

Confidential

12 October 2021

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Electricity Authority - Te Mana Hiko
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By email: doug.watt@ea.govt.nz

Dear Doug,

Review of empirical paper on structure, conduct and performance of wholesale electricity market

The Electricity Authority (Authority) is reviewing the wholesale electricity market. It has prepared two papers: an empirical paper that is diagnostic in nature; and a discussion paper that explores the potential responses to what the first paper has identified.

A - Scope of opinion

The Authority has asked Concept Consulting Group Ltd (Concept) to review the empirical paper, and to specifically comment on:

1. The quality of the evidence
2. Interpretation of the evidence
3. Any evidence that could be added.

Concept has reviewed the draft of the empirical paper (version sent on 12 October 2021) and accompanying appendices. Consistent with our brief, we have not undertaken a full audit of the analysis or independently verified all inputs or materials cited in the paper. Instead, we have largely relied upon the correctness of factual and other material provided by the Authority and have undertaken only limited separate analysis.

In the course of preparing this letter we have benefited from discussions with Pat Duignan of Munro Duignan Ltd (which is also undertaking a review for the Authority). However, the opinions expressed in this letter should not be interpreted as representing the views of any party other than Concept.

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B - We use workable competition as the standard

At the outset, we note the Authority's paper states that it is seeking to determine "whether prices over the review period were determined in a **competitive environment**"¹ (our emphasis). The paper does not further define the competitive standard which the Authority adopts for its analysis. In our review of the Authority's empirical paper, we have assumed that workable competition is the relevant standard.

C - Authority has assessed a wide range of indicators

The Authority has assessed a wide range of indicators, using the Structure; Conduct; Performance approach as the lens to assess competition. The Authority states that it does not rely on any single indicator but instead says "looking at all the indicators in the round we can build a picture of the way the market is operating."²

We agree that the level of competition is best judged by looking at a range of indicators. In this context we note the High Court has stated:

[15] In a workably competitive market no firm has significant market power and consequently prices are not too much or for too long significantly above costs.

[16] These terms are admittedly not precise. No two markets are the same and no single market stays the same. Whether workably competitive conditions exist is a judgement to be made in the light of all the information available, rather than something that can be ascertained by testing whether certain precise conditions are satisfied.³

In the following sections we comment on those aspects of the analysis which we regard as being most critical to the overall conclusions. In the attached document we have set out our more detailed comments on the draft empirical paper. These include suggested clarifications or qualifications for consideration by the Authority.

D - Apparent structural change in electricity spot prices

The Authority's paper refers to statistical analysis which seeks to determine how much of the increase in spot prices observed after 2018 is explained by changes in hydro storage, gas prices, wind generation, and electricity demand. The analysis finds that each of the above variables has statistically significant explanatory power. However, it also finds that a dummy variable applied from late 2018 is also significant, with spot prices after that date being approximately \$39/MWh higher than before.

Based on this analysis the Authority states:

"Prices over the review period have – at least to some extent - reflected underlying supply and demand conditions, which is a sign of a competitive market. Over the review period, demand has been higher; hydro inflows and storage have often been low; there have been a number of gas production outages; and all fuel costs - including the value of stored water and the cost associated with carbon dioxide emissions - have been rising. These have all impacted on electricity spot prices.

However, some of the increase in prices since the Pohokura outage appears to be unexplained by the underlying conditions. This observation is supported by two statistical tests presented in the paper."⁴

We regard the regression analysis as among the most potentially informative evidence in the review because it allows diverse data to be assessed in an integrated way. Putting aside the underlying cause of the apparent

¹ Page ii.

² Page ii.

³ New Zealand High Court, NZHC 3289, 11 December 2013.

