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CARBON EMISSIONS INDEX PLUS

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National Electricity Market update, data to January 2016.

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cedex® provides an early indication of key greenhouse gas emission trends in Australia.
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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 January 2016. All emissions data are reported as annual moving averages. This approach removes the impact on the reported data of seasonal changes, which particularly influence electricity and gas. 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 31 January 2016

Emissions and demand continue to climb

Key points

The year to January 2016 saw a small increase in electricity demand and generation in the NEM, and a fall in emissions. This continued the pattern reported in last month's of *CEDEX® Electricity Update*, which reported that, although both demand and emissions grew, the increase in emissions was much smaller than the increase in demand.

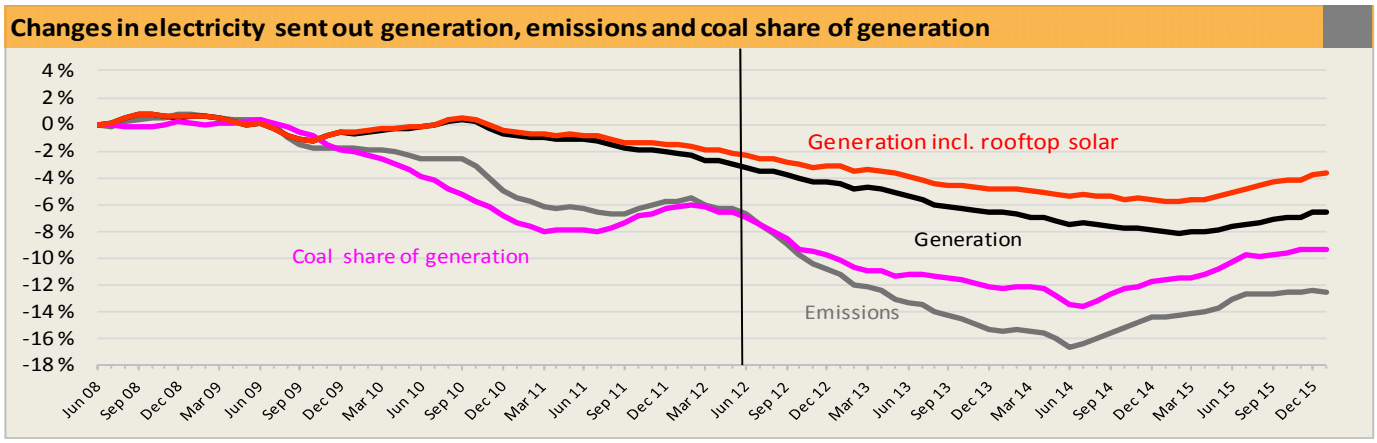
The total coal share of generation stayed virtually constant at 75.9%, but the total is made up of a distinct increase in black coal generation and an almost equal and opposite decrease in brown coal generation (see the Generation section below for details). Hydro generation also increased, while gas generation continued to fall and wind generation was almost unchanged.

Queensland demand continued to grow, as did demand in SA but in the other three states demand was virtually unchanged. There was a very small increase in WA demand in the year to December 2015, but demand remained below the level reached in the first half of 2015.

It is clear that the small reduction in emissions was caused by a change in the mix of generation supplying the NEM, analogous to that which occurred during the carbon price period. The main components of the change were a decrease in brown coal generation and an increase in black coal and hydro generation. This issue of *CEDEX® Electricity Update* examines all three of these changes.

Particular attention is paid to the electricity supply problems being faced by Tasmania, following the failure of Basslink on 20 December.

FIGURE 1



Demand

January 2016 was the eleventh successive month to record an increase in total demand for electricity in the NEM. Total annual demand is now 1.9% higher than the minimum level recorded in the year to February 2015 (Figures 2 and 3), a sustained rate of increase not seen for nearly seven years. As has been the case for over a year, Queensland was the main driver of growth, with demand 4.5% higher than in the year to February 2015, mainly driven by use of electric motors to power equipment in the coal seam gas fields, as discussed in previous issues of *Electricity Update*. Demand increases in the other states were much smaller, in both relative and absolute terms. Demand actually fell slightly in Victoria, but was still 1.0% above the post Point Henry smelter closure minimum.

