from the higher spot prices for their generation. Therefore, it is rational for generators to agree to a discounted price for the electricity supplied to NZAS, in exchange for NZAS' longer term commitment to stay when that commitment results in additional revenue from other consumers that exceeds any loss from the discount.
- **The Tiwai contracts were negotiated and structured in a way that may increase the likelihood of inefficient price discrimination occurring:** The negotiation for the supply of electricity was undertaken off-market, meaning that other prospective users did not get the opportunity to bid for the electricity. Exposing this transaction to competition from other consumers could potentially provide greater assurance that electricity is going to its highest valued use, for example, by requiring public tendering of appropriately sized contracts-for-difference (CFDs). Crucially, the Meridian–NZAS CFD has a 'use-it-or-lose-it' clause requiring NZAS to use the electricity, or else Meridian could exercise an option to terminate the contract. This clause effectively precludes NZAS from significantly scaling back operations and re-contracting the surplus electricity with other consumers who may value the electricity more highly. This clause is a central feature of the agreement to protect Meridian and Contact from price reductions on the rest of their portfolios, but it adversely affects the allocation of electricity to the consumers with the highest willingness to pay for that electricity, reinforcing the efficiency concerns.

The price the rest of New Zealand pays for electricity is affected by whether NZAS stays or leaves. This raises the following policy question: would NZAS have stayed if it had faced a 'market price' for its electricity, while suitably adjusting for differences in the cost to serve NZAS relative to other consumers, the value of demand response provisions in the contract, and the magnitude of any stranded water? If NZAS were, in principle, prepared to pay 'market' prices, then the prices the rest of New Zealand pays for electricity would reflect underlying fundamentals of supply and demand and the public policy concerns would be mitigated. However, if the arrangements were designed in part to keep market prices high (to obtain more revenue from other consumers), by subsidising a party that would have exited if they were required to pay a market price, then there would likely be a material question as to whether this arrangement was efficient.

The Tiwai case has several relatively unique attributes, including the large size of the supply and its impact on prices, such that all generators' revenues are expected to increase from the contract. The Authority is interested in submissions on whether any potential problem with inefficient discriminatory pricing is specific to NZAS (and other sufficiently large future contracts

that could risk distorting the efficient allocation of electricity and affect market prices) or whether other forms of price discrimination should also be addressed.

The Authority considers that overall market operations could be improved through a market design that reduces the likelihood of inefficient price discrimination occurring. Hypothetically, if the 'rest-of-New Zealand consumers' were at the negotiating table, they would have had the opportunity to counter bid for the electricity being offered and therefore may have provided greater assurance that the electricity went to its highest valued use. Conversely, if NZAS was shown to be willing to pay a market-determined price adjusted for location, then the public policy concerns fall away.

The analysis outlined in this paper illustrates scope for inefficient outcomes, particularly in the context of future agreements where Clutha-Upper Waitaki transmission constraints are alleviated. The Authority recognises that alternative calibrations can imply that the current arrangements are welfare-enhancing. Nevertheless, the Authority considers that the current incentives and market design could result in inefficient future outcomes (given changes to transmission constraints amongst other considerations) and it is worth exploring options to address this potential outcome.

Possible options

The Authority has identified possible options to address potential problems with discriminatory pricing.

1. Status quo
2. Prohibit 'use-it-or-lose-it' clauses
3. Electricity Authority pre-approval of large contracts
4. Require public offering of all (or some percentage of) hedge contracts
5. Require public offering of large hedge contracts
6. Extend trading conduct provisions beyond the spot market to hedge markets
7. Non-discriminatory pricing rules
8. Hybrid of non-discriminatory pricing and pre-approval of contracts.

This list is not exhaustive and there may be other approaches that enhance the long-term interests of consumers. The options are not mutually exclusive, nor are they fully developed at this time. Rather the intention is to get feedback on what options the Authority should consider further and how those options are in the interests of consumers. At this time, no single policy option or amendment to the Electricity Industry Participation Code 2010 (Code) is being proposed. If this consultation process demonstrates to the Authority that there is need for a policy response to the issues raised, then the Authority would publish a subsequent consultation paper to develop a Code change to improve outcomes.

The primary focus of this paper is on options that the Authority could potentially advance through Code amendments to address the risk of inefficient price discrimination. The Authority recognises that bespoke structural or financial separation solutions regarding generation assets could also be considered, but they would likely need to be considered further by other branches of government. Consistent with its statutory function to undertake inquiries into any matter relating to the electricity industry, the Authority encourages submissions on the most effective options to address inefficient price discrimination overall. Any options identified in submissions that have merit but cannot be progressed by the Authority will be shared with the relevant branch of government.

The Authority is seeking feedback on which options should be considered further, and the criteria the Authority could use to assess the long-term benefits to consumers of potential interventions. Details on when and how to make a submission are included in section 1 of this paper. The Authority expects to progress any consultation on a Code amendment in early 2022, if an option is worth developing further.

The Authority is also considering whether interim actions are required to forestall any contracts that raise material concerns due to inefficient price discrimination, before an enduring Code amendment, if required, coming into force.

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1 What you need to know to make a submission

What this issues paper is about

1.1 The purpose of this paper is to consult with interested parties on potential options to address the risk of inefficient price discrimination occurring in the wholesale electricity market. The Electricity Authority (Authority) seeks feedback on whether regulatory interventions are required to mitigate efficiency losses and competition concerns. This consultation is at a preliminary stage and no specific amendment to the Electricity Industry Participation Code 2010 (Code) is yet being considered. Instead, a range of potential options are being explored.

1.2 This issues paper identifies various interventions, motivated by the Authority's statutory objective to promote efficient operation of the New Zealand electricity industry. The interventions discussed are intended to support the Authority's strategic ambitions of fostering trust and confidence in the wholesale electricity market, thriving competition, and they are intended to contribute to an efficient transition to a low emissions economy.

1.3 The Authority seeks public feedback on the issues raised in this paper and on the potential options that could be adopted to improve the efficiency of outcomes for the long-term benefit of consumers. In response to the feedback on this issues paper, the Authority will develop and publish a summary of submissions and/or a consultation document, which would include any proposed Code changes the Authority considers worthy of further attention.

How to make a submission

1.4 Our preference is to receive submissions in electronic format (Microsoft Word or PDF) in the format shown in appendix A. Submissions in electronic form should be emailed to reviewconsultation2021@ea.govt.nz with 'Consultation Paper: Inefficient price discrimination in the wholesale market – Issues and options' in the subject line.

1.5 If you cannot send your submission electronically, post one hard copy to either of the addresses below, or fax it to 04 460 8879.

Postal address	**Physical address**
Submissions Electricity Authority PO Box 10041 Wellington 6143	Submissions Electricity Authority Level 7, Harbour Tower 2 Hunter Street Wellington

1.6 Please note, the Authority wants to publish all submissions it receives. If you consider that we should not publish any part of your submission, please:

(a) indicate which part should not be published

(b) explain why you consider we should not publish that part

(c) provide a version of your submission that we can publish (if we agree not to publish your full submission).

1.7 If you indicate that part of your submission should not be published, we will discuss with you before deciding whether to not publish that part of your submission.

1.8 However, please note that all submissions we receive, including any parts that we do not publish, can be requested under the Official Information Act 1982. This means we would be required to release material that we did not publish unless good reason existed under the Official Information Act to withhold it. We would normally consult with you before releasing any material that you said should not be published.

When to make a submission

1.9 Please deliver your submissions by 5pm on Wednesday 8 December 2021.

1.10 We will acknowledge receipt of all submissions electronically. Please contact the Authority info@ea.govt.nz or 04 460 8860 if you don't receive electronic acknowledgement of your submission within two business days.

2 Introduction and background

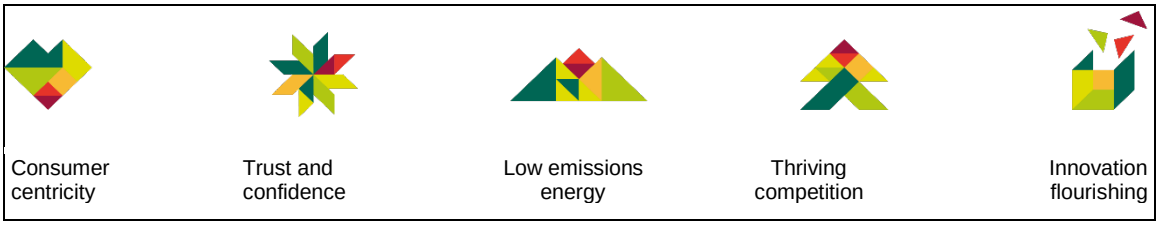
Objectives and strategy

2.1 The Authority is an independent Crown entity charged with promoting competition in, reliable supply by, and the efficient operation of the electricity industry for the long-term benefit of consumers.

2.2 The July 2021–June 2025 *Statement of Intent* outlines the Authority's strategic ambitions and framework to achieve its statutory objectives. The Authority's ambitions are to foster a consumer-centric electricity system, support trust and confidence in the sector, help competition and innovation thrive and flourish, and support the transition to a low emissions economy. These ambitions are underpinned by the tikanga-based values of kaitiakitanga (long-term sustainability), manaakitanga (social responsibility), whanaungatanga (social connections) and whairawa (thriving whānau).

2.3 Part of the Authority's mandate is to design, implement and enforce compliance with the Code; the rules that guide the interactions between industry participants. The design of the Code is intended to achieve the Authority's statutory objectives: competition, reliability and efficiency.

Figure 1: Strategic ambitions



3 Price discrimination and the Tiwai contracts

3.1 This issues paper is a first step in addressing questions raised in the Review. The paper considers the inefficiencies that may arise from price discrimination and possible interventions to mitigate such inefficiencies.

Why focus on inefficient price discrimination now?

3.2 While the Review is being consulted on, the initial Authority observations have highlighted the market impact of the Tiwai contracts and the potential consequences for other consumers. The evidence, to date, indicates the arrangements for the supply of electricity to the Tiwai Point smelter may not necessarily be efficient because electricity may not be supplied to the parties that have the highest valued uses, that is, have the highest willingness to pay (WTP). The Tiwai contracts seem to provide preferential pricing in a way that is unique in the industry, even in contrast to the terms available to other large industrial consumers. The Authority considers that inefficient price discrimination could potentially have a material impact on the market and warrants being explored in greater depth at an early point.

3.3 The Authority wants to ensure that the Code is designed so similar, future contracts support its statutory objectives. Addressing these concerns now is

required to ensure that appropriate incentives are put in place for any future contracts. If the Tiwai contracts are inefficient then other consumers would have faced higher prices than they should have.

3.4 Additionally, price signals to invest in new generation and the electrification of the economy may also have been distorted, delaying the retirement of existing and higher cost (thermal) generation, and adversely affecting the electrification of the economy. High electricity prices affect investment payback periods, but are only assured for the term of the contract and would not be realised by investors during the time to build. Moreover, investors in generation face the risk that the Tiwai Point smelter may ultimately decide to exit, placing downward pressure on prices and returns in subsequent years.

3.5 The Authority notes that the current Tiwai contracts are for 4 years and that efforts are being made to develop alternative uses for the electricity currently supplied to NZAS. These alternatives include the supply of electricity to consumers elsewhere in the country where it is most highly valued (supported by the alleviation of transmission constraints), and the potential development of hydrogen production facilities or data centres. These considerations mean there is urgency to ensure that any potential changes to market design are made soon enough to influence future contracting.

3.6 While the focus on the Tiwai contracts and price discrimination is reasonably specific, this line of inquiry has broader implications for the design of the wholesale market, raising issues in relation to allocative efficiency, dynamic efficiency and competition. The issues raised by the Tiwai contracts have wider applicability and raise concerns more generally about the potential for inefficient price discrimination both to divert electricity from its highest valued use, in the interests of keeping prices high elsewhere in generators' portfolios, or to reduce downstream competition by offering competitors electricity hedges on unfavourable terms.

4 The existing arrangements

NZAS is beneficial for all electricity generators

4.1 The Review outlined the sequence of events underpinning the negotiation of the contract for differences (CFDs) between NZAS and Meridian and between Meridian and Contact (see Figure 6 in section 5). In brief, NZAS announced on 23 October 2019 that it was conducting a strategic review to determine whether to continue with production at Tiwai Point and, on 9 July 2020, terminated its electricity contract with Meridian (with the contract ending end-August 2021) and announced it would close the smelter. On 28 August 2020, NZAS advised that it was still negotiating with the Government, and various other announcements played out in the media.

4.2 On 14 January 2021, NZAS and Meridian announced a new electricity contract for the Tiwai Point smelter, effective until December 2024. Contact also announced it would continue to support the contract by sharing the financial burden of the CFD with Meridian.

4.3 The charges paid by NZAS for electricity by way of this arrangement were significantly lower than prevailing forward prices at the time the arrangement was

negotiated. The price of the new contract was also at a larger discount to prevailing forward prices than the previous contract, despite general increases in electricity prices and new investment in transmission upgrades in the lower South Island.[5] Aluminium prices had fallen before these negotiations, increasing uncertainty about whether the Tiwai Point smelter was profitable at prevailing electricity prices. It is not clear that these trading conditions provided a rationale for the size of the price discounts and the duration of the new Tiwai contracts.

4.4 Making 'like-for-like' price comparisons is challenging for several reasons. For example:

(a) prices differ across nodes, because of transmission losses and constraints, and futures markets are incomplete

(b) the shape of daily and seasonal load profiles also matters for average prices

(c) the Tiwai contract also corresponds to an unusually large amount of electricity, which might be expected to receive a cost-based discount, just as generic wholesale prices differ from retail prices

(d) there are potential transmission constraints that may materially compromise the value of the water, with potential for some stranded water until these constraints are addressed

(e) demand response provisions can be very valuable and may be a significant contributor to differences in average price.

Qu. 1 NZAS has a number of unique attributes as a consumer of electricity, including size, location, the related potential for stranded water, and capacity to provide demand response. Do you agree that these factors support a discount relative to Benmore prices (as the reference South Island node)? Are there other relevant factors and how might one determine an appropriate level of discount?

4.5 NZAS's electricity consumption is significant, currently using around 13 percent of the electricity generated in New Zealand (see Figure 2 to Figure 4). These figures illustrate the size of NZAS's electricity demand relative to the market in aggregate and other large industrial consumers. Together, Figure 2 and Figure 3 illustrate that NZAS's consumption is much larger than all other grid-connected industrial consumers combined. These figures inform the importance of NZAS for electricity demand and provide some indication of the likelihood of 'volume-based' discounts. Because of its size, the allocation of electricity to NZAS has flow-on effects to other consumers of electricity. These effects are evident in movements in futures prices. NZAS made two announcements that made a material impact on forward electricity prices: August 2020 'might stay' and January 2021 'will stay'. These announcements led to increases in future wholesale electricity prices of around $13 to $22 per MWh over the following 3 years.[6]

[5] See Meridian Energy Limited New Zealand Aluminium Smelters Limited, "Electricity Agreement Conformed as at March 2016," https://www.meridianenergy.co.nz/assets/Investors/Reports-and-presentations/NZAS-contract/ca5a09f07b/NZAS-contract-consolidated-and-redacted.pdf. This new contract brought forward the termination of the old contract.

[6] See the Review for further discussion.