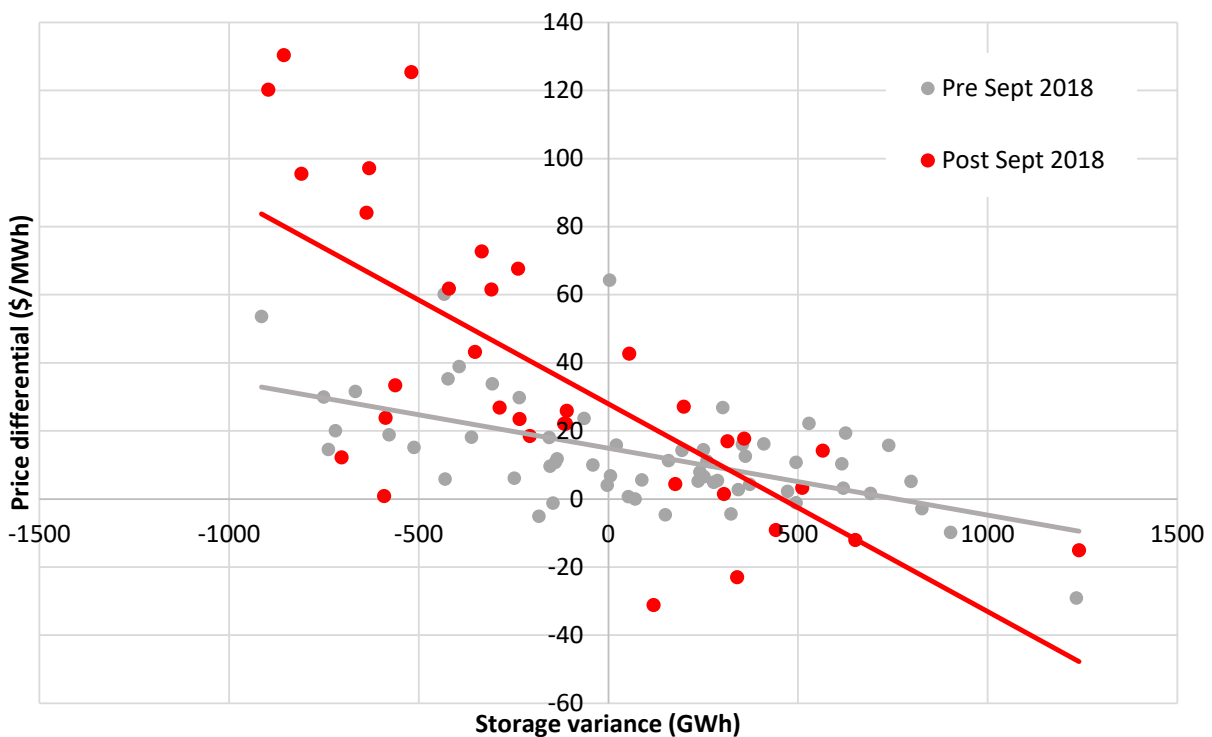
⁴ Page ii.

shift for now, it is striking that the analysis points to an unexplained upwards shift in average spot prices of almost \$40/MWh from late 2018 to mid-2021.

Apparent structural shift

This is a significant finding and to cross-check it we have undertaken some separate analysis which compares spot prices to estimates of the short-run marginal cost (SRMC) of generation. The SRMC estimates are based on the most expensive thermal plant running in each trading period or wind generation when no thermal was needed. Differences between spot prices and estimated SRMC values are to be expected, especially at times when water values exceed thermal costs because storage is low. Other factors can also cause differences such as risk aversion by participants, difficulties in forecasting with 100% accuracy, some recovery of capital costs, etc. However, we would not expect the *pattern* of overall differences to alter dramatically pre- and post-2018.

Figure 1: Differences between observed spot prices and estimated SRMC of marginal plant



Source: Concept analysis

Figure 1 shows the results of the analysis with data expressed as an average value for each month. The x-axis shows the variance in national hydro storage relative to the mean value for the time of year and the y-axis is the spot price minus the estimated SRMC. The chart shows a discernible change in the pattern of price/SRMC differences pre- and post-2018. In summary, this analysis points to a similar conclusion to that reached by the Authority. While much of the increase in spot prices after late 2018 is explained by elevated gas spot prices (as it affects SRMC) and hydro storage (displayed on the x-axis), there is also a sizeable unexplained component.

