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National Electricity Market update, data to June2016.

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Introduction

This *CEDEX® Electricity Update* contains data for emissions from electricity generation in the National Electricity Market (NEM) up to the end of June 2016. All emissions data are reported as annual moving averages. This approach removes the impact on the reported data of seasonal changes. Annualised data reported in CEDEX® will show a month on month increase if the most recent monthly quantity is greater than the quantity in the corresponding month one year previously.

Electricity emissions update - data to 30 June 2016

Demand growth softening, small drop in emissions as renewables rise

Key points

The year to June 2016 saw a continuation of the slowdown in demand growth first seen last month.

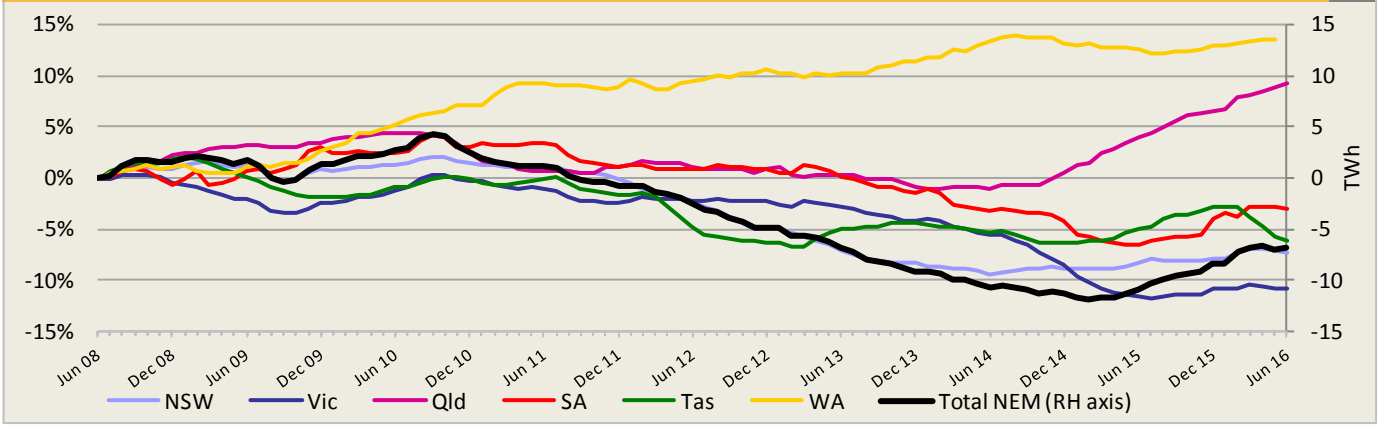
Total emissions from electricity generation in the NEM fell slightly in the year to June 2016. Annual emissions were 5.7% higher than in the year to June 2014.

Total coal generation fell slightly to 75.8%, compared with a minimum of 72.3% in the year to July 2014. Gas generation fell again, for the eighteenth month in succession. Both hydro and wind generation increased and, as a result, total renewable generation reached 13.6%, its highest level since September 2014.

This issue of *CEDEX® Electricity Update* concludes with an examination of the extraordinarily high spot prices recorded in the wholesale market of the NEM during May and June, and the relationship of wholesale prices to wind generation in SA and Victoria.

FIGURE 1

Relative changes in electricity demand by State, and total absolute NEM demand



Demand

Total annual demand for electricity fell slightly in NSW, SA and Tasmania and increased very slightly in Victoria. Demand continued to increase in Queensland, but more slowly than in previous months, suggesting that demand outside the coal seam gasfields may have fallen, as in the other states (Figure 1). Demand in WA also increased, though only slightly, in the year to May 2016. Total annual NEM demand in the year to the end of June was 2.7% higher than the minimum value, which was in the year to February 2014. It is of course too early to say whether, after a year or so of increasing demand, we are seeing another trend reversal.

Generation and emissions

As demand was almost completely flat from May to June, so too was generation. Emissions, however, fell, in line with the fall in coal generation (Figure 2). Black coal generators supplied 53.2% of total supply and brown coal generators supplied 22.6%, making a total coal share of 75.8%, down from nearly 76.2% in the year to April 2016, which was the highest coal share since September 2012 (Figure 3 and Figure 4). The closure, in early May, of Northern power station in SA made a small contribution to the lower total coal generation, offset by continued increase in Queensland to supply the demand from the coal seam gasfields. However, the main cause of lower coal generation was increased supply from renewables.

