cedex®

CARBON EMISSIONS INDEX PLUS

Providing a comprehensive and early indication of key greenhouse gas and energy trends in Australia.

National Electricity Market update, data to September 2015.

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NEW
We are pleased to announce a new partnership between **The Australia Institute** and **pitt&sherry** to continue producing both the quarterly *CEDEX® Report* and an expanded monthly *CEDEX® Electricity Update*.

The Carbon Emissions Index (CEDEX®) is the benchmark indicator for Australia's carbon emissions from the energy sectors. This issue of the *CEDEX® Electricity Update* will the first time include data on rooftop solar electricity generation. This means that from now on the *Electricity Update* will provide readers with accurate and comprehensive figures for total renewable energy produced in the National Electricity Market, including all hydro, wind and solar.

Introduction

This *CEDEX® Electricity Update* contains data for emissions from electricity generation in the National Electricity Market (NEM) up to the end of September 2015. 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.

This month we are including for the first time, as a result of a collaboration with Australian Photovoltaic Institutes (APVI), data from the APVI's Live Solar website(http://pv-map.apvi.org.au/live).

Electricity emissions update - data to 30 September 2015

No change in emissions and demand steady, except in Queensland

Introduction: Key characteristics of rooftop solar

With the inclusion of generation by rooftop solar, CEDEX® will from now on give a more complete picture of electricity supply and consumption in the parts of Australia covered by the NEM. While currently a small contributor to total supply (Figure 1), rooftop solar has been growing steadily (Figure 2) and will undoubtedly continue to do so. Moreover, data on electricity demand which CEDEX® has been reporting up till now excludes the consumption of electricity sourced from rooftop solar. Inclusion of rooftop solar on the demand side makes a material difference to the apparent trend in demand (Figure 3) and thus helps to provide a better understanding of the factors driving changes in electricity demand.

The historic data on rooftop solar generation shown in Figures 1, 2 and 3 has been sourced from the 2015 *National Electricity Forecasting Report*, published last June by the Australian Energy Market Operator (AEMO). From now on, figures on monthly increments to rooftop solar generation will be provided by the Australian Photovoltaic Institute.

Up till now, all data reported by CEDEX® has concerned activities at the transmission grid level of the electricity system. All generation has been by generators connected at the transmission level and participating in the NEM wholesale market. Demand has been measured as the quantity of electricity sent out to the grid by these generators. Rooftop solar generators are not connected at this level and do not participate in the wholesale market. Instead, they are embedded within local distribution networks. Some of the electrical energy generated is exported into the local network and contributes to the electricity being supplied, through the network, to other nearby electricity consumers. The remainder of the energy is termed behind the meter consumption; it is used on-site by the household or business hosting the rooftop solar installation and never enters the distribution network.

From the perspective of the distribution network operator there is an important difference between behind the meter consumption and electricity supplied to the network by rooftop solar. Behind the meter consumption appears as a reduction in demand by the customer and is indistinguishable, in general terms, from other sources of demand reduction, such as use of more efficient appliances or changes in consumer behaviour. Electricity exported through the meter, on the other hand, is a completely new source of electricity supply to the network. The existing electricity distribution networks were designed and built for electrical energy to flow in one direction only, from the centre to the periphery. Needing to accommodate energy flowing in the opposite direction is now presenting technical and management challenges to distribution network businesses.

From the perspective of the operator of the whole grid system, i.e. AEMO, and of all the generators connected to the grid, all generation by rooftop solar looks like a reduction in demand, irrespective of whether the electricity is consumed behind the meter or exported to the local network. The rooftop solar generation data which CEDEX® is now reporting also makes no distinction; it is the estimated total electrical energy output of rooftop solar installations across the NEM, including both behind the meter consumption and exports to the distribution network.

Finally, it is worth noting that rooftop solar is not the only source of generation embedded within distribution networks. AEMO estimates that other embedded generators, which it terms small non-scheduled generators, supplied 4.4 TWh in 2014-15, compared with 5.1 TWh generated by rooftop solar. However, this source of generation has been growing much more slowly than rooftop solar. Generators in this group include both renewable and non-renewable generators, such as landfill gas and small hydro at irrigation dams (renewable) and

gas fuelled cogeneration plants (non-renewable). Data on output from this group of generators is extremely sparse and it is most unlikely that they will ever be included in CEDEX®.