Gas market issues cannot be ruled out as cause of structural shift

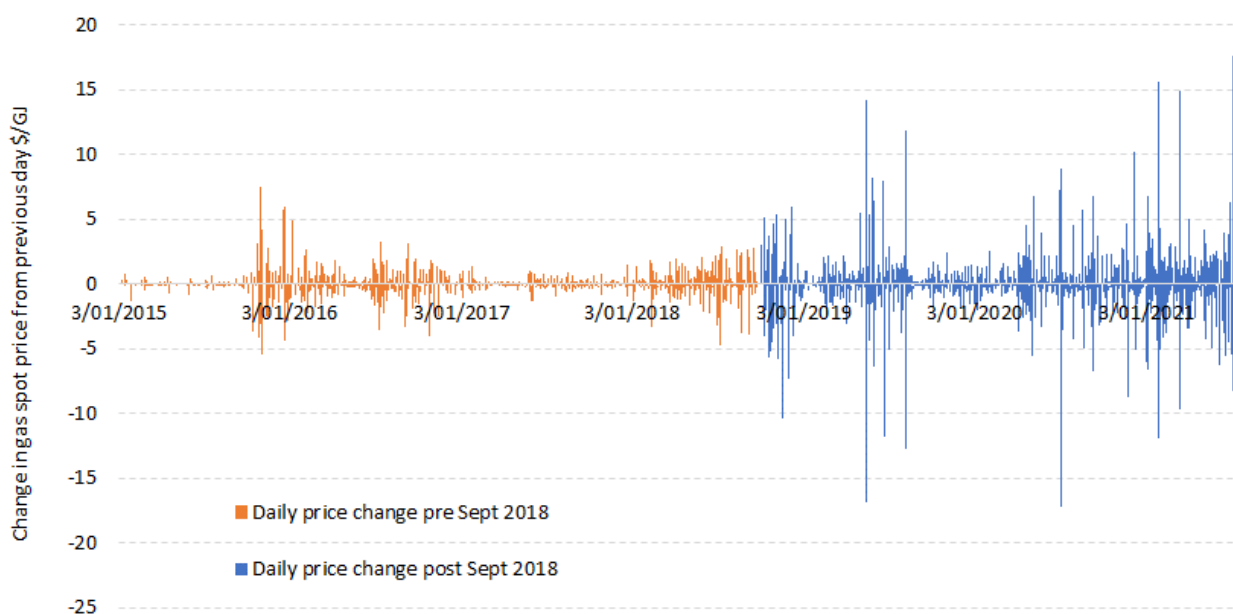
We now turn to whether gas market issues might account for the unexplained shift in electricity prices from late 2018. In particular, it is possible that market participants are expecting future gas costs to be higher than prevailing spot gas prices – and hence lifting the value of stored water above the level that would be implied by current thermal fuel costs.

Arguably this might be possible because the gas supply system did experience significant shocks with the repeated and (as yet) unresolved issues at the Pohokura gas field from 2018. Gas supply had already been tightening in years leading to 2018,⁵ and the ongoing issues at Pohokura exacerbated that position. Accordingly, an expectation of high gas prices in future periods might logically affect the value of discretionary stored water and hence electricity spot prices in the review period.

However, it might also be argued that an expectation of high gas prices in future periods should also affect prevailing gas spot prices if gas storage is feasible.⁶ On this logic the regression analysis would already take account of expected *future* gas prices because they are incorporated in *current* gas spot prices which are in the regression equation.

A first order check can be performed by examining daily changes in gas spot prices. If they were a good predictor of future gas prices we could expect them to be relatively stable – since forward expectations of prices are unlikely to swing violently from day to day if storage is feasible.

Figure 2: Change in gas spot price from previous day



Source: Concept analysis

Figure 2 shows the daily movement in gas prices since 2015. There have been periods when little change was evident, but that has seldom applied since late 2018.