FIGURE 2

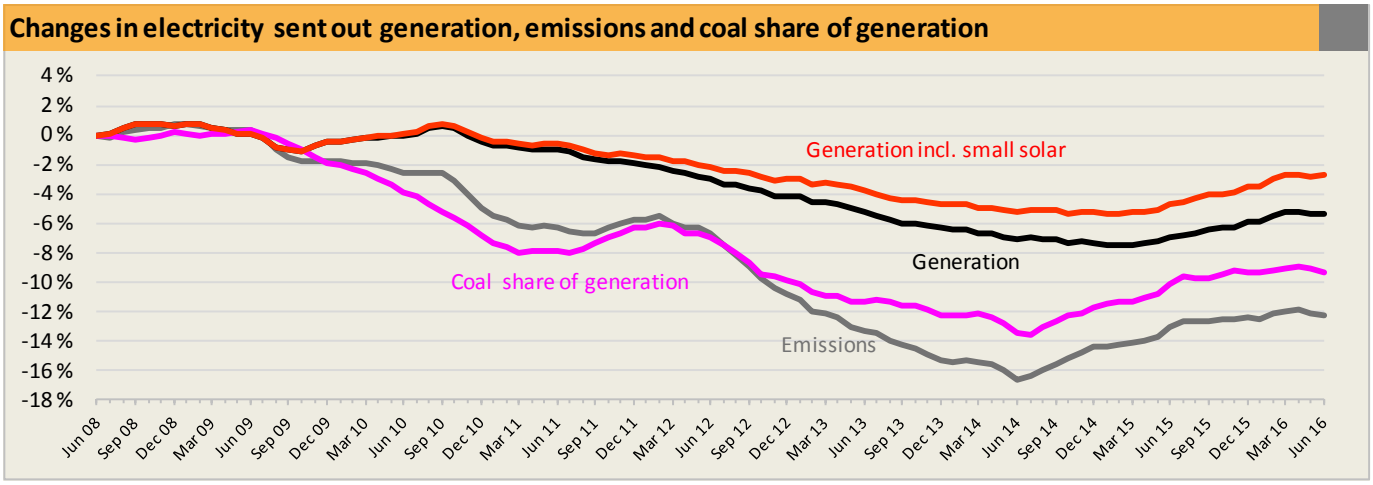
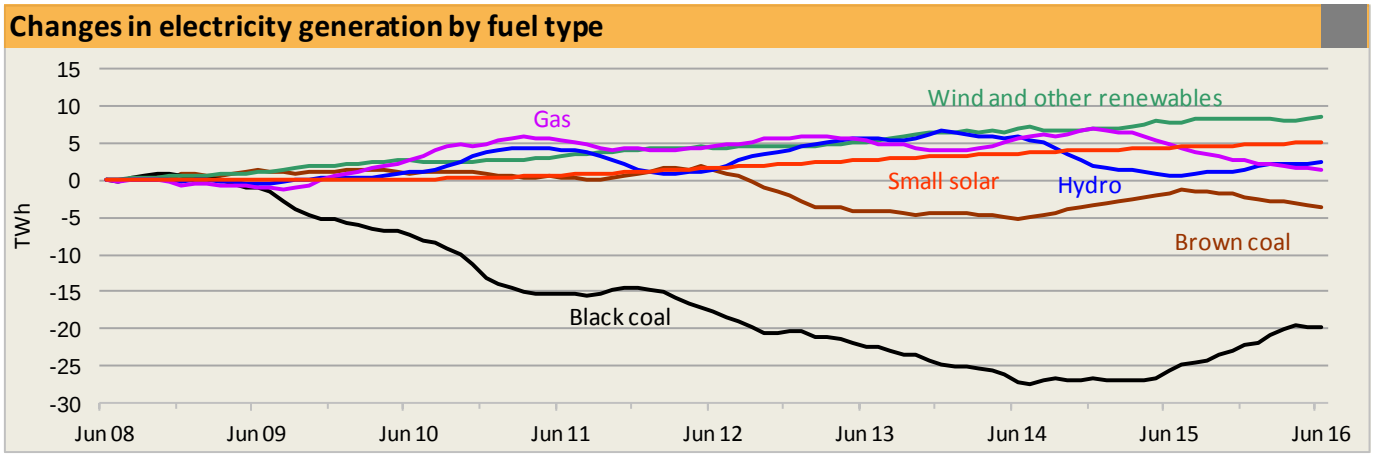