FIGURE 1

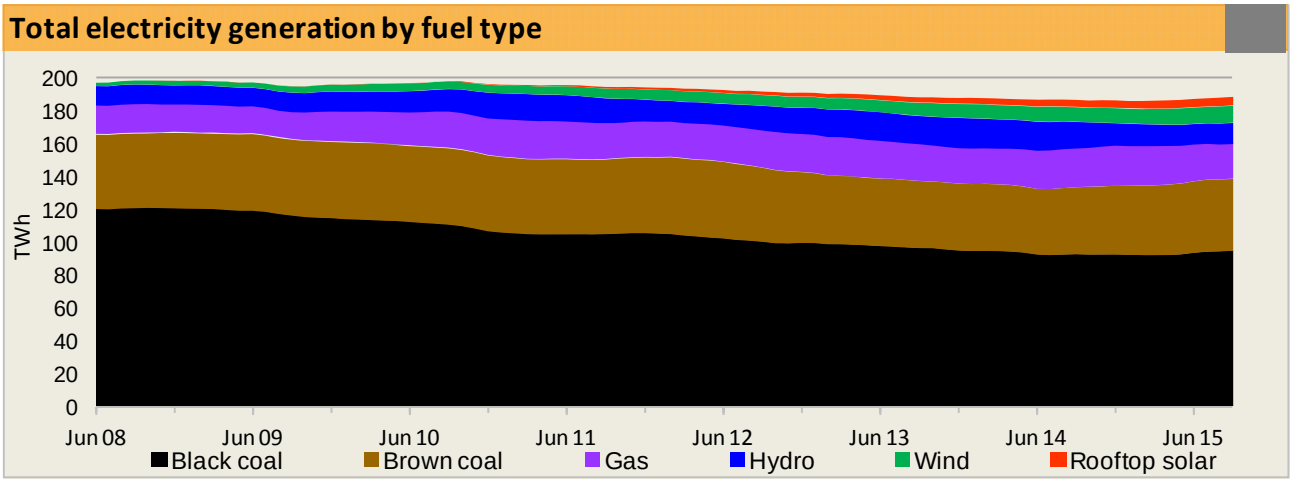


FIGURE 2

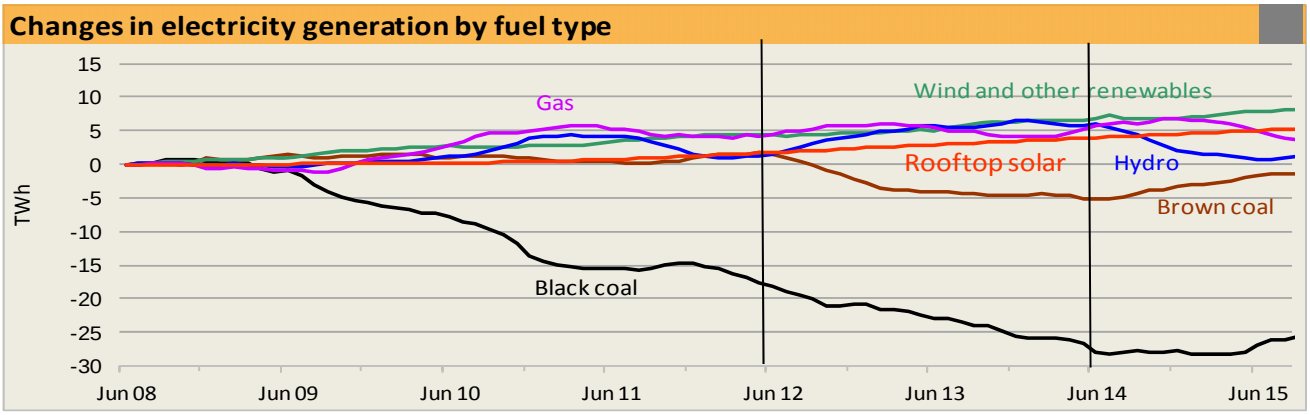
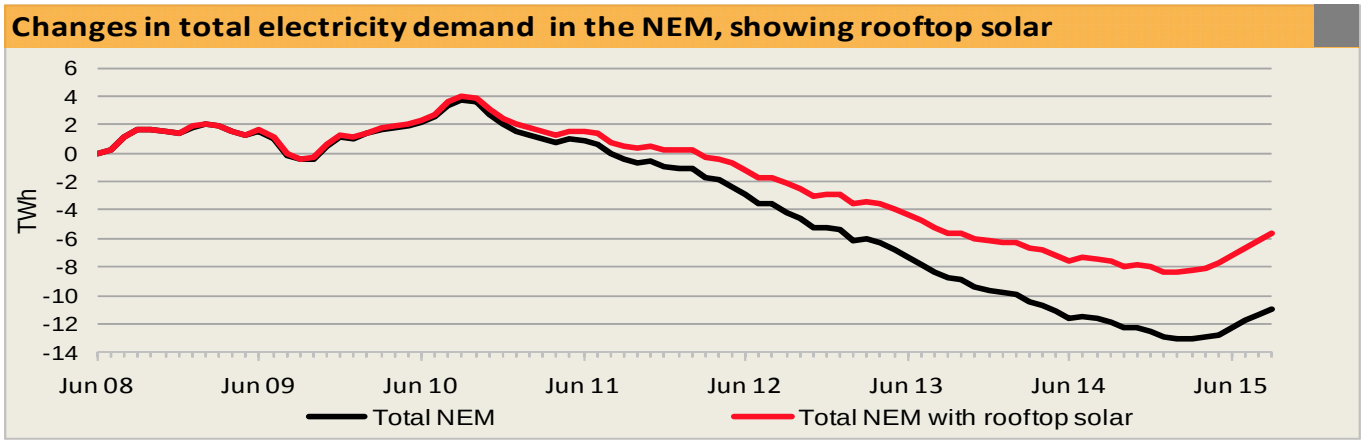