Figure 2: Monthly NZAS electricity consumption

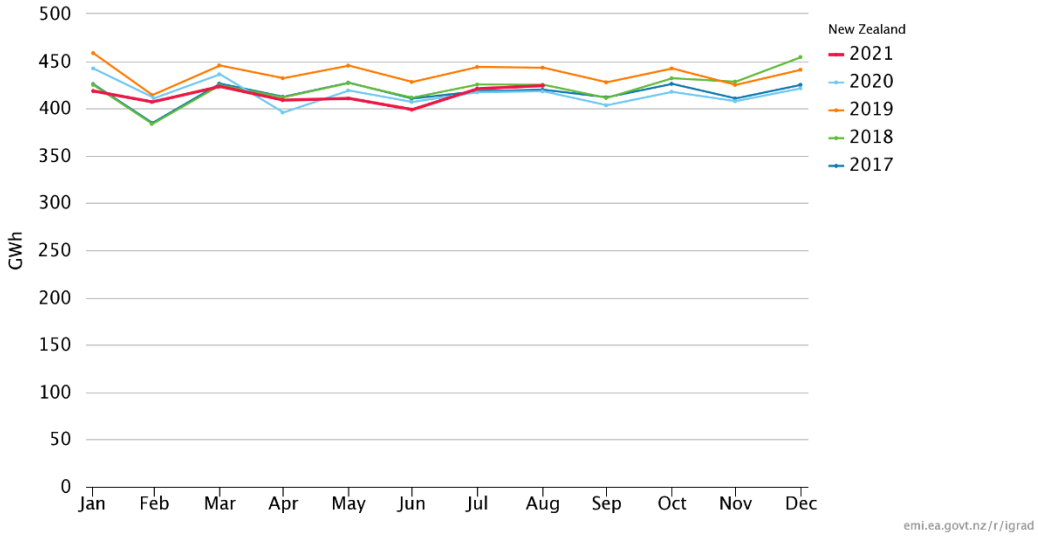


Figure 3: Monthly industrial grid-connected (excl. NZAS) electricity consumption

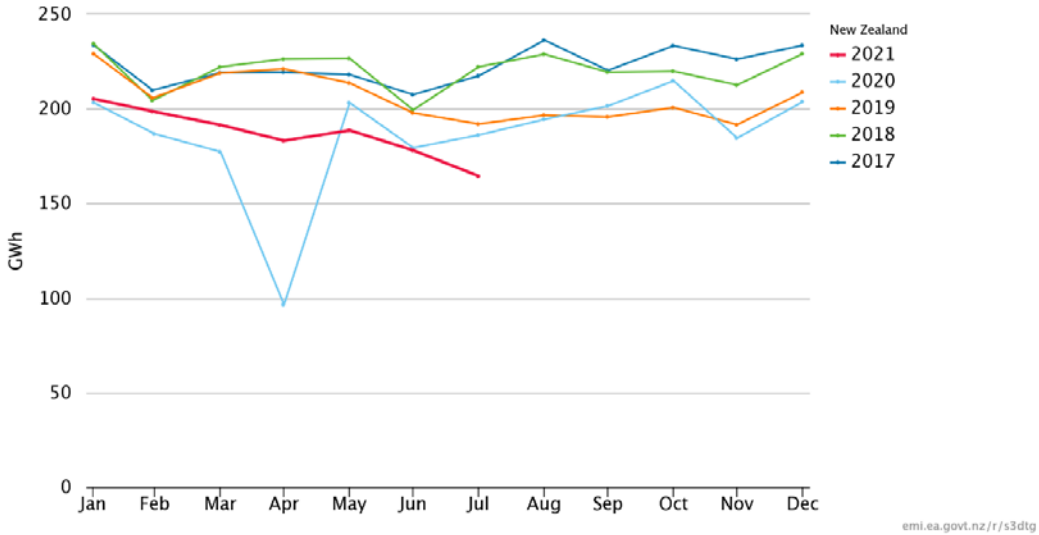
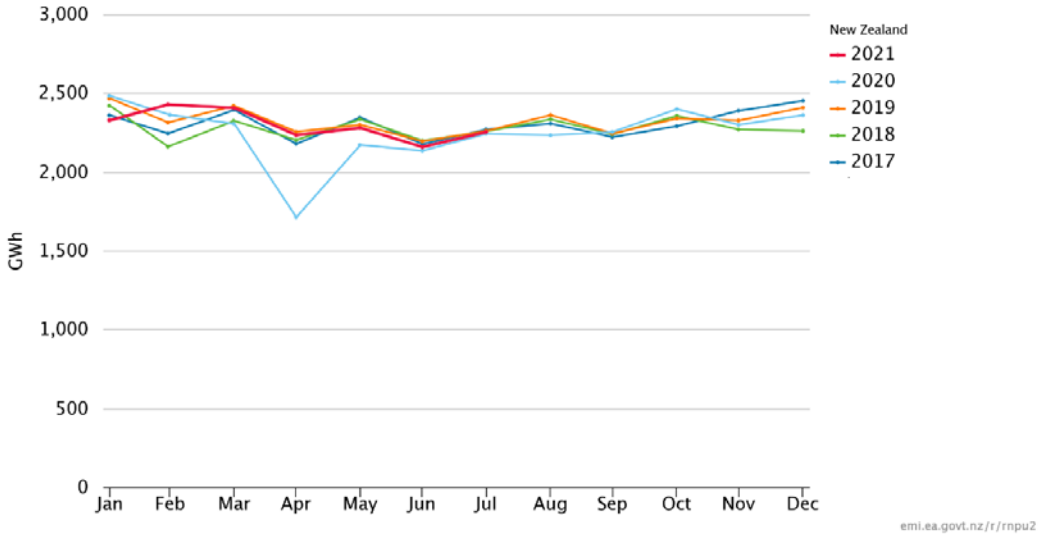


Figure 4 Monthly electricity consumption (total)



Note: The dips in consumption in April 2020 reflect the first COVID-19 lockdown.

4.6 The CFD between NZAS and Meridian was determined by a bilateral negotiation. NZAS enjoyed a strong bargaining position in those negotiations because of its size and proximity to Meridian's South Island generation, the absence of comparable demand in the lower South Island, transmission constraints and the possibility of stranded water, and because of alternative production options available to NZAS's parents in other countries. The latter factor increases the credibility of an NZAS 'exit'. The impact of its decision to stay or exit, on both supply conditions and prices nationally, can be leveraged by NZAS during negotiations.

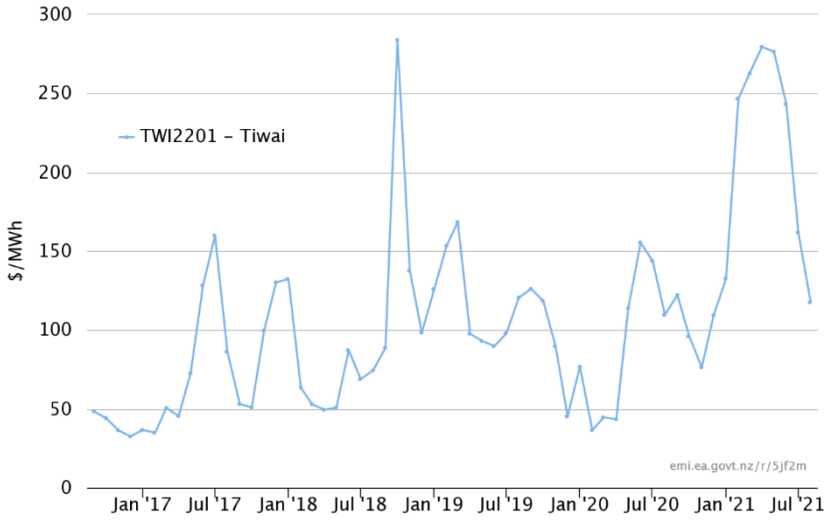
4.7 NZAS has a strong commercial incentive to use the threat of exit to leverage a lower effective cost of electricity. Generators can be expected to weigh the costs of keeping NZAS, say through a discounted contract price or other forms of support, against the consequences on their revenues from other customers. However, bilateral negotiations of this sort may not sufficiently account for the interests of other consumers.[7] If this arrangement is inefficient, the NZAS CFD can be considered a rent-seeking device – the generators' losses that arise from the CFDs are the costs they are willing to bear to capture a greater share of other consumers' economic surplus, through the elevated spot and forward prices that these consumers face, due to NZAS staying.

4.8 If all parties faced a 'market price', then inefficiencies of the kind being discussed would be less likely to eventuate. (The right consumers would consume the right amount of electricity.) 'Use-it-or-lose-it' clauses may not then be required by the generators to protect their interests, because the prices in the Tiwai contracts would be at market prices (adjusted for the cost and risk of serving) at the time of contracting.

4.9 Figure 5 provides additional context for the later discussions about efficiency. Since September 2016, monthly nodal prices at Tiwai have fluctuated between $32.55/MWh in December 2016 to $283.85/MWh in October 2018. The most recent peak in April 2021 was $279.44/MWh. In January 2021, around the time the Tiwai contracts were signed, the monthly spot price averaged $132.66/MWh.

7 Ronald Coase suggested that such inefficiencies could be resolved if the costs of bargaining were sufficiently low and all affected parties were involved in the negotiation. See R Coase, "The problem of Social Cost,," *The Journal of Law and Economics*, vol 3, (1960): 1–44. For example, absent collective action problems, in theory, other New Zealand consumers could pay a low willingness to pay (WTP) consumer to leave, for example, when the value of the electricity to the exiting consumer is less than the impact of the increase in the costs of electricity facing all other New Zealander consumers from the consumer staying.

Figure 5: Monthly nodal price at the Tiwai node 2017–2021



All generators have commercial incentives to retain NZAS's load

4.10 The Tiwai contracts have been agreed at prices substantially below prevailing market prices and below the prices at which electricity could have been sold to other consumers. This difference in price raises the possibility the electricity was not going to its highest value uses at the time the contract was struck. Rio Tinto, the majority shareholder in NZAS, undertook its own strategic review, and subsequently terminated NZAS's previous electricity contract, stating that the Tiwai Point smelter would not be competitive or financially viable unless the price of its electricity was reduced below the level in the contract that was terminated. This decision could suggest that NZAS's willingness-to-pay was below the price negotiated in the then-existing contract.

4.11 At 13 percent of generation, the load from NZAS is twice the size of load from other industrial grid-connected consumers combined, such as the Norske Skog pulp and paper mill at Kawerau[8] and the New Zealand Steel mill at Glenbrook. (See Figure 2 and Figure 4.)

4.12 Electricity generators aim to ensure that they achieve a suitable return on their generation assets. Overbuilding electricity generation is expensive and inefficient, and can result in under-recovery of the capital invested. Because electricity demand from NZAS is so large, the appropriate quantum and mix of generation capacity in New Zealand differs, depending on whether NZAS stays or exits from the market. If it were to leave, the market would be 'over-supplied' until supply and demand rebalance (either through spilling of stranded water and the exit of higher-cost generation, or through an increase in demand, or both). Such a supply–demand imbalance would accelerate the retiring of plant (most likely thermal) and result in a significant dampening of spot and forward market prices, especially in the lower South Island (at least until transmission constraints are addressed and supply and demand reach a new equilibrium).

4.13 The potential impact of the stay and exit scenarios can be observed in forward price movements at the time of the announcements to the market pertaining to

[8] The pulp and paper mill at Kawerau closed in June 2021.

NZAS's ongoing commitment to New Zealand. The periodic review of the Tiwai contracts creates significant and ongoing uncertainty for the industry because there is no alternative electricity load that could immediately replace NZAS if it should decide to exit New Zealand.

4.14 The earnings, asset values and share prices of generators involved in the CFD (and indeed other generators who are not) are expected to be higher if NZAS stays at least in the short-to-medium term. Of course, the generators supplying electricity to NZAS aim to charge as much as NZAS is prepared to pay for electricity to maximise their return. But the prices and revenues that they obtain from other consumers are much more important for their overall profitability.

4.15 The higher prices that generators receive for the electricity sold to non-NZAS consumers, due to the added demand from NZAS staying, means that the generators were (and still are) incentivised to offer low contract prices (or other financial incentives), relative to the prices facing other users, to encourage NZAS to stay.

(a) Meridian and Contact's respective forecast or estimated financial positions are improved over 'exit' scenarios.

(b) There was a willingness to trade off contract price in exchange for a longer term contract with the NZAS.

(c) The other generators, not party to the Tiwai contracts, also benefit from the higher prices of electricity on-sold to non-NZAS consumers. However, these generators are only motivated to participate in such an agreement if they believe that Meridian and Contact, by themselves, would not ensure that NZAS stays.

4.16 Trading conduct rules set out the appropriate trading conduct behaviour required of generators when market power becomes significant in the **spot market**. The new trading conduct rules were introduced in June 2021 after the Tiwai contracts were signed but trading conduct rules would not have applied because they do not extend to forward agreements and do not address the market power held by purchasers. One of the options discussed below proposes extending trading conduct rules to encompass hedge markets.

4.17 Generators are also incentivised to mitigate the strength of NZAS's negotiating position. Generators' bargaining positions are dependent on the alternative uses they have available, including unmet demand of a comparable size and improved transmission options to get the electricity to other users. Meridian and Contact are using the period of the current Tiwai contracts to develop or attract new large-scale demand, while supporting Transpower to reduce existing transmission constraints.

Two contracts supported the supply of electricity to the Tiwai Point smelter

4.18 The supply of electricity to NZAS's Tiwai Point smelter has two main components. The primary agreement is between Meridian and NZAS, and the supporting agreement between Meridian and Contact.

4.19 The Meridian–NZAS contract[9] is a CFD for the supply of 572 MW of electricity at a price well below prevailing forward prices at the time the contract was signed. All electricity provided by generating stations with a capacity of 30 MW or more must be offered through the spot market and dispatched by the system operator.[10] However, Meridian is able to guarantee NZAS a particular price through the CFD during the term of the agreement. If the spot price is higher than the contract price then Meridian pays the difference, and if it is lower than the contract price NZAS pays the difference between the lower spot price and the contract price. The financial flows associated with the CFD offset spot payments made to the clearing manager.

4.20 The Meridian–NZAS contract is for 4 years. NZAS can purchase 572 MW at one price, with an option to reduce consumption to 400 MW after 1 January 2022, at a lower price. The Meridian and Contact contract is similarly a CFD for the supply of 100 MW, with an option to reduce consumption after 1 January 2022.

4.21 Meridian allowed NZAS to forego its remaining obligations under the previous contract in exchange for a new, extended contract. In doing so, NZAS gained additional value, which can be thought of as further reducing its cost per megawatt of electricity. The previous contract expired in August 2021 and had a higher price structure than the new contract. The price reduction in the new contract between Meridian and NZAS was applied to the remaining term of the earlier contract.

4.22 The agreement gives NZAS some flexibility to wind down a portion of its plant ahead of 2024 should aluminium production be uneconomic. The agreement also gives Meridian and Contact 400 MW of certain demand in the lower South Island.

4.23 The contract includes a use-it-or-lose-it clause enabling Meridian to terminate the contract if NZAS's physical consumption falls below a certain threshold for a period longer than 3 months. This clause is mirrored in the Meridian–Contact CFD. It aims to prevent NZAS from monetising the value of any subsidy — the difference between the contracted price and market prices — by re-contracting with another party. If NZAS was able to cut its production and sell its claim on up to 572 MW at market prices, it would capture the value of the subsidy and, at the same time, bring down market prices facing other consumers to 'exit' scenario levels. This would undermine the generators' financial incentives for structuring the Tiwai contracts as they have.

4.24 The Commerce Commission opened enquiries into the 2021 Tiwai contract but concluded that there was insufficient evidence of a breach of section 27 and section 30 of the Commerce Act 1986 and decided to make no further enquiries. Nevertheless, the Authority has its own interest in reviewing these arrangements given its competition mandate under the Electricity Industry Act 2010 (the Act) and its wider statutory objective more generally.

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9 See Meridian Energy Limited New Zealand Aluminium Smelters Limited, "Electricity Agreement Conformed and Redacted as at January 2021," https://www.meridianenergy.co.nz/assets/Investors/Reports-and-presentations/NZAS-contract/NZAS-Contract-Consolidated-and-Redacted-v3.pdf.

10 In some cases, the system operator can require a generator of 10 MW or more to offer their generation through the spot market.

Generators may have sought to maintain high prices in the spot market

4.25 Meridian and Contact appear to have the most to gain from NZAS continuing to operate the Tiwai Point smelter because they are the largest generators, and they have significant generation assets in the lower South Island close to NZAS's smelter. As a result, they were the natural counterparties to support the relevant contracts. However, all generators stand to benefit from higher wholesale prices. The possibility remains that other generators with similar incentives may agree to contribute to similar arrangements in future.