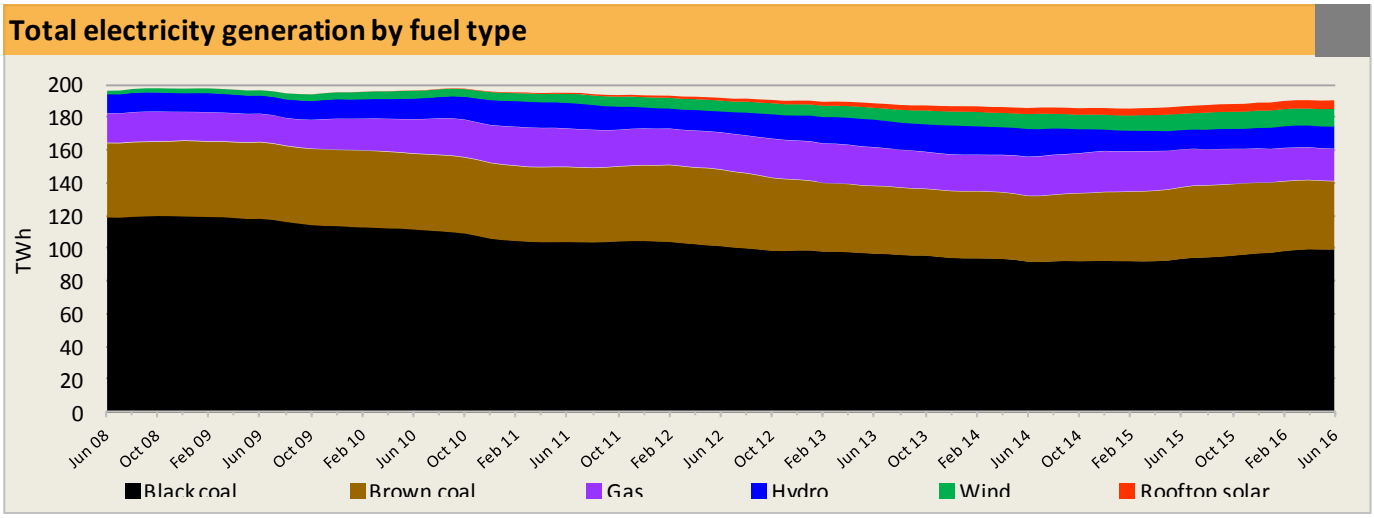
FIGURE 3



Good rainfall across the catchments in May and June saw hydro generation in June rise to its highest monthly level since June 2014, and annual hydro to its highest level since November 2014. In Tasmania, Hydro Tasmania was able to shut down most of its gas generation and meet all demand in the state without needing to make more than nominal use of its two biggest power stations, Poatina and Gordon. This allowed energy in storage to reach 29.1% of full supply level by the end of June, up from its minimum level of 12.8% in late April. The two deep storages, Gordon/Pedder and the Great Lake, remain at low levels (17% and 23% respectively) but are currently rising. There

was also no need to import electricity from Victoria, notwithstanding the re-opening of Basslink, following completion of repairs, on 13 June. In Victoria, hydro generation, most of which comes from the two Murray power stations in the Snowy scheme, reached its highest monthly level since July 2012 and its highest annual level since February 2014. In NSW monthly hydro generation was less dramatic, because output from the Tumut power stations in the Snowy scheme ran at higher levels earlier this year. However, this meant that annual generation reached its highest level since December 2013.

FIGURE 4



Wind generation in the month of June was less than in May, but total annual wind generation in the NEM reached a new record level of 10.54 TWh, equal to 5.84% of total supply. With small contributions from bagasse generation in Queensland and large solar generators in NSW, total renewable generation in the months of May and June reached its highest ever level as a share of total NEM supply, at 16.7% and 16.6% respectively. On an annual basis, total renewable generation in the year to June 2016 was 13.62% of total supply, the highest level since September 2014.

As households and, increasingly, businesses continue to install rooftop solar generation, distributed solar generation continued its steady growth. In the year to June 2016 its output added an estimated 2.8% to the electricity supplied at the wholesale level in the NEM (and 3.0% of NEM supplied electricity used by consumers when allowance is made for transmission and distribution losses in moving the electrical energy from power station to consumer). Some of the rooftop solar electricity generation is exported into local distribution networks and some is consumed "behind the meter", and therefore only seen by the electricity supply industry as a reduction in consumer demand.