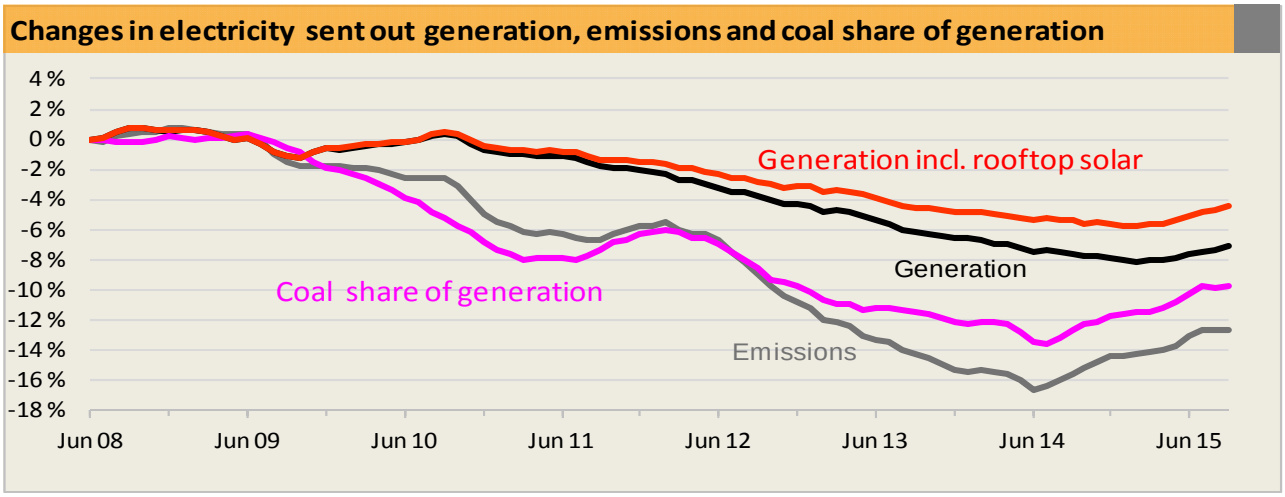
FIGURE 3



Generation

Total electricity generation in the year to September 2015 continued the steady growth of the past few months, but emissions were virtually unchanged (Figure 4). As was the case in August, the total coal share was also virtually unchanged, with a small increase in black coal generation offset by a small decrease in the higher emissions brown coal generation (Figure 2). The total coal share of generation (excluding rooftop solar) in the year to September 2015 was 75.6%. The gas share fell, but only slightly, wind was almost unchanged and the hydro share increased slightly as both Hydro Tasmania and Snowy Hydro continued to gradually increase output back towards long term average levels.

FIGURE 4



Demand

Total demand again increased (Figure 3), driven entirely by the growth in Queensland (Figure 5), caused by the use of electricity in the production and pipeline transport of coal seam gas to the LNG plants at Gladstone. Demand in NSW was unchanged from August, while small increases were seen in Victoria, SA and Tasmania, again continuing the trend of the past few months. The gradual decline in WA continued.