Without Queensland, the other four NEM states combined still recorded an increase in annual demand of 0.6% over the same period. A significant part of this increase has occurred in the past three months. In the summer months, hot weather is a major driver of demand for electricity, as examined in last month's *Electricity Update*. In particular, electricity consumption rises sharply on particularly hot days. If we define hot days as days with maximum temperatures above 30 deg. C, there have so far this summer (November to January) been nearly twice as many as there were over the same period last summer, in both Melbourne and Adelaide. There were also more in Sydney, though the difference is less marked. It is therefore possible that seasonal weather may be contributing to the increase in electricity demand, but it is very difficult to believe that this is the only factor, apart from Queensland gas industry demand, responsible for the reversal of the previous declining trend of electricity demand.

FIGURE 2

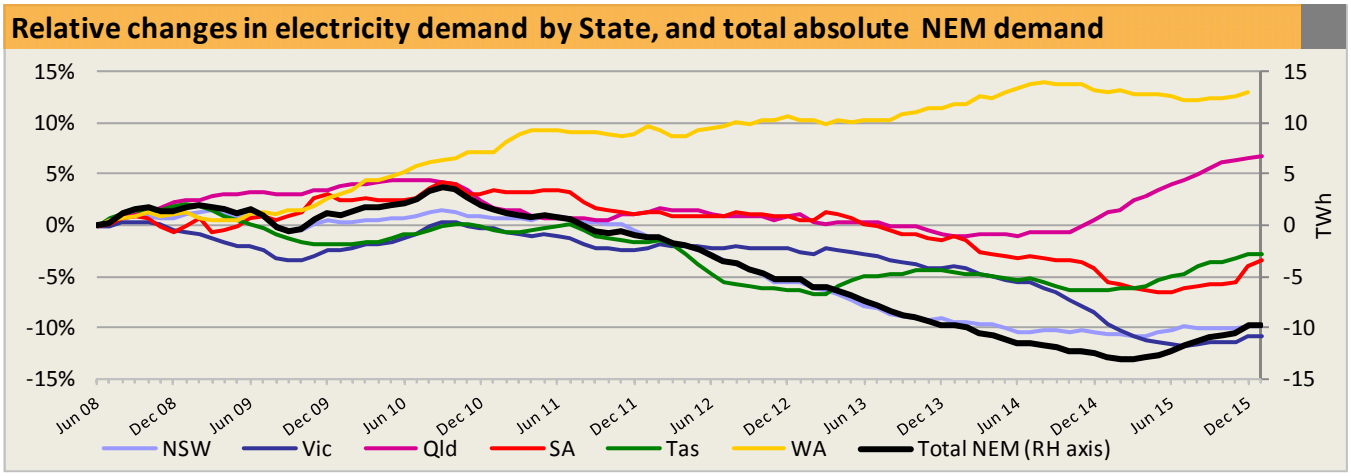
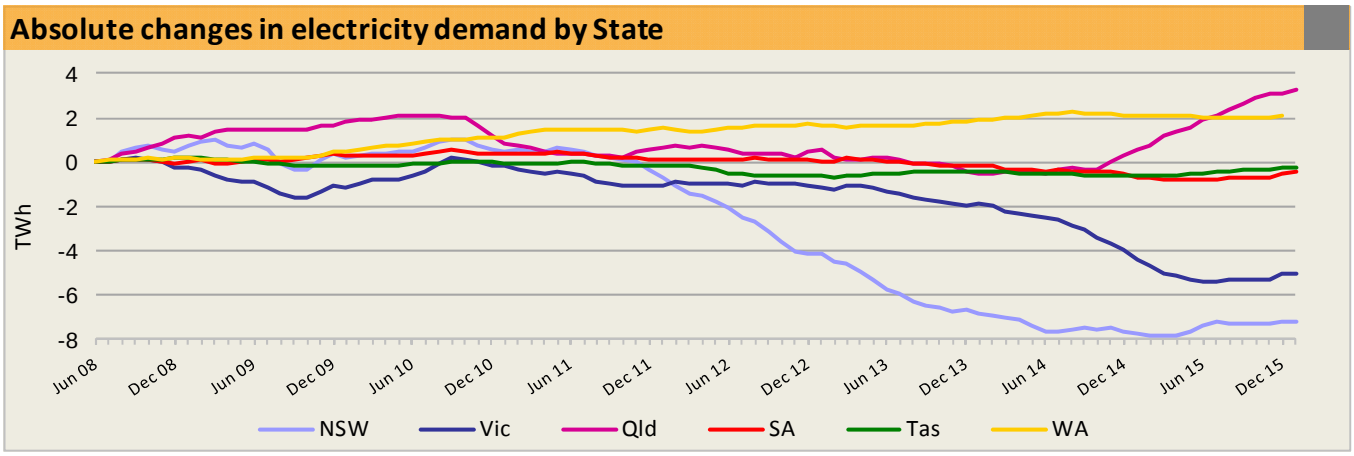