Finally, gas generation also fell again, to 19.5 TWh, which is the lowest annual level since March 2010, and equal to 10.51% of NEM generation. As has been the case for many months, this was driven by reduced generation in Queensland. Gas generation increased in SA, following the closure in May of Northern power station. Most of the increase came from the ageing Torrens Island A and Torrens Island B stations, owned by AGL, which in early June announced that it had withdrawn its previously announced decision to mothball Torrens Island A in 2017. Torrens Island A was commissioned in 1967, making it the oldest thermal power station still operating in the NEM. Increased gas generation in SA also came from the Osborne, Quarantine and Ladbroke Grove stations, all of which are operated by Origin Energy. As the two largest electricity retailers (commonly termed gentailers), not only in SA but across the NEM, AGL and Origin have the decisive advantage of being able to self-hedge the high cost of gas

generation. That is not available to Engie, which owns Pelican Point, the newest and most efficient gas fired power station in SA. Two years ago Engie mothballed half of Pelican Point and since then has operated the remaining capacity only intermittently. Engie is best known in Australia as the owner of Hazelwood power station Victoria, but it does not have a retail presence.

The relationship between wind generation and wholesale prices

May and June both saw high levels of wind generation (particularly in May) and progressively higher average spot wholesale prices in the NEM (especially in June). Average spot wholesale prices in each of the four mainland NEM regions (states) during June 2016 were higher than at any time during the carbon price period, with the sole exception of January 2013 in Queensland (Figure 5). This figure also shows that, throughout the period since July 2011, prices in SA were similar to prices in each of the other three states, though mostly slightly higher.

FIGURE 5

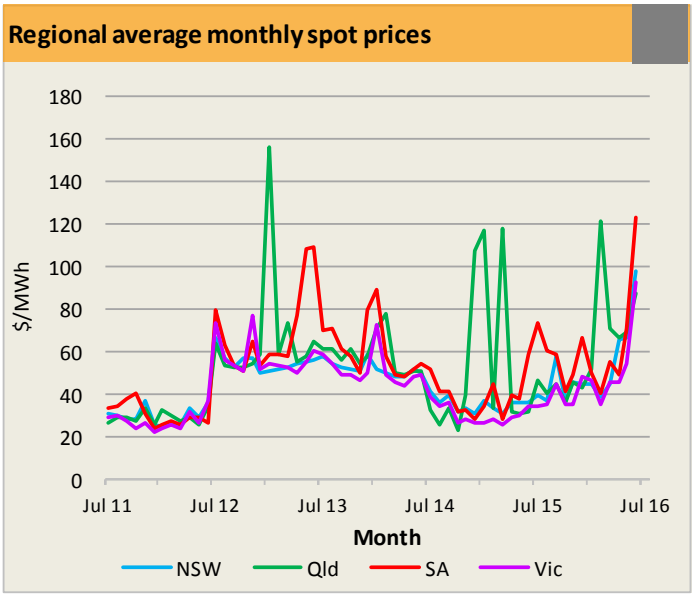
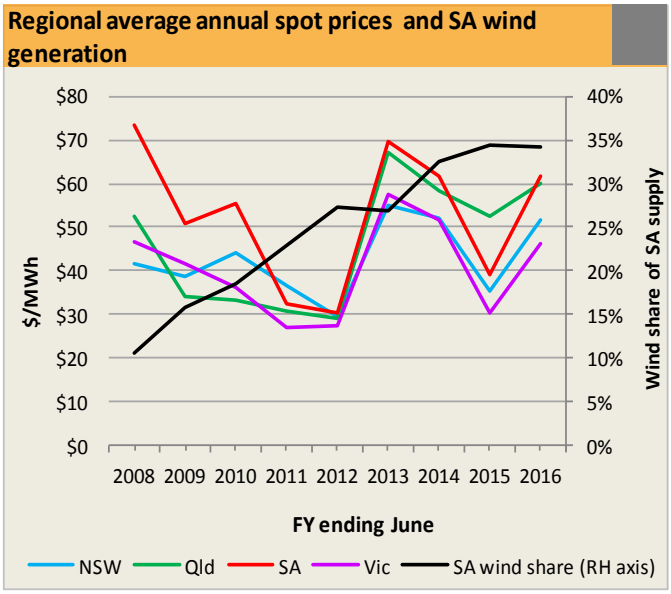


FIGURE 6



The emergence of high NEM wholesale prices, however, has seen renewed claims that higher prices in SA are caused by the high share of wind generation in state electricity supply. Looking over the whole period since AEMO began comprehensive reporting of wind generation, there is in fact no relationship between the share of wind generation and wholesale prices in SA (Figure 6). The average annual price in 2007-08, when wind supplied only about 10% of total demand, was higher than in 2015-16, when it supplied nearly 35%.