4.26 The Authority considers it is important to understand the commercial drivers behind such contracts to assess whether the market is delivering outcomes that are consistent with its statutory objective. It notes in respect of those commercial imperatives that:

(a) at 13 percent of national demand, NZAS's electricity use is sufficiently large that the Tiwai contracts inevitably increase demand and contribute to higher spot prices for the duration of the contract by ensuring that NZAS remains in the market. This observation is consistent with the significant increase in forward prices that occurred when the market was informed that NZAS was still in negotiations and ultimately had extended the contract

(b) an NZAS exit, whether swift or staged, would likely dampen wholesale prices and lower generation revenue for a considerable time, particularly in the South Island and even more so in the lower South Island

(c) it is commercially rational for generators to trade off the discounted price they receive for the electricity supplied to NZAS, in exchange for NZAS' longer term commitment to stay where that commitment results in additional revenue from other consumers that exceeds any loss from the discount[11]

(d) the Tiwai contract between Meridian and NZAS includes a use-it-or-lose-it type clause as described in paragraph 4.23. The clause protects the generators from a key financial risk from entering this arrangement. The prohibition on trading the electricity increases the likelihood of NZAS continuing to consume electricity even if other consumers have higher valued uses for that electricity. The two generators are only required to provide the contract price when NZAS consumes a sufficient volume of electricity, thereby ensuring the generators enjoy a premium on the electricity they sell to the rest of New Zealand. If NZAS cuts production below the threshold specified in the clause, the two generators are no worse off than if NZAS had exited, because any potential value transfer to NZAS by way of the CFD is forfeited

(e) delaying NZAS's exit (until potentially December 2024) provided certainty for an extended period, increasing the incentive to build new generation. It also gave time for:

(i) Contact and Meridian to develop or secure new demand in the lower South Island

[11] The Authority acknowledges that the generators in question have an obligation to act within the law to deliver value to their shareholders.

(ii) Transpower to address transmission constraints in the lower South Island to enable the more efficient transmission of energy produced by Meridian and Contact to the North Island (noting that Transpower's current upgrades to the grid to address such constraints between Clutha and the Upper Waitaki will be completed by mid-2022).

4.27 Meridian and Contact both appear to have acted rationally given their respective commercial incentives as outlined above. The outcome from the agreement reflects, at least in part, the strong negotiating position enjoyed by NZAS. The Authority's analysis of the Tiwai contracts is not part of any current compliance investigation.

4.28 Looking forward, it is not obvious the relationship between NZAS and the electricity industry will end in 2024 (which will depend on the commercial incentives for all parties at the time).[12] The Authority is looking to ensure, as far as possible, that any future Tiwai contracts, and potentially others like it, are in the long-term interests of consumers.

Qu. 2 Do you have any additional feedback or information on the efficiency of the existing Tiwai contractual arrangements and their consequences?

5 Issues the Authority would like to address

The Authority would like to address the potential for allocative inefficiency stemming from price discrimination

5.1 The Review published at the same time as this issues paper notes that electricity is being supplied to the smelter at Tiwai Point at prices that do not appear to be available to other consumers. Price discrimination involves selling the same goods at different prices to different consumers. These preferential terms raise questions about whether the allocation of electricity to the smelter is **efficient**.

5.2 In this issues paper, the Authority primarily focuses on allocative inefficiencies that can arise from price discrimination. Several related concerns, including dynamic inefficiency and issues with weak competitive pressures from new generation, are also identified. Section 6 discusses options to address the issues raised here. Table 1 provides a simplified description of allocative and dynamic efficiency.

Qu. 3 Do you agree that the Authority should investigate price discrimination in relation to wholesale contracts?

[12] This includes not only incentives for generators, which may or may not still exist in their current form, but also on the then-future outlook for aluminium prices.

Table 1: Summary of the problem definition

Allocative efficiency

Markets ordinarily separate consumers with a high willingness to pay for a good or service from consumers with low willingness to pay. With a single market price, all consumers pay prices that exceed the costs of production.[13] With inefficient price discrimination, the right consumers are no longer consuming the right amounts of electricity, the allocation of electricity to different consumers may be inefficient – or the cost of producing electricity may be higher than people value it.

If consumers can negotiate directly with each other then consumers with low willingness to pay for electricity can on-sell to consumers that have high willingness to pay, making both sets of consumers better off.

Dynamic efficiency and the transition to a low emissions economy

Prices provide incentives for innovation and investment in generation, electric vehicles, the electrification of process heat, investment in industrial processes, and investment in technologies to shift electrical load through time. If prices are distorted by inefficient price discrimination then investment in all forms of capital may be distorted, posing a risk to New Zealand's transition to a low emissions economy.

5.3 The Authority's oversight of the electricity market aims to ensure that the consumers who value electricity above the cost of production can consume the amounts that they desire and that electricity is produced in a least cost manner given available generation. The spot electricity market is designed to ensure that electricity generators are dispatched to minimise production costs, while managing security of supply considerations. However, the presence of forward and other contracts makes it difficult to determine whether the consumers who value electricity most highly are the ones who receive it, particularly where there are restrictions preventing on-selling (eg, use-it-or-lose-it clauses in contracts). The allocation of electricity to different consumers could be inefficient if the consumers who value the electricity most highly are not actually served. Allocative efficiency issues are illustrated in Appendix B.

5.4 As noted above, adverse outcomes can arise where electricity is offered off-market and below the WTP of other consumers, as may be the case with the Tiwai contracts.[14] The inefficiency does not arise from the price being lower than what it otherwise might have sold for — low prices might simply reflect the negotiating position of the parties — but rather occurs when the electricity goes to users who do not value the electricity as highly as the next marginal user of electricity.

5.5 Evaluating the efficiency of transactions is problematic because WTP is generally not observable. To protect their financial interests, entities are incentivised not to reveal their WTP, and it is only possible to place an upper bound on a party's WTP when they do not transact (ie, the party's WTP is below the market price).

13 Here we assume that generators will not sell all of their electricity below the cost of producing it.

14 Note that this argument does not rely on electricity being sold to NZAS below marginal cost. Whether or not that is so is not relevant to the current analysis.

As such, the only time NZAS has revealed an upper bound on its WTP was on 9 July 2020 in terminating the then electricity contract and declaring to the Australian Securities Exchange (ASX) that it would close operations. The revealed upper bound of NZAS's WTP from June 2020 remains relevant for assessing the potential inefficiency of the offers made in the middle of 2020, though it seems likely that improvements in aluminium prices would have changed the WTP by the time the contract was signed in January 2021.

5.6 Efficiency concerns with goods and services not going to their highest valued use are typically mitigated through market design that reduces the costs of all prospective buyers and sellers accessing and participating in a market (coupled with transparency). When transactions occur off market, say, via over-the-counter (OTC) forwards or options to accommodate the bespoke nature of the contract, then confidence that the transaction is efficient can be affirmed through linking the contract price to observable market prices (adjusting for cost of service and risk). Another approach, when the WTP is not observable, is for the regulator to assess whether the party has the ability to pay the forward price by examining the value derived from the use to which it is put, which may necessitate the regulator using its powers to acquire information to make this judgement.

5.7 The Authority's main concern is that the price of electricity for the Tiwai Point smelter agreed by the supplying generators might not reflect the direct costs of supply or the alternative uses of that electricity. Rather, this price could be set at a level that ensures the smelter stays to maintain current levels of demand, so that generators achieve higher prices on their generation assets supplying electricity to other New Zealand consumers. (See Appendix B for an illustration of the mechanism involved.)

5.8 An alternative form of price discrimination to that found in the Tiwai contracts, and that may raise policy concerns, could arise if electricity hedge prices are at premiums above expected market prices to forestall retail competition. For example, a party may offer a contract to a retail competitor on less favourable terms than to an internal business unit.

Qu. 4 Should the Authority's consideration of policy implications from price discrimination practices extend to situations where electricity is supplied both at discounts and premiums to market prices?

Inefficiencies may arise because some consumers subject to price discrimination were excluded from the smelter–generator negotiations

5.9 The low price in the Tiwai contracts relative to the spot and forward prices at the time it was signed raises the prospect that the generators' motivation for reaching an agreement was not necessarily to maximise revenue from the contract with NZAS (though such revenue is desirable to the generators) but, rather, to maintain elevated prices paid by other consumers. The price discrimination associated with the Tiwai contracts may mean that some users who value electricity more than NZAS are unable to purchase it, whether from the generators directly or by re-contracting with NZAS.

5.10 The Authority has estimated the potential magnitude of the welfare gains and losses from the Tiwai contracts for different parties. From a policy perspective, the welfare gains and losses are of interest both when offers are made and when they are accepted.

5.11 The estimates illustrate the potential for inefficient outcomes, though the Authority notes that for some calibrations the contracts enhance welfare in aggregate.

5.12 A plausible baseline calibration shows that there may be sizable efficiency losses (see Table 2).

(a) The efficiency loss of consumers with higher WTP (potentially) being denied access is estimated to be around $8 million per year.[15]

(b) The efficiency loss associated with producing the electricity required to supply NZAS is estimated be around $49 million to $109 million (aggregating generator and NZAS surplus).

5.13 A significant wealth transfer occurs from residential, commercial and non-NZAS industrial consumers to generators (and indirectly to NZAS). The wealth transfers from rest-of-New Zealand (RoNZ) consumers to generators are estimated to be as much as $850 million per year or $2.6 billion over the first 3 years of the NZAS–Meridian contract, depending on the extent to which wholesale prices are passed through to consumers.[16] (See Figure 6.)

(a) High-cost, high-emitting generation is held in the market when it may otherwise retire (ie, if the hydro generation supplying the Tiwai Point smelter was available to the broader market and played a greater role in firming solar and wind, thermal plants with higher cost fuels would be less economic to run).

(b) Uncertainty about the possibility of future exit may discourage investment in new renewable generation. (See paragraph 5.34 and following paragraphs for further discussion.)

(c) Inefficient curtailment of electricity use and reduced access to affordable electricity. Consumers who would otherwise use electricity (residential, commercial and non-NZAS industrial) are reducing demand as a result of higher prices on the spot or forward markets. This reduction has meaningful flow-on effects for people, for example, through choosing not to use their heaters in winter, or businesses closing and making their staff redundant. It may also delay electrification of the economy, including the adoption of electric vehicles and the electrification of industrial heat.

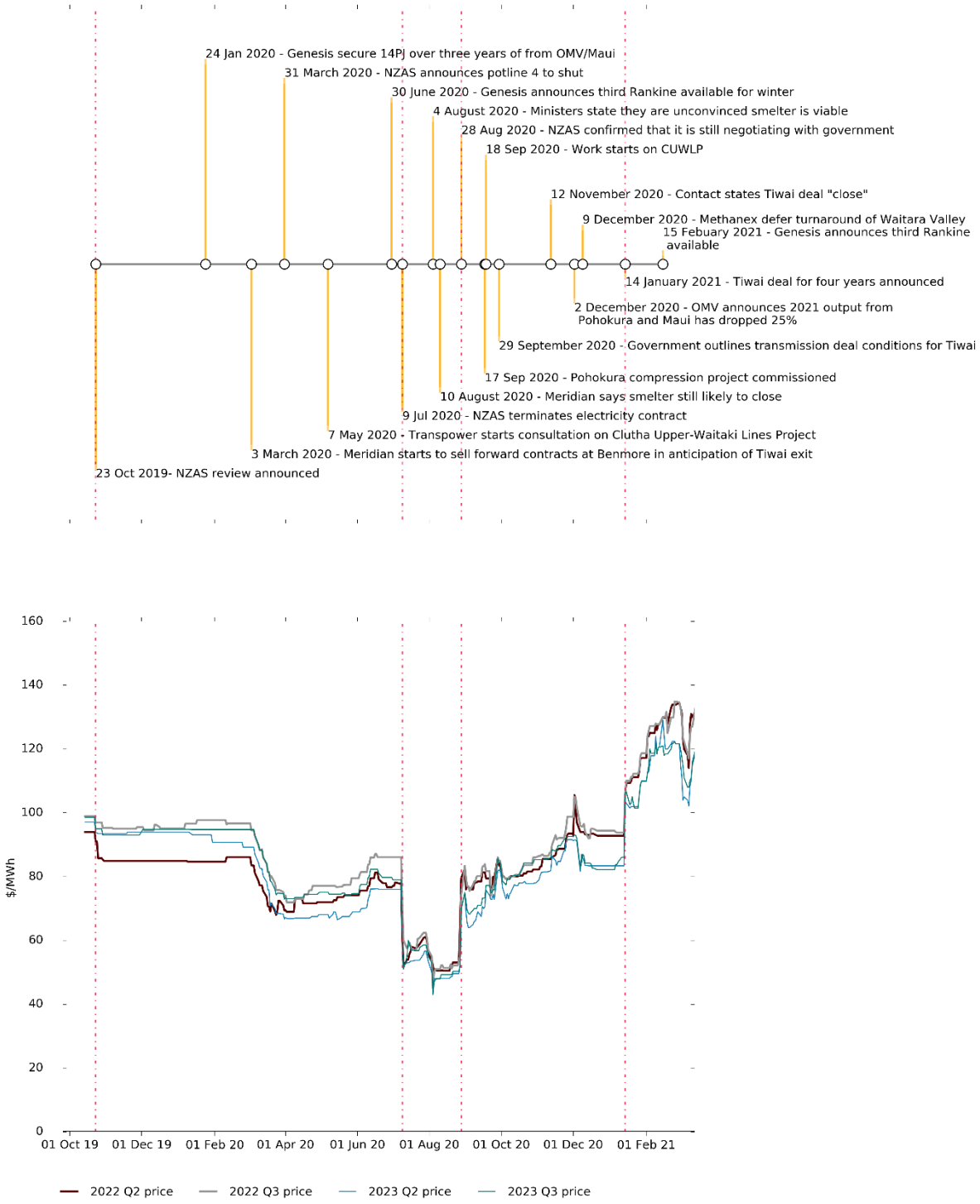
5.14 Figure 6, reproduced from the Review paper, illustrates how Benmore futures for the second and third quarters of 2022 and 2023 change in response to various

15 The efficiency losses are discussed for the first 3 years so that the period aligns with the forward curve for futures, which only extends out 3 years.

16 The cost of electricity for a representative annual load is determined by using the forward curve for futures before and after key Tiwai announcements. That is, the cost of electricity is computed for $Q_{2019} \times P_{Exit}$ and $Q_{2019} \times P_{Stay}$, where Q_{2019} is the load from 2019 (taken because the load in 2020 was disturbed by COVID-19 lockdowns); P_{Exit} is an estimate of the average price when the smelter exits, based on 3 years of futures prices, and P_{Stay} is the comparable average price when the smelter stays in production. The $2.6 billion amount is the difference, ie, $Q_{2019} \times P_{Exit}$ minus $Q_{2019} \times P_{Stay}$.

public announcements. In particular, the figure shows the expected price impact of ‘exit’ and ‘stay’ scenarios at the time of these announcements.

Figure 6: The Tiwai contracts timeline and Benmore futures



5.15 Table 2 reports estimates of the potential efficiency losses or gains that could arise from NZAS’s participation in the wholesale electricity market, for different calibrations of key parameters. The efficiency losses are illustrated and explained

in Appendix B. The computation of the surpluses and losses for the different parties is described in Appendix C.

5.16 The assessment of the efficiency losses needs to account for the 'welfare' of RoNZ consumers, NZAS and generators. Welfare is approximated by considering the benefits that accrue to each party in excess of the costs that they face. The welfare costs are computed on an annual (per year) basis. Given that interest rates are very close to zero, present discounted values for *Y* years would be approximately *Y* times the annual dollar amounts reported here.

5.17 The analysis is necessarily simplified by ignoring variation in prices and costs across trading periods and seasons. This preliminary analysis does not estimate dynamic impacts on capital investment, reporting instead just static allocative efficiency impacts.

5.18 The first row of Table 2 reports the baseline welfare consequences. RoNZ consumer losses are reported alongside upper and lower bound estimates of the generator plus NZAS loss. NZAS and generator gains and losses are aggregated to maintain confidentiality regarding the contract price. In the case where NZAS has a low willingness to pay, its gain in surplus offsets generator efficiency losses one-for-one. Note that given the assumptions outlined below there is also a wealth transfer (not reported in the table) from consumers to generators, of around $729 million per year, that greatly out-weighs the efficiency losses for generators, providing incentives for the agreement. For more explanation see Figure 9 in Appendix B.