Another check is to consider how easy it is for participants to use Ahuroa to arbitrage inter-temporal gas price differences. If arbitrage is easy, we would not expect to see large differences between the current and expected future value of gas. Put another way, if storage is feasible gas spot prices should be a reasonable predictor of expected future gas values. To this end we examined daily data on gas spot prices and Ahuroa gas injections and withdrawals for the year to July 2021.⁷

The results of the analysis are summarised in Figure 3. While there is some positive correlation between net withdrawals from storage and gas spot prices, the relationship is not particularly strong. Indeed, spot prices

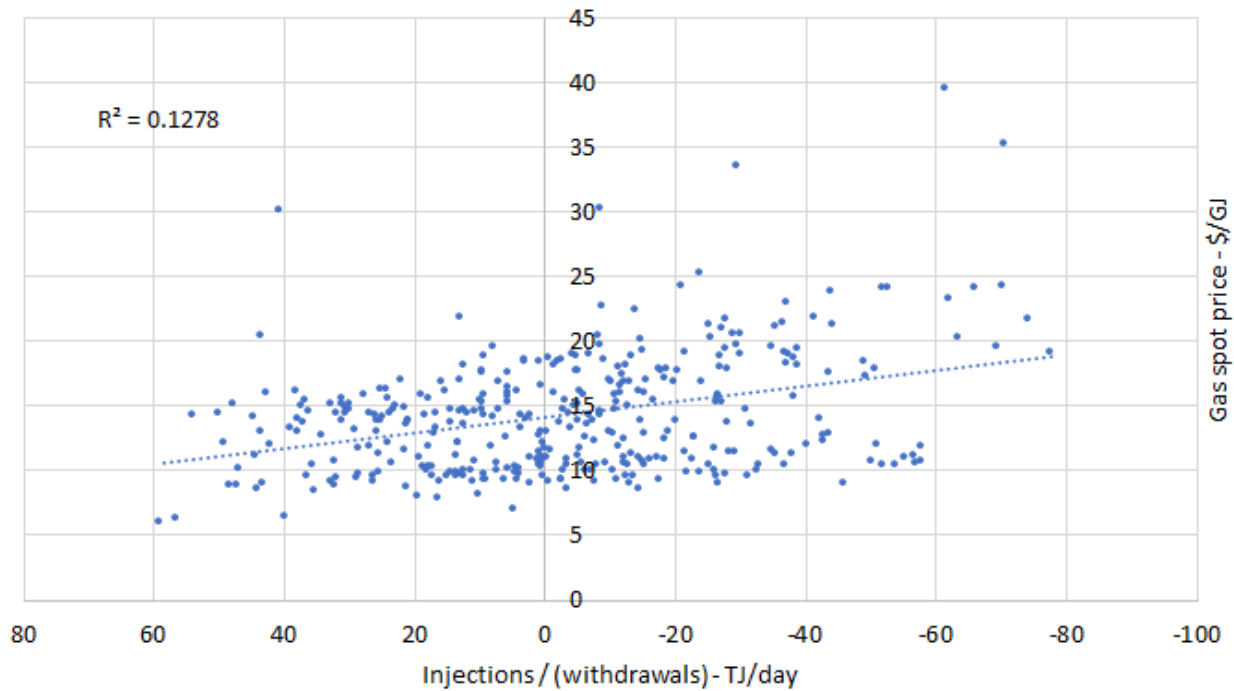
⁵ See Figure 7 of Gas demand and supply projections – 2021 to 2035, published by Concept Consulting Group Ltd, May 2021.

⁶ After taking account of storage and transmission fees, holding costs and uncertainty.

⁷ The gas spot prices are volume weighted prices reported on emsTradepoint. The Ahuroa information is compiled from a combination of OATIS data and adjustments to account for behind the gate gas use at the Stratford site.

can explain around 13% of the observed variation in daily gas storage movements in the year to July 2021. Similar results were produced when data for earlier periods was examined.

Figure 3: Ahuroa injections/(withdrawals) and gas spot prices (year to July 2021)

