1. Introduction

In August the government announced it would pay a one-off subsidy of $30 million to the New Zealand Electricity Smelters Ltd (NZAS) and reduced the price on the 15 year electricity contract held between the Smelter and Meridian energy (Meridian, 2013). The contract cannot be cancelled until the beginning of 2017, effectively guaranteeing the operation of the Tiwai aluminum smelter for another two years. It recently came to light that the government did this against the advice of Treasury (Bennett, 2013).

The smelter had been losing money in the light of low world aluminum prices and a surge in Chinese and Middle Eastern production, plus new smelters in Quebec and Russia where energy prices are much lower. The recent figures show a $91.5 million operating loss for 2012 which increased to $678 million after including a write down in the book value. These events have prompted discussion on the future of the electricity contract held by the smelter with the power company. Before the new contract Meridian had stated that if the plant shut down they could sell the same electricity at better margins, however the overall impact on Meridian’s profitability if the smelter closed is far from clear. Proponents of the government deal such as Tim Shadbolt have argued that the closure of Tiwai point would have no significant effect on electricity prices (Charman, 2013).

If the smelter were to close down, then Meridian would be able to sell Manapouri electricity on the spot market. The smelter consumes 15% of the total electricity produced in NZ so the increase in supply is significant, and could lead to a decrease in the wholesale price. However very little detailed modeling of the quantitative impact on prices is in the public domain. As a contribution to the debate we present here the results of simulations performed by the Energy Centre to assess the impact the smelter closure would have on the market.

2. Methodology

A computer agent based model is used to simulate prices (Young et. al., 2012). Firms in the model are represented by computer agents who experiment by bidding their generation assets into the spot market at different prices to maximize profits. Eventually the bids from all the agents converge after a large number of trials and this sets the market price. A simplified 19 node network (Figure 1) is used to represent the main features of the physical network. The model has been used to understand the extent of market power in the New Zealand electricity market (Browne at. al, 2012) finding similar numbers to those presented in the Wolak report (2009).
We run the model using our best estimate of network parameters in 2014, which includes some recent upgrades to the electricity grid\(^1\). We use forecast demands from the Electricity Authority\(^2\). Details on short-run fuel and operating costs are based upon the Electricity Authority’s GEM model. We assume there are the same hydro lake inflows as in 2009, a year where water scarcity was not an issue.

We simulate two scenarios. A baseline scenario, in which demand grows according to Electricity Authority estimates, plus expected transmission and generation additions by 2014. In this scenario, the smelter continues to operate. We compare this scenario to a ‘No Smelter’ scenario which is identical except for the smelter is no longer operating.

3. Results

We find that when the smelter is removed there is a significant drop in the wholesale price of electricity across the country. Figure 1 shows how electricity prices fall across the country. At the Tiwai node where the smelter is located the price of electricity falls by 18.4% over the course of the year. Whilst at the main population centers in Auckland, Wellington and Christchurch prices fall by 5.4%, 9.0% and 15.0% respectively. These price reductions occur despite the extra line losses that would occur from having to transmit energy further up the country.

![Figure 1 Average annual electricity prices by node](image)

\(^1\) In addition to the network described in Young et. al. (2012) we assume the following upgrades: 1.) Thermal upgrade between TKU-BPE in 2009, 2.) Additional reactive support at ISL build in 2009, 3.) Duplexed line between ROX-NSY-LIV, 4.) New line from WKM to Brownhill commissioned in October 2012. 5.) New line from Penrose to Albany scheduled for completion by end of 2013. 6.) New HVDC line complete, with additional STATCOM to bring the capacity to 1200MW in 2014.  

Over the course of the year these lower prices reduce the total wholesale cost of the country’s electricity by over $140 million, 9.9% of the wholesale electricity bill.

Figure 2 shows how these reductions in price are distributed over the course of the year

4. Conclusion

The government subsidy of NZAS did not resolve the underlying issue of whether the Tiwai plant is economically viable, If current economic conditions persist it may have simply pushed back decisions about the plant’s future until the end of 2017. The purpose of this note is not to critique the government’s decision to subsidize Tiwai, but rather to note that the closure of the plant would have wider impacts on the electricity sector which should be taken into account.

The computer agent based price simulations reported here suggest that spot prices could fall by 9.9%, reducing the wholesale price of electricity for the rest of the country by $140 million. Although Meridian may get a better price on the spot market for Manapouri hydro generation than selling it as a contract to Tiwai, they will also see lower prices across the board for the rest of their output which is concentrated in the South Island. Other electricity companies will unambiguously see a fall in average prices and hence profits.

Wholesale electricity prices constitutes around 38% of the retail price of electricity (Bertram, 2013). Lower wholesale prices may ultimately lead to lower retail prices as competition forces electricity companies to pass through the reduced costs.

The impact on the market is likely to be most significant in the short to medium term. In the long term firms may hold off building new generation if prices are too low, this and growing demand would offset the lower prices
5. References