5.19 The baseline calibration is as follows:

- RoNZ price elasticity $\varepsilon = -0.1$ (modified from empirical estimates)[17]
- RoNZ annual consumption based on 2019 annual MWh (36.454 TWh)[18]
- NZAS consumption based on 572 MW (as per maximum contracted amount)
- Smelter WTP = $45/MWh (approximation based on NZAS's bounded WTP at 9 July 2020)
- the operating and maintenance cost from deploying otherwise stranded water to generate electricity is assumed to be $8/MWh
- average price under exit scenario = $70/MWh (in line with Benmore futures after NZAS exit was announced 9 July 2020, with an adjustment to approximate an average, whole-of-New Zealand price)

17 Empirical estimates (see footnote 26) suggest that the short-run price elasticity for demand is about –0.25. Because wholesale generation is about one-third of the total cost of electricity for residential consumers (and a larger contribution for grid-connected consumers) a value of –0.1 is used to estimate the response of consumers to a change in wholesale electricity price. While the elasticity driving an instantaneous response to a wholesale price change may be low because many consumers are hedged, over the life of a 4-year contract, more adjustment of consumption is expected to occur.

18 Note that 2019 consumption for rest-of-New Zealand consumers was chosen for the baseline because the COVID-19 lockdown in 2020 disrupted electricity consumption. Note that NZAS's surplus would only change if the contract for difference price, NZAS's WTP or the quantity of electricity consumed by NZAS were amended, but these three elements are held constant in both tables.

- average price under 'stay' scenario = $90/MWh (in line with Benmore futures prices after ongoing negotiations were confirmed by NZAS 28 August 2020 and estimates of the levelised cost of electricity)[19]
- average stranded water = 140 MW (annual analysis assuming transmission constraints are resolved post-2022; sensitivity analysis considers the impact of lower stranded water).

Qu. 5 Do you agree these baseline assumptions are reasonable? What other assumptions should be tested?

5.20 The subsequent rows of Table 2, below the baseline reported in the first row, illustrate how replacing one parameter of the baseline affects the welfare assessments. The change in the parameter is noted in the first column of the table (with the remaining parameters being the same as the baseline).

Table 2: RoNZ consumer and generator+NZAS efficiency losses

	RoNZ consumer losses	Generator +NZAS losses (Lower bound)	Generator +NZAS losses (Upper bound)	Total deadweight loss (lower bound)	Total deadweight loss (upper bound)
	$m/year	$m/year	$m/year	$m/year	$m/year
Baseline	–8	–49	–109	**–57**	**–117**
Exit price = $60/MWh	–18	–11	–88	–30	–107
Stay price = $80/MWh	–2	–49	–83	–52	–85
RoNZ Elasticity ε= -0.05	–4	–49	–117	–53	–121
Average stranded water = 120 MW	–8	–60	–123	–68	–131

5.21 The alternative calibrations are intended to illustrate how the parameter changes influence efficiency outcomes. Some of the changes are informed by observations about the agreements. For example, the second two rows consider how efficiency losses change if the exit and stay prices are lower, and the third row considers the impact if the RoNZ price elasticity is dropped to –0.05 to account for the possibility that RoNZ consumers may be less responsive to price changes than estimated.

19 See the generation stack reports at Ministry of Business, Innovation and Employment, "New Zealand generation stack updates," last updated December 18, 2020, https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-publications-and-technical-papers/nz-generation-data-updates/.

5.22 The last row considers the impact of reduced 'stranded water', reflecting the alleviation of transmission constraints. The magnitude of stranded water has a material impact on the efficiency implications of the agreement. Stranded water in the lower South Island will also become less important for efficiency assessments of future large contracts. Recent information from Transpower indicates that the capacity in the Clutha-Upper Waitaki line is being doubled from 590 MW to 1180 MW by mid-2022.[20] By way of comparison, Manapōuri has a generation capacity of 800 MW, Clutha has a capacity of 432 MW and Roxburgh has a capacity of 320 MW.

5.23 In these stranded water scenarios, the smelter surplus remains unchanged, representing NZAS's WTP less the contract price × MW × number of hours per year. The smelter still obtains surplus from the stranded water. In contrast, the efficiency losses for the generators only relate to the proportion of electricity that could be exported to other consumers. The efficiency **gain** for generators on stranded water is estimated to be the contract price less avoidable cost (of around $8/MWh given South Island mean injection charges from Transpower and operating and maintenance costs).

5.24 Independent analysis by Concept Consulting Group Limited estimates the additional charges payable by NZAS for 572 MW and the incremental (avoidable) cost of supplying the additional demand. This results in an expected subsidy to NZAS over the lifetime of the contract of more than $500 million, or approximately $125 million to $150 million per year. The break-even cost of supplying New Zealand consumers when the smelter is operating is estimated to be more than $60/MWh, which is significantly higher than the current contract price in the NZAS–Meridian agreement.

5.25 The Authority considers the analysis illustrates scope for inefficient outcomes, particularly in the context of future agreements where Clutha-Upper Waitaki transmission constraints are alleviated. The Authority recognises that alternative calibrations can imply that the current arrangements are welfare enhancing (eg, if NZAS had a sufficiently high WTP). Nevertheless, the Authority considers that the current incentives and market design could result in inefficient future outcomes, and it is worth exploring options that address this potential outcome.

The potential for inefficient price discrimination

5.26 In competitive markets, consumers with the highest WTP obtain the goods being supplied, with the price of the goods acting as a screening device separating consumers with high WTP from consumers with low WTP. However, such an outcome is predicated on participation in the market. The use-it-or-lose-it clause in the Meridian–NZAS contract has the effect of restricting welfare-enhancing trades between third-party consumers and the parties to the contract.

5.27 It is well understood that perfect price discrimination – where suppliers can charge consumers exactly their WTP – will result in efficient outcomes (with some consumers being charged high prices and others low prices), though the benefits of such transactions accrue to suppliers. Likewise, at the other end of the

[20] See Transpower, "Power Flow Limits – Clutha Upper Waitaki Lines Project (CUWLP)," no date, https://www.transpower.co.nz/sites/default/files/bulk-upload/documents/SO%20Analysis%20CUWLP%20Capability%20post-Duplexing.pdf.

spectrum, if suppliers cannot discriminate then that too is likely to result in an efficient outcome. However, there is potential for price discrimination to be used in such a way that the efficient allocation of a good is no longer assured.

5.28 If prices are inefficient then the consumption of electricity is likely to be distorted; using the smelter example, it may potentially be consuming too much electricity and other consumers may be consuming too little. If the RoNZ consumers have higher valued uses for the electricity than NZAS and were at a hypothetical negotiating table, they could have counter bid for the subsidised electricity being offered. Suppose that the CFD between Meridian and NZAS has a strike price of $X/MWh, where X is below the WTP of at least some other consumers. Then New Zealand consumers would have an incentive to bid $X+1/MWh for the electricity, forcing NZAS to counter at $X+2/MWh and so on, until a point was reached where either the smelter was prepared to pay as much as other consumers or it was uneconomic for the Tiwai Point smelter to remain. Based on forward prices for the next 3 years when the Tiwai contracts were agreed, New Zealand consumers could expect to pay an additional $13/MWh to $22/MWh so would be incentivised to bid right up to that price.

5.29 Having the rest of New Zealand 'at the negotiating table' would likely have increased the price the generators would have earned for this electricity and provided added assurance that the electricity went to its highest valued uses. If, through such a process, NZAS was shown to be willing to pay the market price for electricity then the public policy concerns fall away, and the higher prices paid by the RoNZ consumers, compared with a smelter exit scenario, simply reflect legitimate supply and demand conditions.

5.30 To highlight the issues being considered, Appendix B provides a stylised representation of the electricity market representing the supply of electricity by generators and distinguishing between electricity demand (load) from NZAS and RoNZ consumers. In this stylised framework (abstracting for the moment from nodal pricing), there are two prices in a given trading period: the price paid by the smelter and the price paid by RoNZ. The discussion illustrates the allocative issues through outlining contrasting scenarios, one in which the allocation of electricity to the smelter is efficient and another in which it is not.

5.31 Section 6 identifies possible regulatory interventions that might be taken to improve the allocation of electricity to competing users (and uses) and thus to improve in the operation of wholesale electricity markets, taking into consideration both scenarios.

5.32 The Authority notes that the Act requires it to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers. In the Act, consumer means any person who is supplied or applies to be supplied with electricity (other than for resupply, and so excludes generators, generator–retailers, non-integrated retailers, other on-sellers of electricity or financial market speculators). Thus, the smelter is a consumer whose interests need to be considered when the Code is developed, alongside other consumers.

5.33 Consistent with the Authority's foundational interpretation of its statutory objective,[21] the fairness of wealth transfers between different consumers is not directly within the remit of the Authority. However, the potential inefficiencies that are associated with such wealth transfers **are**. Future Code changes addressing these inefficiencies may also dampen or reallocate these wealth transfers.

Other concerns that could be addressed by regulatory or public policy interventions

Distorted investment

5.34 The operation of the wholesale market could potentially be improved if policy changes are made that forestall inefficient price discrimination. The price signals that are provided in each trading period and expectations of future price signals also provide incentives for timely investment. If the Tiwai contracts with NZAS result in inefficient prices, then the signals provided for all forms of investment — both generation and electrification — may be distorted, threatening the efficient transition to a carbon-neutral economy.

5.35 Electricity is both a final good consumed directly for the benefits that it confers and an intermediate good used in the production of other goods and services. Reflecting these multiple roles, electricity prices (and expectations of future prices) affect investment in electricity generation, demand response, load management, electric vehicles, and in other sources of electricity demand.

5.36 Higher electricity prices and expectations of elevated prices **promote** investment in electricity generation and demand response, including the maintenance of high-cost thermal generation to support reliability. However, higher prices **deter** investment in the electrification of process heat and transportation and may slow the decommissioning of high-cost thermal generation. Current and future elevated electricity prices thus have attendant environmental implications, affecting the efficient transition to a low emissions economy.[22]

5.37 The Authority notes the ongoing incentives for generators to agree to similar, future contracts, with attendant implications for longer term prices. The contrasting incentives for investment in generation and electrification need to be considered in the design of the Code. Whether prices are too high or too low is not easy to determine at any single point in time, given the analytical tools, information and frameworks available, and the multitude of signals that are being provided simultaneously for different kinds of investment. However, markets can be designed to provide added assurances that price signals are reflective of supply and demand fundamentals, and the solutions being proposed here will be evaluated with regard for this criterion.

A lack of generation investment from other participants

5.38 Ongoing, periodic uncertainty about the Tiwai contracts may have discouraged investment in new generation for two reasons. First, the risk of an NZAS exit, with

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21 See paragraph A.6 in Electricity Authority, "Interpretation of the Authority's statutory objective," February 14, 2011, https://www.ea.govt.nz/assets/dms-assets/9/9494statutoryobjective.pdf.

22 The 2020 amendments to the Climate Change Response Act 2002 have committed New Zealand to mitigate climate change. The Authority recognises these broader objectives and aims to ensure that the resulting changes in the electricity market are efficiently accommodated.

the associated reduction in electricity load, decreases expected returns on generation investments. All incumbent generators benefit from the high prices that arise when NZAS stays, without being directly involved in the contract. This might serve as a disincentive to invest in new generation; each incumbent generator must assess whether the increase in earnings from greater generation outweighs the reduction in earnings on the rest of its portfolio from lower wholesale prices. These incentives differ between incumbents and new entrants. New entrants are not concerned by the effect of price changes on the revenues earned from existing assets.

5.39 Second, the uncertainty around NZAS remaining for non-Meridian and Contact generators may create enough instability that it is hard for others to make the business case to invest, particularly when they are already benefitting from NZAS remaining in the market without having to make payments to forestall exit. Meridian and Contact have an information advantage with respect to NZAS's decision to stay, which helps them to adjust their generation portfolios. The timing of Meridian's Harapaki and Contact's Tauhara announcements,[23] shortly after the new Tiwai contracts were announced, may have discouraged other generators from pursuing projects, and ensure Meridian and Contact grow their market share of generation. However, other generators have subsequently announced new investments (eg, Genesis with Kaiwaikawae and Lodestone Energy with five solar farms) and this could be explained in part by the continuation of NZAS's participation in the market.

5.40 The Review identified several reasons why there may be barriers to investment in new generation, including resource consents, transmission constraints and uncertainty around government policy. The Authority believes the issues identified with respect to the Tiwai contracts pertaining to incentives to invest in new generation are best addressed through a work programme looking at generation investment more generally. The Authority intends to progress this work programme in 2022.

Qu. 6 Do you agree that any investment issues raised by the Tiwai contracts are best addressed through a review of barriers to new investment more generally, as the Authority intends to undertake in 2022?

Some considerations go beyond the mandate of the Authority

5.41 The Authority recognises the parties agreed to these contracts given the commercial incentives they faced to deliver value to shareholders. These arrangements both supported their commercial goals and contributed to a wider set of national goals, including regional job creation and supporting cleaner aluminium production, when compared with other Rio Tinto smelters.

[23] Meridian announced it was progressing the development of Harapaki wind farm on 24 February 2021. Meridian, "Meridian to build $395 million wind farm in Hawke's Bay," February 24, 2021, https://www.meridianenergy.co.nz/news-and-events/meridian-to-build-395-million-wind-farm-in-hawkes-bay. Contact announced it was progressing the development of the Tauhara geothermal station on 15 February 2021. Contact, "Contact to build Tauhara geothermal power station; will raise $400m in equity," February 15, 2021, https://contact.co.nz/aboutus/media-centre/2021/02/16/contact-to-build-tauhara-geothermal-power-station-will-raise-$400m-in-equity.

5.42 Issues such as regional development, employment, foreign direct investment and taxation lie outside of the Authority's remit and are better addressed by other arms of government.

6 Exploring policy options to address price discrimination

Legal context

6.1 In this section, the Authority sets out, at a high level, potential policy options that could be explored to address the sorts of issues that can arise from inefficient price discrimination. The options presented are not intended to be an exhaustive list, and stakeholder feedback is welcome on other options that may be available to the Authority in the long-term interests of consumers.

6.2 It is acknowledged that further work would be required on all options including the precise form of any regulatory change. In developing and evaluating options, the Authority would ultimately need to be satisfied that any option, once fully developed, is consistent with its statutory objective and functions.

6.3 Under the Act, the Authority can make regulations by amending the Code.[24] Code amendments must be consistent with the Authority's statutory objective and functions, as outlined earlier, and more specifically in line with section 32 of the Act. In this regard, the Authority notes, for example, that it cannot make Code on matters the Commerce Commission is authorised to regulate under Part 3 or Part 4 of the Commerce Act 1986. The Authority's ability to make Code may also be limited where primary legislation already exists, or where matters have previously been addressed through primary legislation. For example, historically, structural change to electricity market participants and asset swaps have been progressed through primary legislation.

6.4 The primary focus of this paper is on options that the Authority can likely advance through Code amendments focused on inefficient price discrimination. The Authority is seeking feedback on an initial list of options as outlined below.

6.5 However, the Authority also encourages submissions on the most effective options to address inefficient price discrimination more generally, even if such options could fall beyond the scope of the Code. Consistent with its statutory function to undertake inquiries into any matter relating to the electricity industry, the Authority is also seeking feedback on all options. Where an option is identified in submissions that may require input from another branch of government, the Authority will share the feedback provided with the relevant branch of government, as appropriate.

Options for consideration

6.6 The Authority is publishing this issues paper to elicit feedback from stakeholders on whether discriminatory pricing is a problem of sufficient scale to warrant

[24] For further information about delegated legislation and disallowable instruments see Clerk of the House of Representatives, *Parliamentary Practice in New Zealand*, chapter 8. (Wellington: Clerk of the House of Representatives, 2017), https://www.parliament.nz/en/visit-and-learn/how-parliament-works/parliamentary-practice-in-new-zealand/chapter-28-delegated-legislation/. The Code is a disallowable instrument that can be amended or revoked by parliament under the Legislation Act 2012.

intervention, given that it has the potential to result in electricity not being used efficiently.

6.7 This section sets out the options the Authority has identified that could address concerns about discriminatory pricing, including an assessment of the pros and cons. The objective is to identify interventions that could address the problems with discriminatory pricing, either singularly or collectively.

6.8 The options below are not mutually exclusive or exhaustive, nor are they fully developed and final. The intent is to obtain views from interested parties on a range of possible options the Authority is considering in light of the problem discussed above. Views are sought on alternative ways of implementing the options outlined in this paper and on any further relevant options. The Authority is interested in views on the implementation issues regarding different options as well as views on their efficacy in resolving concerns regarding price discrimination. It may be that some combination of options is identified as worth considering.