FIGURE 3

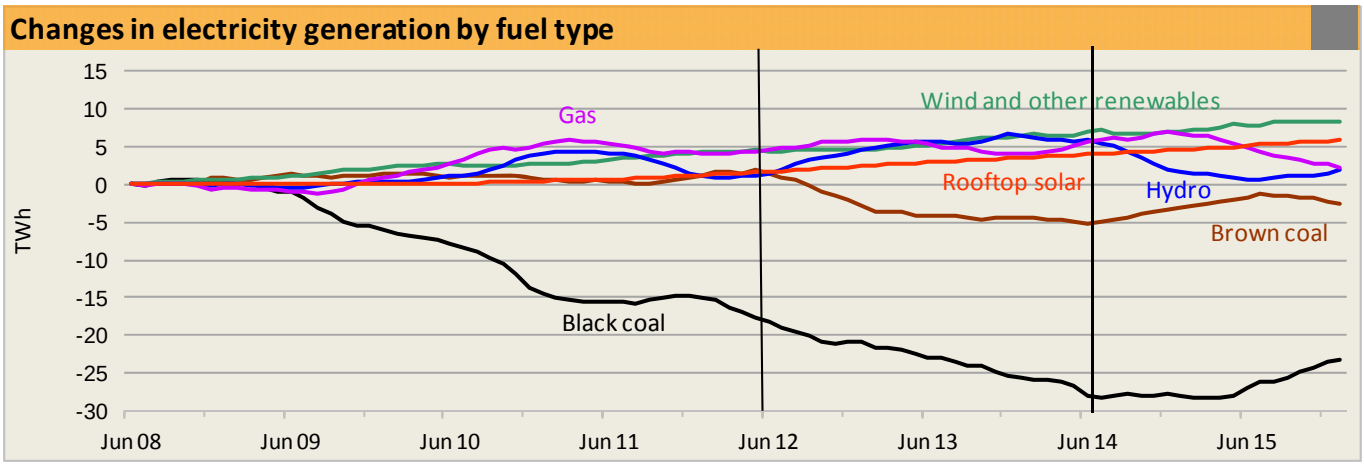


In last month's *Electricity Update* we drew attention to how increasing efficiency in the use of electricity could contribute to reducing the size of extreme peaks currently experienced on very hot days, particularly in Victoria and SA. Energy efficiency is also very effective in reducing *total* demand for electrical energy (in addition to *peak* demand). In particular, mandatory energy efficiency standards for new buildings and equipment, properly regulated and enforced, can make a large impact while also providing substantial benefits, in the form of lower electricity bills, to electricity users. Unfortunately, however, national progress in this area has been at a virtual standstill for the past three years or more. The reductions in total electricity demand, now apparently ended, that CEDEX® has charted were in large part a legacy of efficiency standards and programs put in place prior to 2012. The consequences of inaction on the efficiency front are now showing up in rising electrical demand and related emissions.

Generation

Over the past several months, *Electricity Update* has noted that brown coal generators have been losing market share, not only relatively but in absolute terms also, to NSW black coal generators (Figure 4). This has been associated with an increase in the mean Victorian pool price from around $27 per MWh between October 2014 and March 2015, to around $35 per MWh since June 2015. The mean price was higher again in December, but mainly because of a series of extreme short term price spikes during the pre-Christmas heatwave, which was described in the January *Electricity Update*. NSW prices are closely linked to Victorian prices and for most of the time slightly higher. It is fairly clear that at least some of owners of brown coal power station have been willing to sacrifice sales volume to improve the profitability of their sales. The increase in Australia's emissions from electricity generation has been kept in check as a consequence of this strategy. It would be reasonable to interpret these changes as a clear demonstration that the NEM wholesale market is working in a way consistent with the overall objectives of the National Electricity Objective and Law of 1996, which include, by implication, ensuring the overall financial stability of the system as a whole. But mitigation of greenhouse gas emissions forms no part of either the Objective or the Law. The short term reduction in emissions is entirely fortuitous.