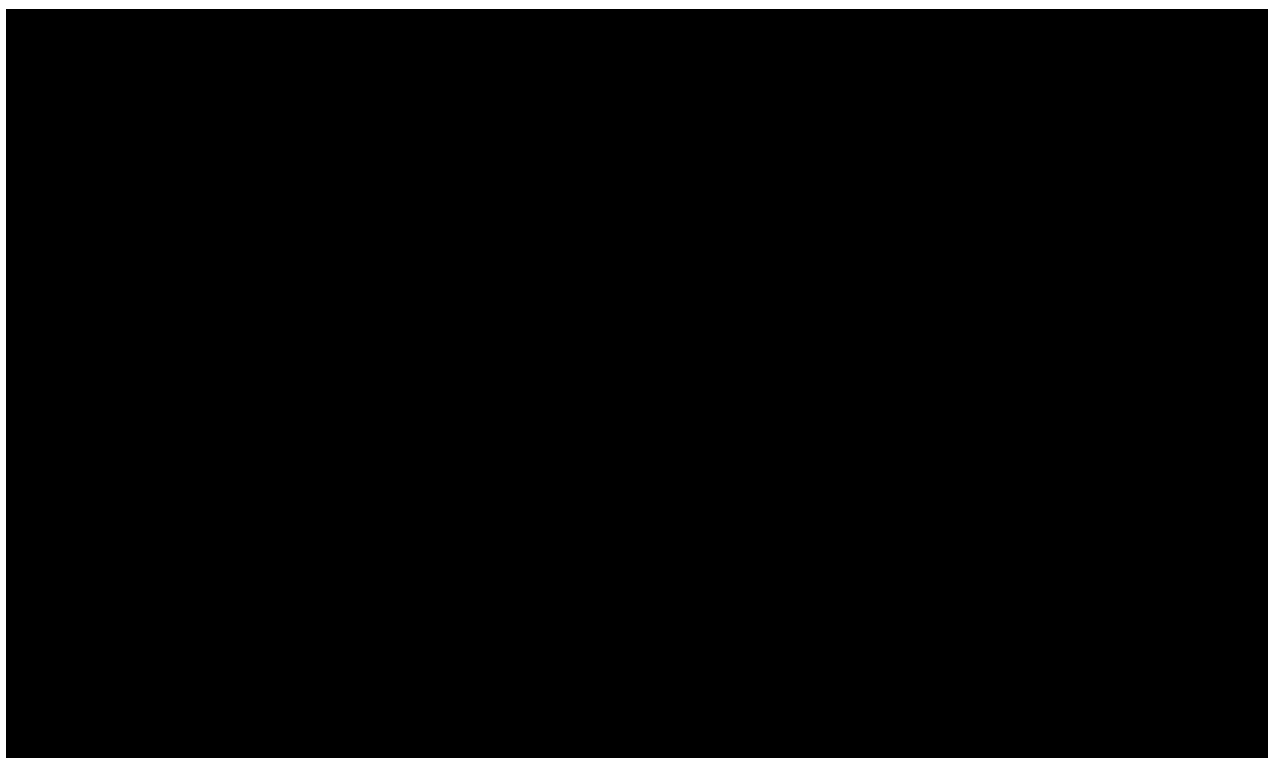


Source: Concept analysis

Our understanding is that the relatively weak correlation reflects the difficulties that parties have in reacting to gas spot prices which are extremely volatile from day to day. This volatility makes it hard to plan and coordinate gas transmission and storage nominations to arbitrage expected price differences. Given the apparent difficulty in using Ahuroa to undertake short-term arbitrage, we think it would be unsafe to assume that daily gas spot prices are a good predictor of expected future gas prices.

An alternative is to use prices from gas supply agreements (GSAs) that provide for gas delivery in a future period (e.g. the coming winter). Arguably, these would provide a better reference point for assessing the value of discretionary hydro storage. The Authority did seek such GSA information which was provided on a confidential basis by certain participants. The information is summarised in Figure 4.

Figure 4: Gas prices (spot and GSAs)



Source: Concept analysis of information provided by the Authority

The chart shows that GSA and spot prices have followed a similar pattern, with a rising trend and sharp increases at times. This provides a degree of confidence that spot price movements are not simply reflecting very short term factors, and provide an indication of longer term trends. Having said that, the GSA data is subject to some caveats. First, GSAs are entered into sporadically and therefore don't provide a continuous indication of forward price expectations. Second, the GSAs are of varying duration and this makes it hard to interpret the forward price implications. For example, the forward price implications of 2-year GSA priced at 15 \$/GJ are quite different from a GSA with a duration of (say) only one month. In addition, the prices shown have not been adjusted for differences in supply terms (e.g. degree of flexibility, or purchase locations which differ from the Frankley Rd trading hub⁸) making comparisons more difficult.