6.9 The options below have been selected because they address one or more of the following four conditions that enable inefficient price discrimination:

(a) generators' ability to offer different prices to different customers without having to justify the difference

(b) the capacity to do the deal off-market so as to control which parties can participate

(c) the use of use-it-or-lose-it contract clauses thereby effectively prohibiting the re-contracting of that electricity with other consumers who have higher valued uses

(d) generators own other generating assets that benefit from the increase in revenues from other customers.

6.10 The problem identification section above focused on the Tiwai contracts because of their scale and observable impact on the market. However, it is recognised that inefficient discrimination could also be happening elsewhere in the sector, including:

(a) the large generator–retailers' supply agreements with other large industrial loads or independent retailers, including potential for new large-scale demand to be developed in future

(b) in long-term power purchase agreements (PPAs) where large purchasers could exert pressure on independent generators to obtain favourable terms

(c) in the terms and conditions of OTC derivative agreements between independent retailers and large generator–retailers.

6.11 While none of the individual agreements in categories (a) to (c) above will be of a similar size to the Tiwai contracts, such agreements, when considered collectively, have the potential to raise efficiency and competition concerns. The Authority is seeking stakeholder comments on the efficacy and design of these options, both with respect to possible future contracts similar in scale to the current Tiwai arrangements, but also other contexts.

Qu. 7 Beyond the Tiwai context, do you consider discriminatory pricing or discriminatory terms and conditions are adversely affecting efficiency and competition in the electricity system? If so, please provide evidence.

6.12 The following is a list of options the Authority considers could address concerns about inefficient price discrimination, which are discussed below.

1. Status quo
2. Prohibit use-it-or-lose-it clauses
3. Electricity Authority pre-approval of large contracts
4. Require public offering of all (or some percentage of) hedge contracts
5. Require large hedges to be traded publicly
6. Extend trading conduct provisions beyond the spot market to hedge markets
7. Non-discriminatory pricing rules
8. Hybrid of non-discriminatory pricing and pre-approval of contracts.

Qu. 8 Are there other options the Authority could implement to mitigate inefficient price discrimination?

6.13 The paper also briefly discusses additional policy options that could be considered by other branches of government.

Option 1: Status quo

What the option aims to achieve

6.14 The status quo serves as the counterfactual against which all options are compared.

High-level description of option

6.15 This option assumes the wholesale market functions the same as it does today. Under the status quo, generators and electricity users are free to negotiate bilateral agreements for the supply of electricity at any price they can reach agreement on. If a contract is signed, that indicates there is a benefit to each of the parties involved. If a contract is not agreed, then it was not mutually beneficial to both commercial parties, having due regard for transaction costs. Under the status quo, a contract for the supply of electricity to NZAS is possible, depending on the market conditions at the time.

6.16 The status quo is dynamic. Even with no direct intervention, the conditions facing parties will evolve through time, potentially resulting in different outcomes when the Tiwai contracts are next reviewed. Conditions that dynamically vary through time include:

(a) regulatory settings: the new trading conduct rules are expected to alter offer behaviours in the spot market and could have pricing and implications for forward contracting including ASX futures, CFDs and PPAs. Greater transparency has also been enabled by Code obligations

requiring integrated retailers to disclose their internal transfer prices and retail gross margins

(b) grid capacity: additional transmission capacity from the lower South Island going north, due to be completed by 2023, should increase Meridian's and Contact's opportunity cost of supplying Tiwai or prospective new demand, which would improve Meridian's bargaining power in negotiations with NZAS

(c) sources of load: efforts are being made to develop alternative sources of load in the lower South Island (including hydrogen, data centres and the electrification of process heat), which could compete with NZAS for electricity and could increase confidence that the electricity is going to the highest value uses. It may also result in longer term supply contracts, which reduces the future uncertainty of demand currently facing investors in new generation

(d) input and output prices: changes to alumina, aluminium, and electricity forward prices would affect NZAS's willingness to pay and the opportunity cost of supplying electricity

(e) competition: changes in the generation and load landscape (such as the possible retirement of the coal-fired plant at Huntly, the emergence of a hydrogen demand, and the growth of distributed energy resource and demand response), and potential competitive response from other generators may modify commercial incentives in the next round of negotiation.

Potential pros	Potential cons
Most efficient option when little or no harm is being done to third parties. Continued flexibility of risk transfer between parties best placed to manage it. Regulatory stability provides steady environment for investment. Deals for large volumes of electricity can be contracted at prices amenable to commercial parties involved. Variety of risk management products available for purchase through OTC and market transactions.	Potential for inefficient allocation of resources. Generators' incentives may not provide assurance that electricity is being sold for its highest value use. Confidence in the market would be lowered. One participant receiving a 'low' price that results in higher prices for other consumers reduces consumer confidence that the market is working efficiently. In the absence of contracting via open markets, it is problematic discerning whether one consumer has a lower valued use than another. Maintains demand for electricity and associated high prices, delaying decommissioning of high cost, high carbon-emitting thermal. If there is market power in the system, retail and generation competitors may be priced out of the market. If the current Tiwai contracts are indeed considered problematic, then high likelihood a similar issue may arise again in future.

Option 2: Prohibit 'use-it-or-lose-it' clauses

Qu. 9 What are the pros and cons of the status quo?
Qu. 10 Do you consider that the status quo addresses the problem identified?

What the option aims to achieve

6.17 This option aims to ensure that commercial arrangements do not prevent electricity from going to its highest value use.

High-level description of option

6.18 This option would involve implementing a Code change to prevent CFDs from being conditional on use of physical electricity. The Meridian–NZAS CFD allows Meridian to terminate the CFD if the electricity user's physical use drops below a certain threshold. The intent of such a clause is to prevent the user from ceasing to use the electricity themselves and instead trading it for a higher price than in the original CFD. The effect of this is even if the electricity has a higher value use and other consumers would be willing to pay more, the clause prevents them from purchasing the electricity directly from the smelter. (Moreover, the value of the electricity to the smelter need not drop, for example, to zero, so they may not be prepared to cancel the CFD without additional compensation from some other party.) As a consequence, generators can use these clauses to protect their financial interests when offering discounted electricity to a party, when attempting to keep prices high elsewhere.

6.19 The proposed prohibition on use-it-or-lose-it clauses could apply to both sides of the CFD or could be limited to the party receiving the fixed price (the generators in the context of the Tiwai contracts).

Key considerations and choices that would need to be worked through

6.20 The Authority is aware that the Tiwai contracts have use-it-or-lose clauses that prevent on-selling of electricity. The Authority notes that other contractual terms may also prevent electricity from being on-sold to consumers who have higher valuations. The Authority seeks feedback on such instances. If this option were to be progressed, it would be important to fully understand the economic role of such clauses, to determine whether there were additional benefits that have not been identified.

Potential pros	Potential cons
Adverse efficiency implications of segmentation can potentially be unwound by high WTP consumers contracting with lower WTP recipients. Increases risk and cost of transactions to generators offering low value electricity.	In a repeat game, re-contracting might not take place, eg, low WTP consumers may not be incentivised to re-contract with higher WTP consumers if they know they will not get offered the same deal by generators in future periods. May prevent efficient contracting of large consumers. Potential negative impacts on investor sentiment towards New Zealand. 'Use-it-or-lose-it' clauses may have a legitimate risk management function in other situations.

Qu. 11 Do use-it-or-lose-it clauses have a legitimate commercial role? What would the effect be of prohibiting them in wholesale electricity markets?
Qu. 12 Which contracts (eg, minimum size) should be subject to a prohibition on a use-it-or-lose-it clause?
Qu. 13 What are the pros and cons of prohibiting use-it-or-lose it clauses?
Qu. 14 Do you consider that prohibiting use-it-or-lose it clauses addresses the problem identified?

Option 3: Electricity Authority pre-approval of large contracts

What the option aims to achieve

6.21 This option would aim to ensure there is greater scrutiny of agreements that are more likely to result in inefficient price discrimination, in particular, contracts large enough to have material price effects for other consumers. It differs from option 7 because it would not prevent discriminatory pricing in all cases, only inefficient price discrimination in contracts that meet the 'large' threshold defined in the Code. As such, it would aim to capture contracts such as the Tiwai arrangements but may not capture offers (or non-offers) made by generators to independent retailers for example.

High-level description of option

6.22 This pre-approval option could address large contracts (eg, in excess of **X** MW or **X** dollars) that affect the efficiency of the whole market through price discrimination.

6.23 Under this option, a regulatory change would need to be developed whereby participants would submit relevant contracts to the Authority. The burden would be on market participants to prove they met criteria published by the Authority. The Authority would review the terms of the contract, including the price, to

determine whether there was an actual or material risk of an efficiency loss. If the contract did not satisfy the criteria, then it would not be permitted.

Key considerations that would need to be worked through

6.24 The threshold delineating which contracts are captured by the pre-approval requirement would be an important consideration. Too high and it may not achieve the policy intent, too low and it could create compliance burdens, delays and unnecessary uncertainty in the market around contracts and whether they would be approved. There is also the potential for gaming around the threshold.

6.25 As noted above, a buyer's WTP is generally not observable. Therefore, to assess the efficiency effects of any specific example of price discrimination (eg, a specific OTC CFD with a strike price less than the forward price), the Authority would need to obtain enough information to make the assessment that the party at least has the ability to pay the appropriate forward price (adjusted for cost to service and risk). To ensure the Authority has sufficient information for this purpose, the onus could be on the parties to the CFD (the generator and consumer) to provide the Authority with the information necessary to assess the efficiency effects.

6.26 The criteria outlining which contracts need pre-approval, the process for getting that approval, timeframes for decision-making, and processes to appeal a decision would need to be clear to all market participants. It would also be important to set out how this process differs from the Commerce Commission's authorisation of restrictive trade practices.

Potential pros	Potential cons
Focuses exclusively on contracts which are most likely to raise efficiency and competition concerns. Flexibility in risk contracting preserved. Does ex ante what is currently occurring ex post (market monitoring and review), and with better remedies, eg, aims to prevent inefficient deals from proceeding. Improves confidence in efficiency of prices. Precedent: Overseas Investment Office regarding purchases of assets by foreigners, and Commerce Commission approvals of mergers.	Does not ensure non-discrimination for smaller contracts. Slows down commercial decision-making. Potential resourcing costs for the Authority that would need to be recovered via annual levy. Political economy: the Authority would be required to sanction contracts with regional, economic and other political dimensions. Potential negative impacts on investor sentiment towards New Zealand. Need to develop robust evaluation criteria. May create uncertainty in commercial decision-making. Must ensure there is no regulatory overlap between the Authority and Commerce Commission.

Qu. 15 Should this option be limited to pre-approval of contracts or extended to apply to offers that one party considers are discriminatory?
Qu. 16 What criteria should the Authority consider in pre-approving large contracts?
Qu. 17 What should the MW or dollar threshold be for contracts requiring pre-approval?
Qu. 18 What are the pros and cons of Authority pre-approval?
Qu. 19 Do you consider that pre-approval of large contracts addresses the problem identified?

Option 4: Require public offering of all (or some percentage of) hedge contracts

What the option aims to achieve

6.27 The objective of publicly offered hedge contracts would be to ensure greater and equal access to sale and purchase opportunities, thereby providing greater assurance that electricity is going to the consumers with the highest WTP.

High-level description of option

6.28 Under this option, all (or at least a significant) portion of each generator's portfolio of electricity hedges, both for the energy and location component, would need to be offered and bid for publicly. Under this option, the OTC market, and other closed forms of negotiations, such as PPAs, would no longer exist. Market participants would need to buy and sell their risk management products publicly, giving other participants the opportunity to compete. This could be achieved through public exchanges, such as the ASX, or through public tenders for either the sale or purchase of electricity, for example, generators and large industrials could tender publicly for bespoke electricity contracts.

Key considerations that would need to be worked through

6.29 Currently, standardised monthly and quarterly New Zealand electricity futures contracts are available to purchase in 0.1 MW increments at the Benmore and Otahuhu nodes. The added liquidity in public markets from this option may expand the range of risk-management products offered on the ASX, including greater choice of volumes, nodes, use profiles, durations, or other terms and conditions. However, this arrangement may not provide the same degree of flexibility and tailored hedge cover currently afforded by the OTC market.

6.30 Requiring all electricity related forward contracts to trade publicly mitigates the opportunity for undesirable cases of discriminatory pricing. Open access markets and auctions could provide greater assurance that electricity is going to consumers with the highest WTPs. For example, a generator could not consistently offer another party low priced hedges, because all market participants would have the opportunity to purchase the product at that price. This would support price discovery and could lead to a longer term and more liquid forward curve than is currently available.

6.31 However, as compared with OTC, financial transmission right (FTR) and bilateral contracting or internal transfer pricing, this option has the potential to reduce flexibility in tailored risk management (increasing basis risk). This option could also create coordination issues and compliance costs for parties seeking to develop a complex and large hedge position and would likely add further credit risk into vertically integrated generator–retailers' businesses. These costs would likely be passed onto consumers.

6.32 Requiring less than 100 percent of future contracts to be traded publicly could reduce these costs, while still providing greater confidence that inefficient discriminatory pricing is not occurring or not substantially impeding competition. For example, requiring the sale of a sizeable portion of electricity on public markets may provide added assurance that generator–retailers are not unduly favouring their internal retail arms relative to large consumers and on-sellers, including independent retailers, especially where the internal retail arms are required to buy a significant portion of their electricity on public markets. However, a partial public-trading requirement may not address concerns with large deals like the Tiwai contracts if they can continue to be contracted outside of open public markets.

6.33 Allowing generators and consumers to invite tenders to supply and purchase their specific electricity profiles could provide significant flexibility in risk sharing arrangements akin to OTC markets. However, these tenders would need to be structured in a manner that ensured they did not serve as a barrier to entry, thereby circumventing competition and efficiency objectives. For example, if NZAS tendered for its entire load for 4 years, it is unlikely the result would have been materially different from the current arrangements, despite being contracted through a 'public' or 'open' process. This is because Meridian and Contact are likely best placed to supply this customer, and the competitive incentives for the generators and NZAS are otherwise unchanged, even though the contracting process might be more transparent.

6.34 One solution might be to impose restrictions on the size and specificity of these tenders. For example, all tender contracts above some size (150 MW) must first get approval from the Authority, which would need to be satisfied that the structure of the tender had a legitimate commercial purpose and was consistent with efficiency and competition. Restrictions could be imposed, for example, on the Tiwai CFD, perhaps requiring the smelter to contract for each potline individually (roughly 170 MW each, with the fourth being around 80 MW).

6.35 The increased level of trading through public markets would also have implications for the existing market-making requirements. Mandating that a significant proportion of financial electricity hedging must occur on public markets would likely increase average liquidity but may not mitigate the need for longer term hedges to populate the forward curve and assure market making occurs in volatile markets.

6.36 Finally, PPAs also play a notable role in underwriting new investment in generation. Consideration would need to be given to products that under-write investment in renewable generation to support the transition to 100 percent renewables.

Potential pros	Potential cons
Accessible and open platforms encourage electricity going to its highest valued use by precluding bilateral negotiations. Public disclosure of prices. No evidential burden to show inefficient use — not an administered rule to test, but rather relies on competition to provide the assurance resource is allocated efficiently. The liquidity created would result in more complete energy and locational markets (terms, structures) and support price discovery (a public good). Organic liquidity may replace commercial market makers and encourage speculators. New generation could be more readily bankable for non-vertically integrated generators, eg, if a longer term futures market develops. Better investment signals and risk management options, especially beyond 3 years. Allowing tenders would support risk transfer arrangements akin to over-the-counter (OTC) markets. A bigger market may attract international participation, further increasing liquidity.	Any additional costs from greater standardisation and exchange trading would likely be borne by consumers. • Basis risk: despite high organic liquidity, some degree of product standardisation for public trading is inevitable and would not enable bespoke matching of risks as OTCs currently do. • Value adding trades might not take place when risks are specific to a counterparty and cannot be priced over anonymous public markets, eg, the value of the volume variability in a fixed price variable volume (FPVV) contract, resulting in value added trades not getting done. • Introduces additional credit risk mitigation costs in some cases, eg, if internal transfer pricing is no longer permitted. May compromise efficiency benefits from vertical integration. May require more sophisticated risk management capability within industrials and commercials, and may no longer be as simple as entering a 3-year FPVV contract with a generator. Would need to build a book comprising multiple contracts, and no instantaneous back-to-back contracting. Intermediaries may play important role. May result in generators ceasing to offer risk management products and offer more electricity in spot market. New investment would need to be underwritten through instruments other than power purchase agreements (PPAs). Changing this now may affect investment in the new generation required to support the transition to low emissions. The size and structure of tenders may need to be controlled to ensure effective competition is occurring. Potential negative impacts on investor sentiment towards New Zealand. Resulting size of market could attract adverse speculation. Might not facilitate demand response from parties with bespoke degrees of flexibility. May move responsibilities around but change relatively little in terms of overall incentives.