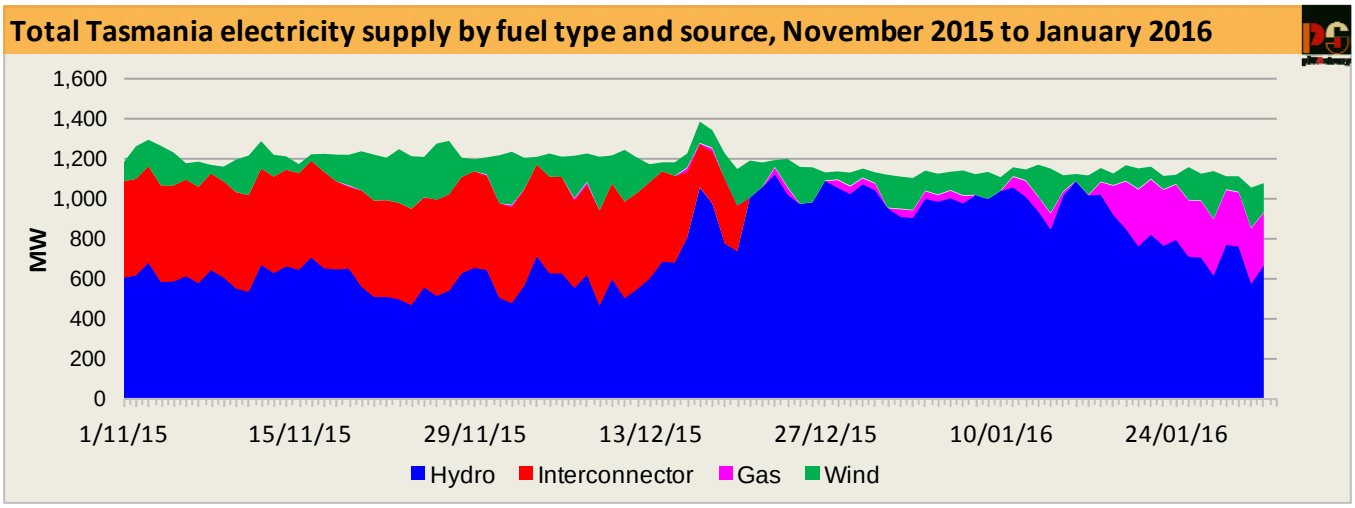
FIGURE 4



A further constraint on output from the Victorian brown coal generators has been the failure of Basslink on 20 December last. Following the drawdown of storages to 14 July 2014, so as to take maximum financial advantage of the carbon price, as described in previous issues of *Electricity Update*, Hydro Tasmania reduced generation to allow energy storage to return towards long term average levels. Exports to Victoria were cut back, and for a time the hydro system remained able to meet most of Tasmania's electricity requirements. In recent months, however, the system has been severely impacted by lack of run-off into water storages, caused by abnormally dry conditions throughout last winter and spring. Consequently, from last October Tasmania was importing electricity through Basslink at the maximum (sustained) level of 450 MW almost continuously. This ended abruptly on 20 December (Figure 5), removing this demand from the Victorian brown coal generators and placing severe strain on the Tasmanian electricity supply system. The two gas fired generators in the state, which have hardly been used since July 2014 (the larger and more efficient combined cycle plant not at all), have been brought back into full operation (the open cycle plant immediately, the combined cycle plant on 19 January). Even so, as at 1 February, the total energy storage in Tasmania's hydro system was 18.9% of full capacity, with 2,735 GWh in storage, equivalent to about 4 month's consumption if hydro supplied Tasmania's total electricity requirements. The two largest storages, Lake Augusta/Great Lake and Lake Pedder/Lake Gordon were at 14.2 % and 11.2% respectively.

The gas fired generators are expensive to operate, so it is very likely that, once Basslink is repaired, electricity will again flow at 450 MW from the Latrobe Valley to Tasmania, with a corresponding increase in Australia's emissions. Maintaining electricity flow through Basslink at full capacity during the latter part of 2015 resulted in the wholesale spot price in the Tasmanian NEM region increasing steadily from about $40 per MWh in September to about $90 per MWh in the first weeks of December. At the end of January 2016 it had reached $120 per MWh. Of course hedging arrangements mean that many Tasmanian consumers will be sheltered from these prices for the time being, although some may be exposed to them for marginal consumption. Even so, it is noteworthy that, based on recent contracts between the ACT government and windfarm developers, new windfarms could probably be built in Tasmania without support through LRET if they could receive a price close to $90 per MWh. Tasmania has abundant wind resources but currently, according to AEMO, only three announced new possible projects, with total capacity of 329 MW.