Finally, we note that the coefficient on the spot gas price variable in the regression equation is 3.08. This implies that a 1 \$/GJ increase in the gas price was associated with an electricity spot price rise of 3.08 \$/MWh on average over the period. This coefficient is significantly lower than might be expected based purely on physical factors. A priori, we would expect the coefficient to be somewhere around the 7-10 range.⁹ The regression results indicate that (on average) electricity spot prices have been much less sensitive to changes in gas input costs than would be expected based on physical factors alone. It is possible this arises because of the interaction between the explanatory variables in the model. However, it also reinforces our view that gas spot prices may not be capturing the full picture in relation to gas market conditions.

Overall, we agree with the Authority statement that "what the regression analysis does not show, is whether this upwards shift is due to the uncertainty surrounding gas supply from Pohokura and other fields (above that reflected in the gas spot price), or if there is some other reason for the upwards shift, such as the exercise of market power".¹⁰

⁸ GSA prices have been adjusted to include carbon to make them comparable with spot prices (which also include carbon charges).

⁹ Based on the fact that fuel conversion ratios for gas-fired stations are in the 7,000 – 10,000 MJ/MWh range.

¹⁰ Page 13.

E - Analysis of offer prices, storage and costs

The Authority's paper includes an extensive analysis of generator offer prices and their responsiveness to changes in hydro storage and various measures of cost. The Authority finds that offer prices have increased since the Pohokura outage, and there is often a large proportion of offers above its estimate of costs. However, the Authority also notes that the difference could potential be explained by gas supply uncertainties discussed above.

We consider cost analysis to be a useful tool but note that results can be quite sensitive to some input assumptions. We also endorse the caveat noted by the Authority in relation to gas supply uncertainty.

F - Analysis of Tiwai smelter contracts

The paper includes an event analysis which examines movements in ASX futures prices following various announcements about the future operation of the Tiwai smelter owned by New Zealand Aluminium Smelters Ltd (NZAS). The paper draws on this analysis and information obtained directly from Meridian and Contact to assess the effect of the Tiwai contracts signed in January 2021 on the electricity market.

We consider that the analysis points to a potential for significant efficiency losses due to a misalignment between private and social interests. The Tiwai contract issues are considered more fully in the separate issues paper on inefficient price discrimination. We refer to our separate letter which comments on that paper.

G - Analysis of generator-retailer earnings

The Authority's paper states that if market power has been exercised, it would be expected to show up in company earnings.¹¹

We agree with the statement that the exercise of market power would be expected to lift a company's earnings relative to the counterfactual. However, we also note that evidence of higher earnings does not necessarily indicate the exercise of market power.

H - Overall assessment

The Authority's overall conclusion is that it did not find definitive evidence of an exercise of market power.¹²

"It is not possible to definitively conclude whether all of the increase in prices is due to underlying conditions – including uncertainty about future gas supply from existing fields¹³, or if some of the increase is due to prices not being determined in a competitive environment."

Rather, it found that some of the increase in the spot price in the review period reflected fuel supply scarcity and increased fuel costs. However, there has also been a sustained shift upwards in the spot price since the Pohokura outage that is unexplainable by the underlying conditions it has been able to model in its regression analysis. It found that there was insufficient information to determine how much of this upward shift was due to uncertainty about the gas market or whether some of it was from firms using that uncertainty to drive prices up by exercising market power.

We think this overall conclusion is reasonable in light of the available evidence.

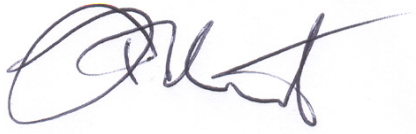
Please let us know if you have any questions in relation to this letter.

¹¹ Page 105.

¹² Page ii.

¹³ In this paper we refer to gas supply risk and gas supply uncertainty. This is a reference to the fact that there has been supply disruption from some fields and, while we understand there are some initiatives underway to improve production from those fields, there remains some residual uncertainty in the market about potential output from those fields.

Yours sincerely

A handwritten signature in black ink, appearing to read 'D Hunt', written over a light blue horizontal line.

David Hunt

Director

Concept Consulting Group Ltd