Market Power in the NZ Wholesale Electricity Market 2010-2016

BY STEPHEN POLETTI

Overview

Over a decade ago the NZ Commerce Commission engaged Frank Wolak to investigate market power in the New Zealand wholesale electricity market. Professor Wolak (2009) found evidence of substantial market power with market power rents of $4.3 billion over the seven-year period (2001-2007) covered by the report. There were a number of criticisms of the report, the most substantial of which was the assumptions made around the value of water, which was capped at the marginal cost of thermal plants. Browne et al (2012) using a different methodology argued that water values during dry years would at times be higher than this. Using a computer agent based approach to model market power and a calibrated water value curve they found similar market power rents to those calculated by Wolak. Philpott and Guan (2013) using stochastic dynamic programing to calculate water values also found high market rents.

Since the Wolak report, Browne et. al. (2012) and Philpott and Guan (2013) there has been no quantitative investigation into market power in the NZ wholesale market, even though there have been considerable changes in market conditions. Despite little demand growth over the last decade there has been a significant increase in new wind and geothermal generation. More recently, a number of thermal plants have exited the market and there have also been line upgrades. Furthermore there has been a number of market design changes aimed at alleviating market power and managing risk better in years of low inflows into the hydro dams. Thus it is timely to investigate whether there are still market power issues in the wholesale market.

Methods

The approach used in this report to model market power is to construct the competitive benchmark, where all plants bid into the market at their marginal cost. There is one exception - hydro bids into the market using the water value. The water value curve is computed as a function of the actual lake level, compared to the mean, for any given day. We compare the competitive benchmark to the prices simulated by the computer agent-based firms trying to maximise profits and attribute the difference as market power rents. We also compare the competitive benchmark to actual prices and compute rents using this approach. It turns out both approaches give similar results.

We start off using the approach advocated by Browne et. al (2012), to investigate market rents over a seven year period from 2010-2016 using computer agents. This approach gives substantial market rents. However we argue that there is a dynamic inconsistency in this approach, as the competitive benchmark consistently dispatches more water than the strategic simulations, which cannot continue for any length of time as the lakes would eventually become empty. We constructed a model that is dynamically consistent by keeping track of dispatch and inflows for each time period and updating the lake level to find new water-values in the following period. This is our preferred approach as it is dynamically consistent and has simulated prices close to actual. We compare simulated prices to the competitive benchmark to calculate market rents.

Stephen Poletti is with the University of Auckland. s.poletti@auckland.ac.nz

Results

Over the period of the study simulated average prices were $63/MWh compared to the average of observed prices which was $68/MWh. The close agreement gives us confidence in the methodology. The computed markets power rents over the period 2010-2016 are substantial. They are similar or even higher, as a fraction of revenue, to those found by Wolak (2009). Table (i) below shows computed market power rents for each year using our dynamic competitive benchmark and market power simulations. Over the 7-year period of the study total simulated market revenue was $14.9 billion. Total market rents are $5.4 billion, which is 36% of revenue.

Year	Simulated Competitive Benchmark Revenue ($million)	Simulated Market rents ($ million)	% of total revenue	Simulated Wholesale Revenue ($million)
2010	1861	588	24%	2449
2011	1668	678	29%	2346
2012	1569	1305	45%	2874
2013	1146	554	33%	1700
2014	1290	831	39%	2121
2015	1142	759	40%	1901
2016	856	688	45%	1544
SUM	**9532**	**5403**	**36%**	**14935**

Table i: Simulated market power rents.

Using actual prices to compute market rents instead of simulated prices market rents as a fraction of revenue are even higher at 39%, reflecting the fact that actual prices are slightly higher than simulated prices.

Conclusions

Having reported in detail for the different methods of simulating market power for each of the seven years 2010-2016, there are some general points that emerge. The first is that all the methods give market rents which are high. The second is how important lake level dynamics are. Ensuring dynamic consistency generally resulted in a large fall in simulated rents. The third point is that nearly all of the simulations tracked actual average annual prices well, with simulated average annual prices typically between 0-$10/MWh of those observed.

To sum up our analysis finds substantial market power in the New Zealand electricity market. Across the seven years we analyse we estimate, using our preferred methodology, total market rents at $5.4 billion, which is 36% of revenue. This is despite policies introduced over the time frame of this study with the goal of mitigating market power. Furthermore there is some evidence that market power rents have increased over the last few years.There is a strong case for policy intervention by the regulator to mitigate market power.

References

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Dual Plenary Session 2 – Market Access and Infrastructure

SUMMARIZED BY BORIS SOLIER, ASSISTANT PROFESSOR, UNIVERSITY OF MONTPELLIER

The session was chaired by Peter R. Hartley from Rice University who introduced the three panelists: Jean-Denis Charlebois from the National Energy Board of Canada, Jean Côté from Suncor and Jürgen Weiss from The Brattle Group.

Jean-Denis Charlebois reviewed the evolution of fossil fuels production and transmission capacities in Canada over the last few years. He showed that crude oil exports have increased faster than pipeline capacities, resulting in a higher utilization of railroads, while in the case of natural gas, capacity and production have evolved at the same pace overall. Turning to electricity, Jean-Denis Charlebois reminded that Canada enjoys a diverse electricity mix dominated by hydroelectricity, and argued there is a need for infrastructure to support the low carbon energy transition.

Jean Côté introduced Suncor's business, an oil and gas producer with assets in renewable generation, and the efforts undertaken so far by the company to reduce its carbon footprint. He stated that Canada has still a large share of fossil fuels resources to exploit and claimed for more stability and clarity in energy regulations.

Jürgen Weiss estimated the need for infrastructure investments to support the electrification of energy demand in the United States. He stressed that electricity distribution facilities will be the cornerstone of the future energy system but transmission infrastructure will still have a role to play at the US level, for instance to ensure exchanges across States when necessary. Hence, if investment in electricity infrastructures will need to double in the future in order to meet growing demand, the situation is less clear when looking to the whole energy system, according to Jurgen Weiss. Regarding oil and gas pipelines in particular, the question is whether or not to invest in assets that are likely to be stranded by 2050. Jürgen Weiss considered nonetheless that additional investments will probably be needed in fossil fuels infrastructures as full electrification of demand will not be easy to achieve.