FIGURE 5

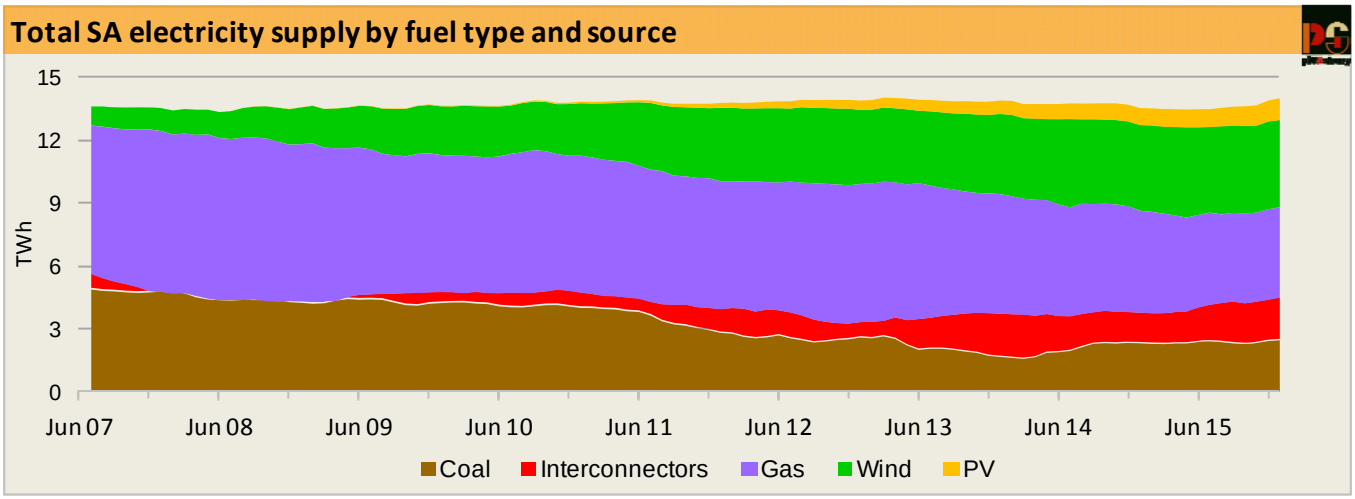


Wind generation is an ideal complement to hydro with storage. In windy conditions, hydro can be turned back, allowing storages to replenish, and subsequently generate at higher levels when there is little or no wind. Figure 4 shows this happening on a number of days during November and December last year. However, the very limited wind generation capacity in Tasmania (only three wind farms with a total capacity of 373 MW) means that it can make only a very minor contribution to meeting the state's current electricity supply problems.

Meanwhile, in SA, Alinta Energy announced last October that it would bring forward closure of Northern Power Station to March 2016. This will remove 530 MW of coal fired generation capacity from the state. This will immediately provide an opportunity for the Victorian brown coal generators to increase their already substantial exports to SA (Figure 6). Over the past three years, they have steadily increased their share of SA supply, largely at the expense of Northern. During that period the Heywood interconnector maximum capacity of 460 MW has been reached at least once in almost every week. (During periods of high wind, energy flows in the opposite direction, from SA to Victoria, but interconnector maximum capacity is seldom reached and the average flow is considerably less than the average flow from Victoria to SA.) A major upgrade of Heywood capacity to 650 MW is currently in progress, and scheduled to be completed in July 2016, in good time for the following summer, when SA experiences its maximum electricity demand, as discussed in last month's *Electricity Update*.

Steadily increasing wholesale gas prices will increase the competitive advantage of the Victorian brown coal generators over the SA gas generators as well. The additional interconnector capacity will allow them more opportunities to realise this advantage. In terms of emissions, replacing supply from Northern Power Station with Latrobe Valley supply will cause only a relatively modest increase, because Northern is only about 15% less emissions intensive than the Loy Yang power stations. Were SA gas generation to be replaced with Victorian brown coal, this would have a larger impact on emissions growth, because the emissions intensity of the gas generators is less than half that of Loy Yang.

FIGURE 6



Finally, there has been a modest increase in hydro generation over the last 6 months, mostly from Snowy Hydro.

Data analysis, text and graphs: Hugh Saddler, Philip Harrington and Mark Johnston.