The real reason for higher electricity prices in SA is that the cost of conventional generation is higher than in the three eastern states because it does not have access to large, low cost coal resources. The same applies to WA, and both states have, for many decades, had higher cost electricity than the three large eastern states.

Another way of looking at the relationship between wind generation and high wholesale electricity prices is to look in detail at the two most recent months in SA and Victoria, the two states with significant shares of wind generation in total supply. When that is done, a strong inverse relationship between market price and wind generation is found; that is, the higher the share of wind generation, the lower the price (Figures 7 and 8). The data shown in this graph are the wholesale prices in each month in SA and in Victoria, averaged over the 1,440 30 minute trading

intervals in May and the 1,488 trading intervals in June, weighted by the total demand for electricity, in MWh, in the trading interval. This is called the volume weighted average wholesale price. It is compared with volume weighted average prices in each month and each state during various subsets of the complete set of trading intervals.

In Figure 7 the subsets of the absolute quantity of wind generation in each trading interval are the four quartiles of the total number of trading intervals in the month. In Figure 8 the subsets, also four quartiles, are defined in terms of the share of wind generation in total electricity demand during the trading interval. It can be seen that wind generation had a very dramatic effect on lowering wholesale prices in both state wholesale markets. In Victoria, in the top quartile of trading intervals for wind generation, the average wholesale price was 32% lower than the average for the whole month in May and 22% lower in June. Corresponding figures for SA are 62% lower in May and 34% lower in June. Conversely, in the bottom quartile of trading intervals for wind generation, prices were 55% above average in May and 36% above average in June. Corresponding figures for SA are 64% above average in May and 47% above average in June. The effect is larger in SA than in Victoria, which is to be expected, given that wind generation over the two months was higher in SA than in Victoria – 958 GWh compared with 705 GWh – and much large in relative terms – 43.5% compared with 9.7% of total electricity supplied. What is surprising is the effect of wind generation on market prices is so large in Victoria, given wind's current relatively small share of supply.

Figure 8 shows that when the quantity of wind generation in each trading interval is defined in terms of the wind share of total supply, rather than the absolute level of wind generation, the price-lowering effect of wind generation is similar, while the increase in prices when wind generation is at low levels is, if anything, even more dramatic.

FIGURE 7

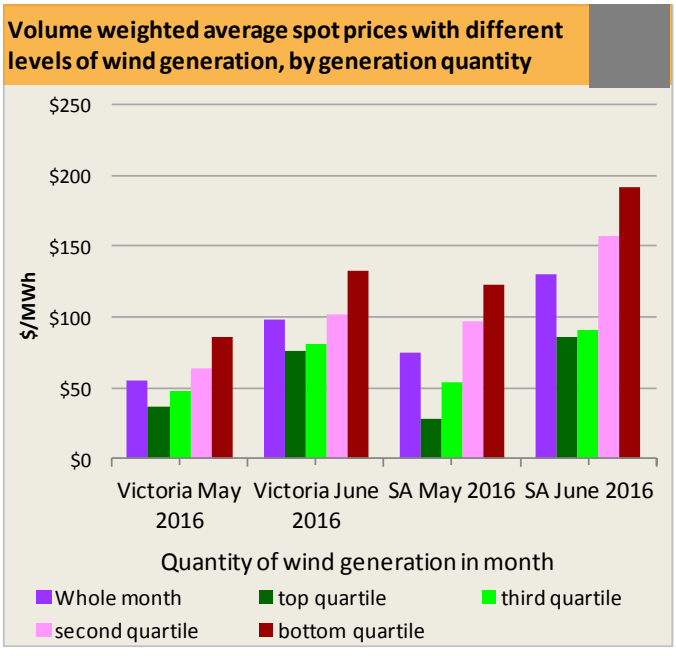
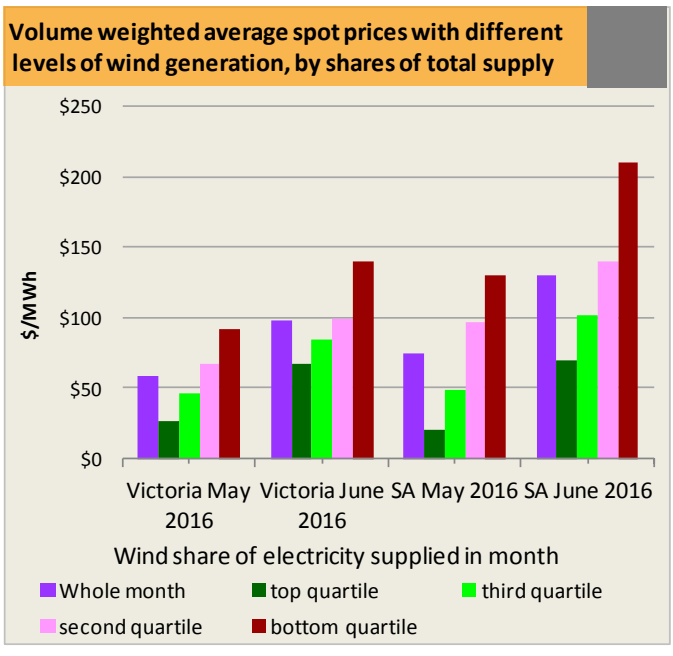