Qu. 20 Would greater reliance on exchange-traded derivatives provide as much risk mitigation as current arrangements that also encompass over-the-counter risk products? Please explain your reasoning.
Qu. 21 What products would you want to be offered in addition to the existing publicly traded hedge products?
Qu. 22 What percentage of hedge contracts should be offered publicly?
Qu. 23 What are the pros and cons of public offering of hedge contracts?
Qu. 24 Do you consider that public offering of hedge contracts addresses the problem identified?

Option 5: Require large hedges to be traded publicly

What the option aims to achieve

6.37 This option would seek to ensure greater and equal access to sale and purchase opportunities by limiting the maximum size of any single hedge and requiring hedges (or parcels of hedges) of a certain size to be traded publicly, thereby providing greater assurance that electricity is going to the highest valued users.

High-level description of option

6.38 This option would include amending the Code to introduce requirements around hedges of a certain volume (eg, over **X** MW). It could include limiting the size of hedges that could be bought or sold by participants, requiring parties seeking larger volumes to enter into multiple contracts with different parties.

6.39 This option could require a party like NZAS to tender its hedges on a public platform. This option is a subset of option 4 above, which has a broader focus.

6.40 An alternative would be to limit the size of a CFD between a single generator and single consumer (and potentially a requirement to sell through a public market, such as an exchange).

Key considerations and choices that would need to be worked through

6.41 The threshold delineating which contracts are or are not captured would be an important consideration were this option to be progressed further.

6.42 In addition, the Authority acknowledges that larger contracts are typically more complicated and therefore public offering may not change the parties that end up tendering for such contracts.

Potential pros	Potential cons
Accessible and open trading encourage electricity going to its highest valued use. Public disclosure of prices.	Larger contracts are often the most complex and may be precluded from accessing the flexibility of over-the-counter markets. Depending on where the threshold is set, there may be contracts with inefficient discriminatory pricing that are not captured by this option. Restrictions on maximum size a single party can provide may adversely affect allocative efficiency, eg, lowest cost provider does not provide all of the service. Potential negative impacts on investor sentiment towards New Zealand. May move responsibilities around but change relatively little in terms of overall incentives. Standardisation of hedge arrangements in single market platforms (volume, price, shape, duration) may stifle the effectiveness of risk management. Increased administration costs.

Qu. 25 How should ‘large’ hedges be defined?
Qu. 26 What are the pros and cons of this option?
Qu. 27 Do you consider that the option addresses the problem identified?

Option 6: Extend trading conduct provisions beyond the spot market to hedge markets

What the option aims to achieve

6.43 This option would seek to ensure that any hedge price offered was one that could be maintained if there was competition for that contract.

High-level description of option

6.44 In July 2021, the spot market trading conduct rules were updated. The change means that all offers to sell electricity must be made at prices the offering party could sustain if there was competition.

6.45 Under this option, the new trading conduct rules would be **extended** to cover the **hedge market** (eg, non-exchange traded products, FTRs, ASX futures and options, OTCs, PPAs). Prices offered when there is no competition for the

contract would need to be consistent with those offered under competitive circumstances.

Key considerations and choices that would need to be worked through

6.46 Consideration would need to be given to how this option would be monitored to ensure transparency and that market participants had confidence in prices being offered. Whereas spot market and ASX and FTR prices are available to market participants, the visibility of prices for OTC derivatives and other hedges is more limited. For example, even the Authority does not have complete information about the terms and conditions of PPAs. Moreover, in cases where parties are receiving supply offers that they believe are higher than they ought to be, and therefore have not signed, the focus needs to be on offers and associated behaviours, not simply signed contracts.

Potential pros	Potential cons
All forward offers and contracts to be consistent with 'as if there were competition'. Enables parties to bring offers that they consider do not meet these competitive standards to the attention of the Authority.	The visibility of terms and conditions is limited for non-exchange traded products, unlike spot markets where information is public and can be policed by participants. Potential resourcing costs for the Authority via annual levy. Not all entities participating in derivatives markets (such as the ASX) are participants that can be regulated by the Code. Potential negative impacts on investor sentiment towards New Zealand. Deters generator–retailers from offering over-the-counter hedges?

Qu. 28 Which types of contracts should be covered by trading conduct-type provisions?
Qu. 29 How would trading conduct-type provisions be monitored: Where a party to an offer or contract believes they are being disadvantaged? Where the parties being harmed are not a party to the contract? Where no offer was received?
Qu. 30 What are the pros and cons of extending trading conduct-type provisions?
Qu. 31 Do you consider that extending trading-conduct provisions to hedge contracts would address the problem identified?

Option 7: Non-discriminatory pricing rules

What the option aims to achieve

6.47 Establishing non-discriminatory pricing rules would prevent generators or other electricity market participants from offering electricity hedges at lower (or higher) prices to different customers absent a credible and quantifiable justification. The primary motivation would be to address efficiency and competition in wholesale forward energy and locational contracts.

6.48 This option may prevent generators from selling electricity at a significant discount to certain parties but also prevent generators from selling electricity to others (eg, their competitors) at higher prices, unless those prices can be explained through differences in risks or costs in servicing different customers (or other similar reasons).

High-level description of option

6.49 This option would involve regulatory change to introduce specific rules relating to non-discriminatory pricing. These rules could cover some or all contracts and internal arrangements for the buying and selling of electricity at future dates. This could include OTC CFDs and PPAs, as well as options and FPVV contracts.

6.50 To be able to identify discriminatory pricing, a baseline price is needed as a point of comparison. The baseline could come from both market prices or from other similar contracts offered to different counterparties. For example, why does the price offered differ from those on publicly traded platforms? And if party A was offered X, why was party B offered different terms?

6.51 Identifying inefficient discriminatory pricing could be achieved in several ways, including by:

(a) extending the current disclosure regime to require public disclosure of all contracts and relevant terms to enable comparisons to be made between the pricing of different contracts entered, or offers made, by a single party. If market participants considered they were being unfairly discriminated against they could allege a breach to the Authority for investigation

(b) requiring information that is already disclosed on the hedge disclosure website for offers (including prices and terms) not just signed contracts

(c) standardising the term sheet for OTCs to include all material components of a price (eg, future energy price, future locational price, optionality components, counterparty credit risk, etc.) and requiring an explanation for any deviation of terms and price.

Key considerations that would need to be worked through

6.52 The Authority acknowledges that there are different costs and risks to contracts, depending on the structure and incentives of the parties involved. Under this option, sellers of electricity would not have to offer the same electricity price to all parties, but rather would be required to attribute price differences directly to differences in the cost of service. The Authority would need to develop clear criteria for what constitutes acceptable price discrimination. These differences might include aspects such as timing of offer, node, volume economies, duration of contract, credit rating of counterparty, consumption profiles, demand response provisions and other terms and conditions. Consideration would also need to be

given to discounts that a generator might provide to (say) a social retailer who works only with vulnerable consumers.

6.53 Price differentials across contracts are to be expected, and to be useful any additional mandated disclosures would have to be of sufficient detail to enable an informed assessment as to whether the price differentials between contracts are warranted on economic or commercial grounds. The information required to make these judgements is non-trivial and often involves commercial judgements to quantify their significance. Some of this information is likely to be considered commercially sensitive to the parties. A regime to manage regulatory access to this information is likely to be needed to ensure genuinely sensitive information is subject to appropriate protection, while preventing inappropriate use of 'commercial sensitivity' to undermine the rule.

6.54 There is also a question about the timing of disclosure, whether it occurs at the offer stage or once the contract has been agreed.

6.55 More thought is also needed on whether the relative negotiating power of parties should be an acceptable justification for explaining a price differential. Negotiating power may be related to market power and is a concern to a regulator when it is used by a supplier to undermine efficient outcomes for consumers. However, it can be argued in the case of the Tiwai contracts that it is the large single **buyer** with the negotiating position to extract value from (all large) generators that creates efficiency concerns, by denying consumers with higher WTPs access to electricity and/or delaying the decommissioning of expensive thermal plant.

6.56 Finally, further work is required on what the penalties should be for a breach of any non-discriminatory pricing conditions and who should pay them. Any penalties would need to be sufficient to discourage a party from entering these arrangements. At a minimum, the penalty should exceed the private benefits the deal bestows on the parties to the contract and ideally should approximate the social harm done. Other questions concern whether it would ever be appropriate to undo a contract, say in situations where all parties to the contract can be shown to have benefited and consciously harmed a third party or whether financial penalties are sufficient.

6.57 Depending on the design, this option would likely include amending the Code but might also necessitate parliament enacting legislative change. The need for legislation would depend on the changes being made, recognising that non-discriminatory pricing regimes in other contexts have been implemented via statute.

Potential pros	Potential cons
Increased confidence that electricity is going to highest value use. Theoretically precludes selling at a discount to low WTP consumers or charging premiums to competitors. Supports confidence through consistent treatment of consumers.	This option may have an unintended consequences and prevent efficient forms of price discrimination. Evidential burden: some material costs and risks are opaque and difficult to value: • fixed price variable volume across parties • counterparty risk

Potential pros	Potential cons
Any differences in price offers between parties must be explained quantitatively. May address market concerns regarding the competitive treatment of independent retailers and independent generators by integrated generator–retailers. Continued flexibility of risk transfer between parties best placed to manage it, so long as any bespoke differences in the terms and conditions are priced and defensible.	• demand response elements • negotiating power of parties may explain price differentials in bilateral monopoly situations, such as at Tiwai. Difficult to enforce. Risk of spurious challenges to contracts, which could degrade confidence in the market. Change in forward energy and locational prices are an important explanatory variable when comparing contracts through time or of varying terms. Ideally this option would necessitate energy and locational forward curves out 10 to 20-plus years in the case of PPAs. May necessitate expensive market making services. May reduce propensity to offer a price to competitors, to avoid non-compliance with non-discriminatory pricing provisions. This could undermine competition. Potential negative impacts on investor sentiment towards New Zealand. Note there may be a period of wealth transfer effects, currently 'subsidised' customers would have to pay more, and currently 'taxed' customers would pay generators less. Current penalties under the Electricity Industry Act 2010 may not be a sufficient deterrent, given the financial incentives that generators face. Issues may be better addressed through the Commerce Act 1986.

Qu. 32 What attributes of a contract should be permitted reasons for price discrimination? What attributes should be expressly precluded?
Qu. 33 What remedies would be appropriate if discriminatory pricing was found?
Qu. 34 Are the current penalties under the Electricity Industry Act 2010 sufficient to deter inefficient price discrimination of the scale potentially associated with the Tiwai contracts?
Qu. 35 What are the pros and cons of non-discriminatory pricing rules?

Qu. 36 Do you consider that non-discriminatory pricing rules would address the problem identified?

Option 8: Hybrid of non-discriminatory pricing and pre-approval of contracts

What the option aims to achieve

6.58 This option would offer additional certainty over and above what option 3 and option 7 provide individually.

High-level description of option

6.59 This option would be a combination of option 3 and option 7. All major transactions would have to get approval in advance, with part of the criteria for approval being consistency with non-discriminatory pricing rules.

Key considerations that would need to be worked through

6.60 The key considerations are largely the same as in option 3 and option 7. However, were a hybrid to be pursued further, the practical interaction between the two sets of requirements would need to be worked through.

Potential pros	Potential cons
As above.	Potentially prohibits 'efficient' discrimination. As above.

Qu. 37 What are the biggest risks of implementing this hybrid combination of non-discriminatory pricing and pre-approval of contracts?
Qu. 38 What are the pros and cons of this hybrid option?
Qu. 39 Do you consider that this hybrid option would address the problem identified?

Other options that could be considered

6.61 This section identifies the following additional policy options, which submitters may like to consider, but that might require input from other branches of government, if they were to be advanced, including:

(a) limiting the size of generators

(b) splitting Manapōuri off from Meridian's other assets

(c) virtual asset swaps.

6.62 While these options might require legislation to implement, the Authority considers that exploring options available to both the Authority and to other branches of government increases the likelihood of identifying the most effective options to address inefficient price discrimination.

6.63 These options would primarily change the scale and asset composition of the largest generators to:

- better align the incentives faced by individual generators with the interests of consumers
- increase transactions costs amongst generators making it more difficult for them to coordinate to execute large inefficient contractual agreements.

6.64 These options could have a substantial effect on market structure. On one hand, these options may address some of the conduct and performance observations made in the Review paper. On the other hand, the options could have significant implications for companies. Compelling companies to buy or sell assets (and negotiating valuations) is more problematic now than it may have been in the past because all major generators are publicly listed companies, rather than 100 percent government-owned enterprises. Synergies and economies of scale might need to be traded off to increase competitive pressure amongst generators. Further, such interventions could affect broader sentiment towards investment in New Zealand electricity assets at a point in time when such investment is required to support an efficient transition to a low emissions future.

6.65 Vertical separation of generation and retail businesses is not considered below because large independent generators would likely have similar incentives to integrated generator–retailers to engage in inefficient price discrimination.

Reduce the size of generators

6.66 Steps could be taken to reduce the size of some generators such that their other revenue streams are not large enough to offset any significant subsidies realised through inefficient price discrimination. Smaller generators may be more concerned with maximising revenues directly from contracts and less concerned with any knock-on effects that these contracts may have on their other revenue streams.

6.67 CFDs like the Tiwai contracts might be agreed to by generators because of the resulting higher prices that are charged to other consumers and the concomitant wealth transfers that are realised. These effects occur because generators are large (relative to their part of the Tiwai contracts) and the Tiwai contracts have price implications for the returns from the remainder of their asset portfolios. If generators are reduced in size then the wealth transfers from these price effects may no longer outweigh the revenue foregone as part of the CFD. Having a greater number of smaller generators may make it more difficult for generators to collectively bargain and replicate the wealth transfers that underpin inefficient price discrimination.

6.68 One difficulty with this proposal is that there may be fixed costs or overheads that create economies of scale, and these economies could be lost. Careful consideration would need to be given to avoid the loss of synergies with respect to group dispatch and river system management. Reducing the geographical spread of individual generators may result in increased reliance on forward prices and the FTR market to enable competition at the national level. Large consumers may incur additional transactions costs to purchase risk management products from multiple parties. Any additional costs may be passed on to consumers and may outweigh the benefits of increased competition.

Split Manapōuri off from Meridian's other assets

6.69 Manapōuri could be made into its own generation company, distinct from Meridian, to decrease industry concentration and increase competition. This is a specific example of reducing the size of generators, so that the price effects experienced on the rest of their portfolios become a less important consideration in decisions to supply entities such as the Tiwai Point Smelter on subsidised terms. This solution would address the Tiwai contracts specifically, but would not necessarily address the wider policy issues raised by discriminatory pricing.

6.70 Manapōuri's capacity is generally sufficient for supplying the Tiwai Point smelter. However, other generation may be required during periods of low storage and/or generation outages at Manapōuri. Compared with the status quo, a standalone Manapōuri generator may have less incentive to subsidise a large commercial contract, and a larger number of other generators may be required to support the agreement. However, to the extent that NZAS or another large consumer's decision to operate materially impacts national pricing, incentives may remain for generators to subsidise either NZAS or the standalone Manapōuri generator.

Virtual asset swaps

6.71 Rather than a physical exchange of assets, the policy intent could be implemented through virtual asset swaps. For example, a virtual asset swap could be introduced whereby a proportion of Manapōuri and/or other lower South Island generation could be exchanged for claims on generation elsewhere. Virtual asset swaps enable greater granularity of asset ownership, in comparison with physical transactions. However, such agreements may result in additional complexities associated with decision rights and accountabilities, for example, making it more difficult to coordinate hydro generation outcomes to meet resource management obligations.