FIGURE 8



In both states, prices across the board were higher in June than in May, which can also be seen in Figure 5. There is general consensus among informed commentators that very high wholesale gas prices are by far the most important, though not the only, cause of the dramatic increase in electricity prices; see for example the excellent

discussion by Paul McArdle at http://www.wattclarity.com.au/2016/07/reviewing-q2-prices/. SA is particularly exposed to the effect of high gas prices on the cost of electricity generation because, following the closure of Northern power station, it is more heavily dependent on gas generation, along with wind and imports of brown coal generated electricity from Victoria. As noted earlier in this *Electricity Update*, wind generation was somewhat lower in June than in May in all states. The results of this analysis suggest that reduced wind generation contributed to pushing average prices in June to even higher levels than those seen in May.

Very high gas prices, by undermining the economics of gas generation, contribute to pushing up Australia's greenhouse gas emissions. It is salutary to note that AEMO lists Pelican Point in SA and Swanbank E in Queensland as the two lowest emission thermal power stations in the NEM. Swanbank has been completely mothballed since December 2014 and Pelican Point almost completely non-operative since March 2015 because high gas prices make them both uneconomic to operate. To the extent that competition from LNG exports is contributing to higher gas prices, this effect is driving additional Australia's greenhouse gas emissions in the electricity market.

Finally, on a more positive note, so far as emissions are concerned, on 23 June the first machine at the Hornsdale windfarm in SA came on line. Hornsdale is the second of the three windfarms making up the first tranche of the ACT government's reverse auction (tender) scheme for moving to 100% renewable electricity supply by 2020. All successful bidders enter into a contract for difference supply agreements with the Territory government. Under a contract for difference, the parties agree to a price per MWh over the life of the agreement. Whenever the market price is below the contract price, the ACT pays the supplier the difference between the contract and the market prices, and subsequently recovers the additional cost through higher retail prices for electricity consumers in the ACT. But when market prices are higher than the contract price, the generator pays the ACT the difference, and passes the benefit on to consumers.

Between 23 June and 7 July, the volume weighted average market price of Hornsdale generation was $247 per MWh. Hornsdale's ACT contract price is reported to be $92 per MWh. As it happens, Hornsdale's contract with the ACT government does not start until 16 February 2017, when all machines in the windfarm are expected to be operating. If prices ever reach $247 per MWh after that date, Hornsdale will pay the ACT $155 per MWh generated over the relevant period. ACT consumers will never pay a wholesale price of more than $92 per MWh. By contrast, electricity consumers elsewhere in the NEM will, sooner or later, directly or indirectly, have to pay for the $247 per MWh wholesale price. ACT consumers will thus be protected from having to pay for extremely high wholesale prices because of the hedging provided by the renewable electricity contracts for difference. By 2020, the ACT government's policy will mean that electricity prices in the Territory are much more stable and predictable than anywhere else in Australia.

Data analysis, text and graphs: Hugh Saddler.