6.72 The Authority notes in this regard the precedent of the 2010 virtual asset swaps, which were intended amongst other things to increase retail competition across the country. Those swaps expire at the end of 2025.

6.73 A virtual asset swap that divided Manapōuri amongst other existing generators may increase the incentive for those parties to support a future contract with a large consumer of electricity, because they would obtain more revenue from their other generating assets. In this case, the virtual asset swap may socialise the cost of subsidising such a contract across a larger generating base. To mitigate these concerns, it may be desirable for the virtual asset swap to involve new entrant generators.

Qu. 40 Is inefficient price discrimination best addressed through an amendment to the Electricity Industry Participation Code 2010 or through structural options that would involve other parts of government?
Qu. 41 Which structural options do you think should be considered further? Please explain your reasoning.

Criteria for evaluating options

6.74 The Authority proposes to evaluate the options using the following criteria. The criteria aim to assess the congruence of the options with efficiency, competition and reliability, and practicality.

Table 3: Proposed criteria to evaluate proposed policy options

	Criterion	Description
Efficiency	Highest value use of electricity	• Electricity is provided to consumers who value it most highly and value it more than the cost of production
	Transparency	• Provides assurance (to public and Authority) that electricity is efficiently allocated
	Confidence	• Minimises risk premiums
	Flexibility	• Supports bespoke transactions that create value, including the allocation of risks to parties that are best able to bear
	Addresses inefficient discriminatory pricing	• Addresses root cause of inefficiency and any competition concerns
Competition and reliability	Reduces potential for price mark-ups over cost	• Reduces consequence of market power
	Incentives to invest in new generation	• Supports price signals for efficient investment in generation and electrification
	Supports investment to maintain future reliability	• Avoids additional uncertainty for investment during transition
Practicality	Within Authority mandate	• Feasible policy actions to achieve outcomes consistent with Authority's legislative mandate
	Timely	• Can be addressed before any further contract negotiations between generators and large consumers
	Benefits outweigh costs	• Satisfies usual cost–benefit analysis required by section 39 of the Electricity Industry Act 2010, including implementation and compliance costs

Qu. 42 Do you agree with the criteria proposed to assess the options? If not, what additional criteria should be used to evaluate policy options?

Appendix A Format for submissions

Submitter's name	

Question		Page
Qu. 1	NZAS has a number of unique attributes as a consumer of electricity including size, location, the related potential for stranded water, and capacity to provide demand response. Do you agree that these factors support a discount relative to Benmore prices (as the reference South Island node)? Are there other relevant factors and how might one determine an appropriate level of discount?	14
Qu. 2	Do you have any additional feedback or information on the efficiency of the existing Tiwai contractual arrangements and their consequences?	21
Qu. 3	Do you agree that the Authority should investigate price discrimination in relation to wholesale contracts?	21
Qu. 4	Should the Authority's consideration of policy implications from price-discrimination practices extend to situations where electricity is supplied both at discounts and premiums to market prices?	23
Qu. 5	Do you agree these baseline assumptions are reasonable? What other assumptions should be tested?	27
Qu. 6	Do you agree that any investment issues raised by the Tiwai contracts are best addressed through a review of barriers to new investment more generally, as the Authority intends to undertake in 2022?	31
Qu. 7	Beyond the Tiwai context, do you consider discriminatory pricing or discriminatory terms and conditions are adversely affecting efficiency and competition in the electricity system? If so, please provide evidence.	34
Qu. 8	Are there other options the Authority could implement to mitigate inefficient price discrimination?	34
Qu. 9	What are the pros and cons of the status quo?	36
Qu. 10	Do you consider that the status quo addresses the problem identified?	36
Qu. 11	Do use-it-or-lose-it clauses have a legitimate commercial role? What would the effect be of prohibiting them in wholesale electricity markets?	37
Qu. 12	Which contracts (eg, minimum size) should be subject to a prohibition on a use-it-or-lose-it clause?	37
Qu. 13	What are the pros and cons of prohibiting use-it-or-lose it clauses?	37
Qu. 14	Do you consider that prohibiting use-it-or-lose it clauses addresses the problem identified?	37
Qu. 15	Should this option be limited to pre-approval of contracts, or extended to apply to offers that one party considers are discriminatory?	39
Qu. 16	What criteria should the Authority consider in pre-approving large contracts?	39
Qu. 17	What should the MW or dollar threshold be for contracts requiring pre-approval?	39
Qu. 18	What are the pros and cons of Authority pre-approval?	39
Qu. 19	Do you consider that pre-approval of large contracts addresses the problem identified?	39

Appendix B An illustration of potential allocative inefficiency

B.1 The agreement between the New Zealand Aluminium Smelter (NZAS) and Meridian is a contract for difference (CFD). The contract modifies the financial consequences of spot market pricing and clearing for the parties involved in the contract. The contract effectively locks in a given price for the parties involved for a 4-year horizon.

B.2 Forward agreements, such as the Tiwai contracts, can help to manage risk and the resultant effect on the volatility of returns for both parties. For example, if the smelter sells aluminium forward at a given price, it can lock in profit at a given level if it also arranges a forward agreement for electricity back-to-back (abstracting from other production costs). Similarly, the generators protect themselves from falls in the spot price of electricity and thereby reduce the volatility and riskiness of their generation revenues.

B.3 To assess the 'social welfare' implications of the Tiwai contracts, the implications for rest-of-New Zealand (RoNZ) consumers, for the smelter, and for generators need to be considered. The outcomes for all three groups need to be considered to evaluate the market arrangements associated with the contracts.

B.4 The rest of this appendix steps through a sequence of stylised figures to illustrate the Tiwai Point smelter's impact on the electricity market and the consequences of the CFD between Meridian and NZAS. The CFD between Meridian and Contact simply serves to share the costs between the generators and is not considered further because it does not alter the aggregate assessment of producer and consumer surplus.

B.5 Figure 7 provides a simple framework to explore these issues. This figure abstracts from time variation in electricity prices, associated with different trading periods during the day and over the term of the contract, and abstracts from nodal price variations.

B.6 To begin with, we do not incorporate the CFD into the analysis. The blue stepped line illustrates a hypothetical offer curve, with the steps up reflecting different generation technologies (eg, geothermal, wind, hydro and thermal). In the following, we will assume that the offer curve reflects the actual cost of generating different quantities of electricity. Given that participation in the electricity market is voluntary, the offer prices for given quantities will (generally) be equal to or greater than such costs.

B.7 The downward-sloping red lines indicate the electricity demand from the RoNZ, that is, the non-smelter demand, and the aggregate demand, which is a combination of demand from RoNZ and the smelter (with the latter denoted AS, short for Aluminium Smelter). For a given price, the amount demanded by RoNZ consumers is summed together with the demand from NZAS to get the aggregate demand at that price.

B.8 The figure illustrates two equilibria: one in which the smelter exits and only demand from the RoNZ remains (denoted 'exit'), and one where the smelter remains (denoted 'stay'). These two options result in different volumes of generation (respectively Q^{Exit} and Q^{Stay}) and different prices (respectively P^{Exit} and P^{Stay}). This figure assumes that the smelter simply pays the market clearing price if it remains in the market.

B.9 Reflecting the cost minimisation in the scheduling, pricing and dispatch model, the lowest cost offers are dispatched first. A key feature of this standard representation of supply and demand is that, at the equilibrium price, demands from all consumers are satisfied provided their willingness-to-pay is greater than the equilibrium price. The

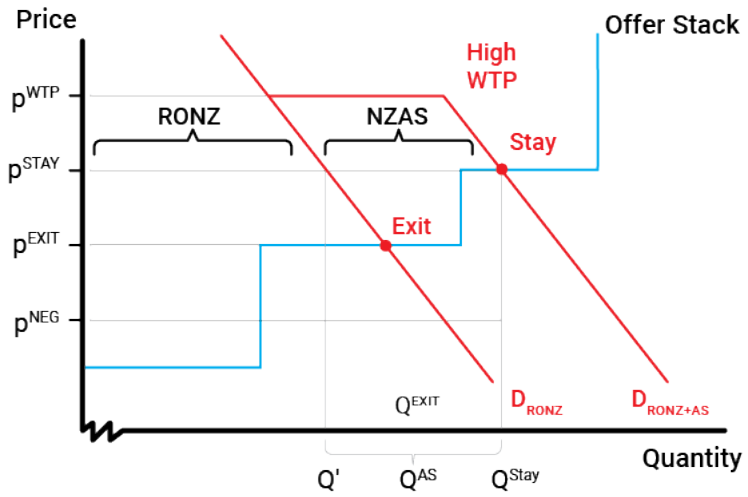
equilibrium also ensures that subsequent units of generation — whose costs exceed the consumer benefit — are not deployed.

A no-price discrimination case

B.10 Figure 7 illustrates that the presence of the smelter can result in high prices, because the extra demand requires higher-cost production technologies to be deployed to meet the extra load associated with the smelter. The RoNZ consumes Q' at this clearing price, while the smelter consumes $Q^{AS} = Q^{Stay}$-Q'. Note that the amount depicted by Q^{AS} on the horizontal axis is the same as the amount represented by NZAS on the horizontal segment of the demand curve, because the two diagonally sloping demand curves are parallel.

B.11 The amount Q' is less than Q^{Exit} because the higher prices crowd out some of the consumption that the RoNZ would otherwise undertake. This crowding out effect is appropriate because consumption of those units would result in costs that exceeded the benefits of consumption at the new equilibrium price (resulting in an inefficiency). All consumers who are prepared to pay the clearing price receive electricity in this scenario.

Figure 7: Energy market with and without the smelter



Note: AS = Aluminium Smelter; NZAS = New Zealand Aluminium Smelter; RONZ = rest-of-New Zealand; WTP = willingness to pay.

B.12 In Figure 7 the smelter is assumed to have a particular demand (represented by the horizontal rightward shift of the demand curve $D_{RONZ+AS}$ relative to D_{RONZ}) and it is prepared to pay up to P^{WTP} for that MW quantity, where WTP is short for the smelter's willingness-to-pay. At prices below P^{WTP} demand from the rest-of-New-Zealand increases, but the smelter's demand remains the same. Above P^{WTP} the smelter's demand falls to zero.

B.13 In the absence of the smelter the equilibrium quantity is Q^{Exit} and the equilibrium P^{Exit}, while the 'stay' equilibrium where the smelter remains in operation results in Q^{Stay} quantity and price P^{Stay}. Here we assume that the spot market clears at a single price and single quantity dependent on the offer stack and the load demanded by different consumers.

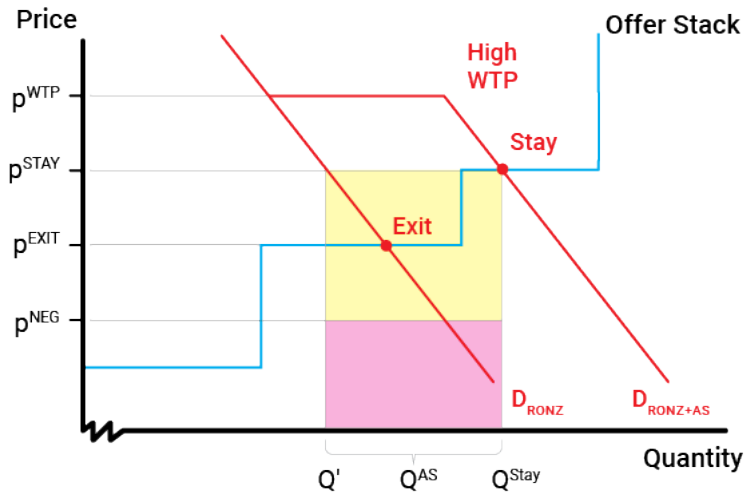
A price discrimination case

B.14 The situation where the smelter negotiates a separate bilateral CFD is depicted in Figure 8. In this figure, the smelter separately negotiates a price (P^{Neg}) with generators. In essence, the smelter agrees to pay the pink shaded region for the electricity supplied to it if it 'stays'. The CFD provides the smelter with a payoff equal to $(P^{Stay} – P^{Neg})\times Q_{AS}$, the yellow shaded region, where Q_{AS} corresponds to the volume of electricity supplied to the generator $Q^{AS} = (Q^{Stay} - Q')$. Although the market price is P^{Stay}, the smelter in essence pays the lower negotiated price resulting in revenue to the generators of just the pink shaded region from selling electricity to the smelter. In this scenario, all consumers who value electricity above the spot price continue to receive electricity, but the smelter pays a discounted price.

High willingness to pay — no resultant inefficiency

B.15 Unlike the single price case in Figure 7, it is less clear whether all consumers in Figure 8, including NZAS, are paying more than the cost of the electricity being supplied. However, NZAS could be thought of as being provided electricity by the least-cost generation sources (ie, by low-cost hydro electricity from Manapōuri) in which case the prices being paid by NZAS would be above the cost of producing the electricity, though some **higher-cost** generation is also being dispatched as a result of the smelter staying.

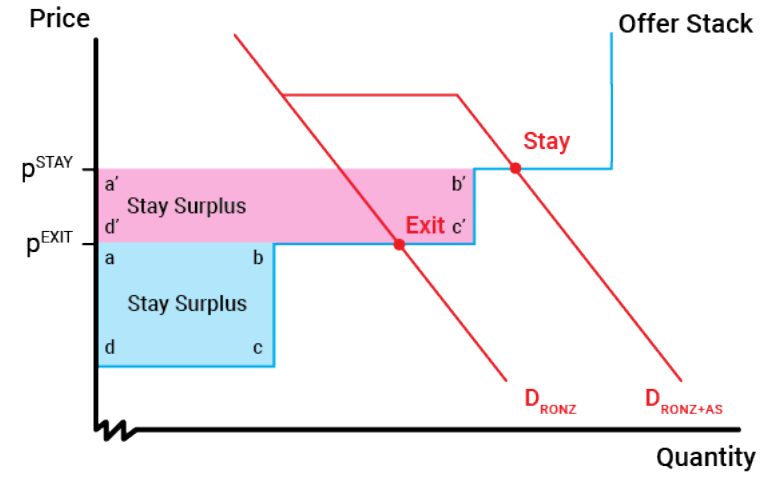
Figure 8: Energy market with and without smelter and contract for difference



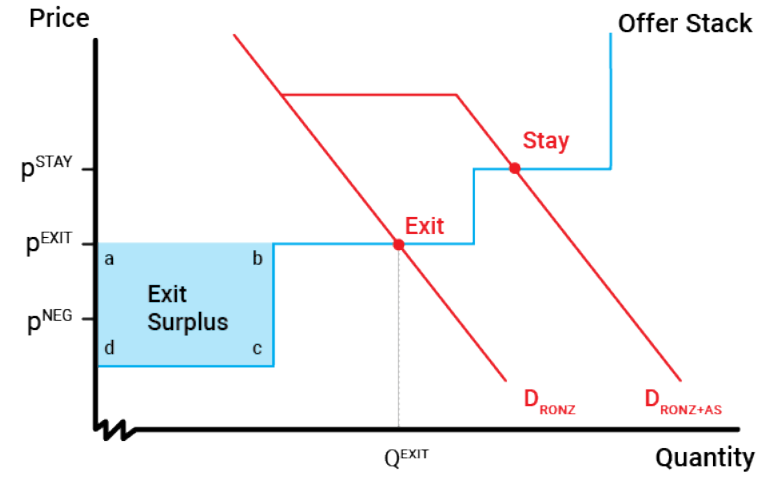
Note: AS = Aluminium Smelter; RONZ = rest-of-New Zealand; WTP = willingness to pay.

B.16 Figure 8 raises an interesting question: why would generators be prepared to negotiate such a CFD? Figure 9 illustrates why the CFD might be in the generators' self-interest. As depicted, the offer curve represents the cost of providing a given quantity of electricity to the market. Any revenue above the offer curve represents 'surplus' for generators.

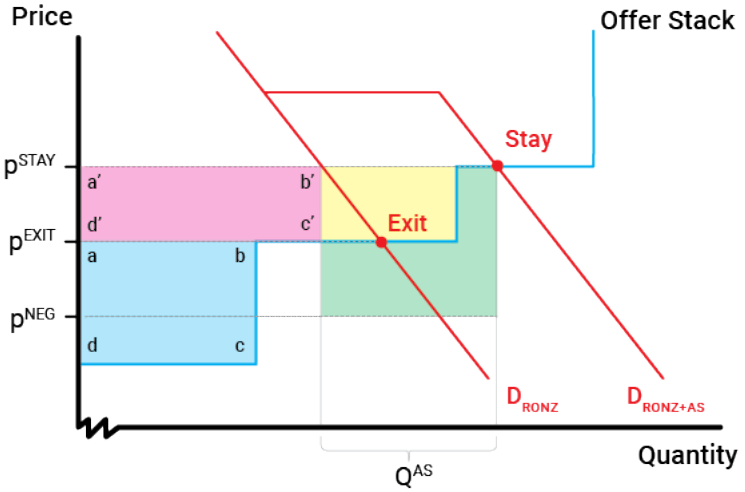
Figure 9: Generator surplus from different market outcomes



(A)



(B)



(C)

Note: AS = Aluminium Smelter; RONZ = rest-of-New Zealand.

B.17 The figure in row (A) represents the surplus when there is a single market price (no CFD). In this scenario, the surplus for the generator reflects the revenue less production costs, which corresponds to the (mauve and light-blue) shaded polygon with corners a'b'c'bcd. If the smelter exits, the surplus is just the blue region in the figure in row (B). If the generators sign up to the CFD then the surplus is the shaded mauve and light-blue region **less** the green and yellow region. (Generators receive the surplus of the figure in row (A) **less** the cost of the CFD; refer to Figure 8.) The green shaded region and the yellow rectangle above it are foregone as part of the CFD, but the generators reap additional returns on the remaining generation sold to RoNZ consumers. In essence, the overall price effect of the Tiwai contracts on RoNZ demand (represented by the mauve region in figure (C)) can outweigh the cost of the CFD to the generator.

B.18 Note that the pictures as drawn are not perfectly proportionate. The RoNZ quantity demanded in the stay scenario should be about 87 percent of total electricity demand at the stay price, with NZAS demand accounting for about 13 percent of the total quantity. (The squiggle in the x-axis indicates that the whole line is not being depicted from a quantity of zero.)

B.19 Evidence from financial market valuations suggests that the stay and exit strategies have precisely these kinds of effects on generator profitability. Empirically, Meridian and Contact have a higher share market value if NZAS continues to demand electricity.

B.20 It should be noted that this allocation **remains efficient**. All consumers with sufficiently high willingness to pay receive electricity. Consumers whose willingness to pay falls below the equilibrium price do not receive electricity.

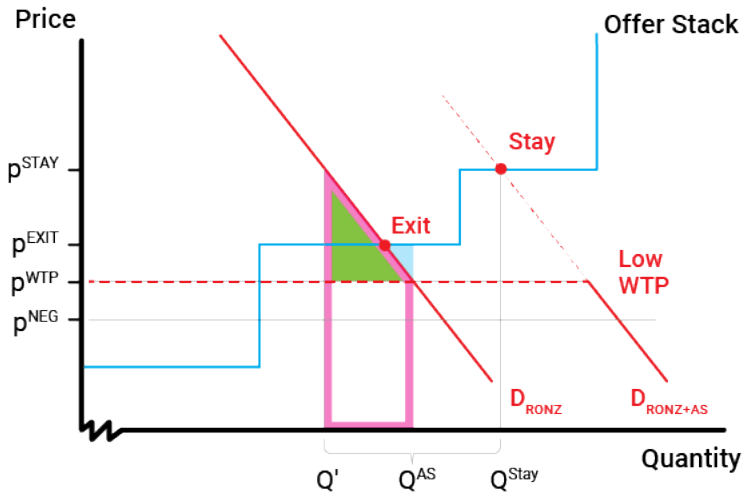
Low willingness to pay results in inefficiency

B.21 The efficiency of the diagram in row (C) in Figure 9 crucially depends on the willingness to pay of the smelter. Figure 10 illustrates a situation where the smelter has low willingness to pay, though it still exceeds the price negotiated with generators, P^{Neg}. The smelter still makes a profit from participation in the market. By remaining, it continues to cause the spot market price to equilibrate at P^{Stay}. This price level is required, to supply RoNZ consumers and the smelter.

B.22 The mauve-bounded region in Figure 10 represents the additional value that would have accrued to RoNZ consumers if the electricity was reallocated away from NZAS to the consumers with higher willingness to pay than the smelter. These RoNZ consumers are otherwise crowded out of the market. In principle, these consumers could compensate the smelter for the electricity that they wanted, leaving NZAS's and generators' surplus unchanged and improving overall welfare. For example, the smelter could sell electricity to those consumers with some portion of the green-shaded region shared between NZAS and the RoNZ consumers. The generators would be no worse off if this trade took place. However, the smelter might not be willing to agree to such a trade if NZAS required the entire allotment of electricity to run its plant.

B.23 Welfare could be further improved if generators compensated RoNZ consumers by paying them to **not consume** beyond the quantity associated with the red dot denoted 'Exit'. This electricity costs up to the blue line to produce, but consumers only value the electricity up to the mauve line. By making a further trade, generators and RoNZ consumers could share the blue triangle, which is otherwise an inefficient loss.

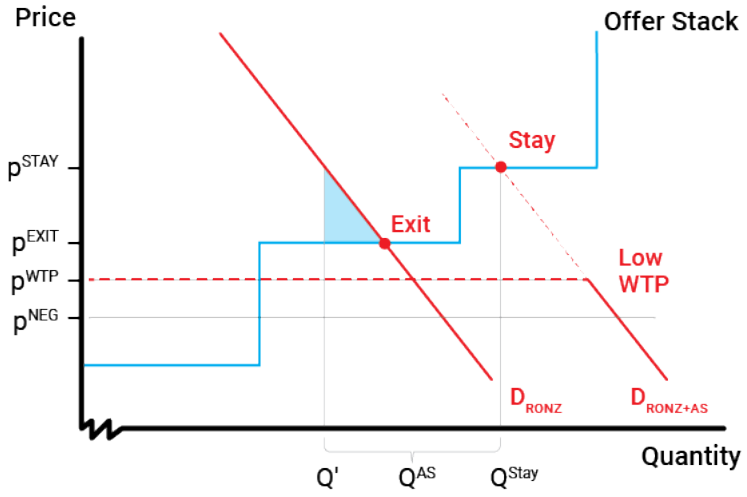
Figure 10: Energy market with a low willingness to pay



Note: AS = Aluminium Smelter; RONZ = rest-of-New Zealand; WTP = willingness to pay.

B.24 The reduction in RoNZ consumer surplus is depicted in Figure 11 as the shaded blue triangle. Some consumers who are willing to meet generators' costs are crowded out of the market by the agreement with NZAS, even though these RoNZ consumers have a higher WTP.

Figure 11: Loss of RoNZ consumer surplus



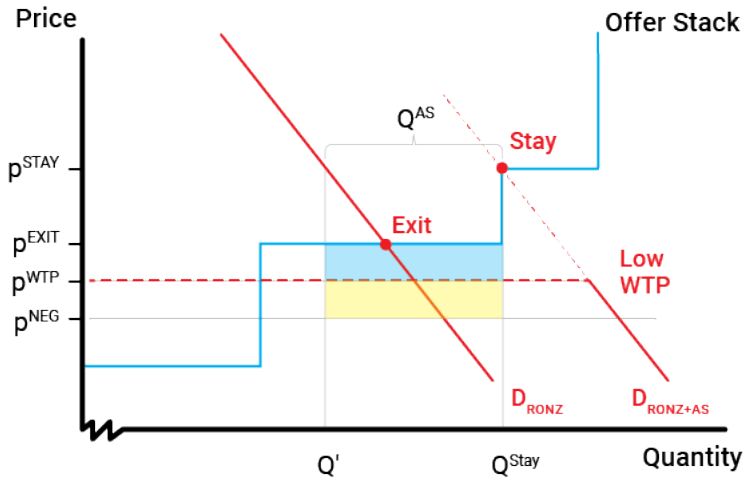
Note: AS = Aluminium Smelter; RONZ = rest-of-New Zealand; WTP = willingness to pay.

Allocative inefficiency and the costs of 'excess' production

B.25 Figure 10 and Figure 11 illustrate a key consideration for welfare: the WTP of NZAS depicted in this figure is below the cost of producing the additional electricity required to supply the market. The smelter makes a welfare gain from the agreement because P^{WTP} is greater than P^{NEG}. This welfare gain offsets some **but not all** of the loss of 'producer surplus', which is bounded by the offer stack and P^{NEG}. Because the electricity network is an integrated system, it is not just the marginal cost of producing electricity at Manapōuri but the average cost of electricity, including the cost of electricity production by thermal generators, that matters for this assessment of efficiency.

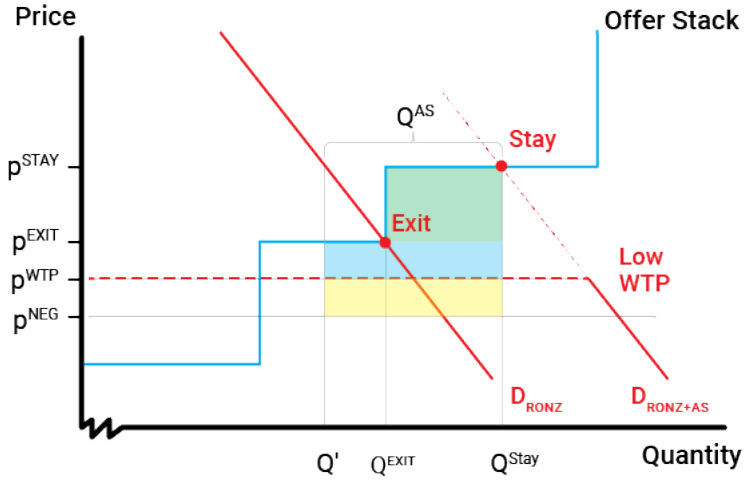
B.26 The loss in producer surplus depends on the shape of the offer stack. Figure 12 and Figure 13 illustrate **bounds** on those net losses. In Figure 12, the generators lose money on the CFD with the smelter, represented by the shaded blue and yellow areas, though the yellow area is offset by the surplus accruing to NZAS. In Figure 13, the producer loss is increased by the green area, because of the shape of the offer curves. These two figures provide bounds on the producer loss. The green area is minimised when the kink in the offer curve occurs just before the quantity Q^{Stay} and it is maximised when the kink occurs just after the quantity Q^{Exit}.

Figure 12: Lower bound on producer efficiency losses



Note: AS = Aluminium Smelter; RONZ = rest-of-New Zealand; WTP = willingness to pay.

Figure 13: Upper bound on producer efficiency loss



Note: AS = Aluminium Smelter; RONZ = rest-of-New Zealand; WTP = willingness to pay.

B.27 The analysis of the costs and benefits of electricity have been simplified above by abstracting from nodal pricing and generator mark-ups over cost.

B.28 Some aspects of the analysis depicted above rest on the ability to supply electricity to the aluminium smelter or to RoNZ consumers. Transmission constraints could modify the

extent to which electricity could be substituted between the two consumer groups.[25] If some proportion of electricity can only be used by the smelter then the quantity Q^{AS} would be reduced. For example, if the smelter uses 572 MW but 272 MW of Manapōuri's generation would otherwise be stranded then Q^{AS} = 572–272 = 300 MW (provided that Manapōuri always generated). Transmission constraints then influence the assessment of the loss in producer surplus. In this example, irrespective of transmission constraints, NZAS would still be obtaining consumer surplus on the entire 572 MW. The generator loss relates to the 300 MW that could be sold to other consumers (and the per MW contract price above any avoidable costs on the remaining 272 MW). Note that the estimates of the efficiency losses are sensitive to the proportion of water that is stranded. See for example the last row of Table 2.

B.29 Mark-ups of price over cost would also affect the assessment of producer surplus. For example, if the resource cost of producing 100 MWh is only $50/MWh, but it is offered in at $75/MWh, then the estimates of producer surplus would also be miscalculated. While mark-ups would affect the estimation of the loss in producer surplus, they would simultaneously raise concern about the exercise of market power.

[25] Transmission constraints might also be relaxed during trading periods when electricity is not particularly highly valued, such as the middle of the night.

Appendix C Computation of the efficiency effects

Inefficient loss of surplus for RoNZ consumers

C.1 For rest-of-New Zealand (RoNZ) consumers, the deadweight loss is computed as ½ $\Delta P \times \Delta Q$, where Δ represents 'change', P is the price and Q is the quantity. See the blue triangle in Figure 11. An assumed elasticity ($\varepsilon = -0.1$) is used to calculate the change in RoNZ quantity.[26] The elasticity is the percent change in quantity for a given percent change in price, for example, $\varepsilon=(\Delta Q/Q)/(\Delta P/P)$. For a given ΔP, the elasticity formula can be rearranged to compute $\Delta Q=\Delta P \times \varepsilon \times Q/P$. This change in quantity can then be substituted into ½ $\Delta P \times \Delta Q$ together with ΔP to compute the deadweight loss for consumers.

Gain in NZAS's consumer surplus

C.2 NZAS's 'surplus' equals its willingness to pay (WTP) (assumed to be constant per MWh) minus the price of the contract multiplied by the MWh over the course of a year. For simplicity, NZAS's WTP is assumed to be constant across the MWh consumed. For convenience, the smelter is assumed to run 24 hours a day, 365 days per year (ie, 8,760 hours per year).

Inefficiency for the generator arising from the CFD

C.3 As per Appendix B, in particular, Figure 12 and Figure 13 and the associated discussion, an upper and lower bound is computed for the loss of the generators arising directly from the contract for difference (CFD).[27] The lower bound is the quantity supplied to the smelter times ($P^{Exit} - P^{Neg}$), where P^{Neg} is the 'negotiated price' as part of the CFD between NZAS and Meridian. The upper bound on the loss experienced by generators is the quantity of electricity supplied to the smelter multiplied by ($P^{Stay} - P^{Neg}$), where P^{Stay} is the average wholesale market price if the smelter stays in operation.

C.4 A complication arises when some water is stranded (in the event of a smelter exit) and cannot be deployed to meet load from RoNZ consumers. Generator surplus is then computed in two parts:

(a) the generator **surplus** on the stranded water is $(P^{Neg} - 8) \times MWh^{Stranded}$, where: P^{Neg} is the negotiated price; \$8/MWh is an allowance for operating and maintenance costs; and $MWh^{Stranded}$, is the MWh of electricity from stranded water

(b) the upper and lower bounds on the generator **loss** on the remaining volume of electricity is computed as in paragraph C.3, except the volume of non-stranded electricity is computed as $(572\ MW - MW^{Stranded}) \times 8760$.

C.5 Stranded water has no impact on the smelter surplus, because it solely depends on WTP, the contract price and the contract volume.

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26 For empirical estimates of such elasticities see Electricity Authority , "Modelling Electricity Demand in New Zealand: Market Performance Enquiry.," April 14, 2014, https://www.ea.govt.nz/dmsdocument/18764-modelling-electricity-demand-in-new-zealand-technical-paper and Koli Fatai, Les Oxley and Frank G Scrimgeour, "Modeling and Forecasting the Demand for Electricity in New Zealand: A Comparison of Alternative Approaches," *The Energy Journal* 24, no. 1, (2003): 75–102, https://www.jstor.org/stable/41323421.

27 Note that generators also obtain additional surplus from rest-of-New Zealand (RoNZ) consumers, but these gains are perfectly offset by reductions in RoNZ consumer surplus and so are not relevant for overall estimates of deadweight losses.

Glossary of abbreviations and terms

Act	Electricity Industry Act 2010
ASX	Australian Securities Exchange
Authority	Electricity Authority
CFD	Contract for difference
Code	Electricity Industry Participation Code 2010
FPVV	Fixed price variable volume
FTR	Financial transmission right
GWh	gigawatt hour
MBIE	Ministry of Business, Innovation and Employment
MWh	megawatt hour
NZAS	New Zealand Aluminium Smelters
OTC	Over-the-counter financial derivatives (ie, not futures and options traded on an exchange like the ASX)
PPA	Power purchase agreement
RoNZ	Rest-of-New Zealand (ie, non-NZAS consumers)
WTP	Willingness to pay

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