The small increases in Victoria, SA and Tasmania may be attributable to the slightly colder winter in 2015, compared with 2014, in these three states. The monthly weather reviews published by the Bureau of Meteorology indicate that average daily minimum temperatures were markedly lower in June and July 2015, compared with the same months in 2014, though August 2015 had slightly higher average minima than August 2014. This effect can be seen in Figure 6, which is unchanged from corresponding graph from last month's CEDEX®, except that winter 2015 in WA has now been included. Note that in Victoria the higher demand from general consumers is masked by the large decrease caused by the Point Henry aluminium smelter closure. WA did not have a colder winter in 2015 than in 2014 and total winter demand was lower in 2015 than in 2014.

Overall, the picture of demand a few months ago was that it might be rebounding after several years of falling demand. Now, for the year to September 2015, it appears as if demand may in fact just be a levelling out in the NEM (excluding the large new demand from the Queensland coal seam gas industry) and starting a possible longer term fall in WA. Such a trend would imply a continuing decrease in demand for electricity per capita and per dollar of GDP, though at a smaller rate than seen over the past few years.

FIGURE 5

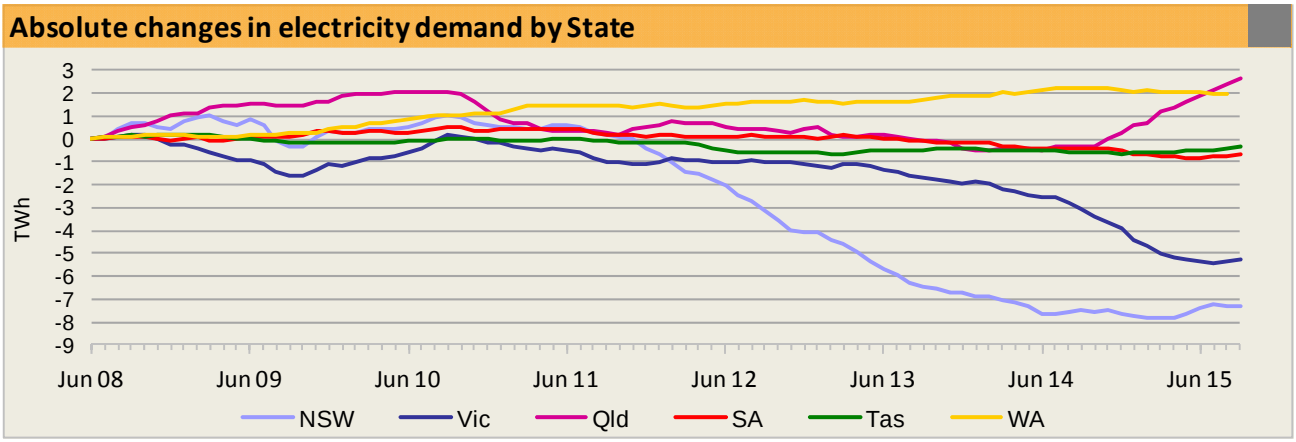
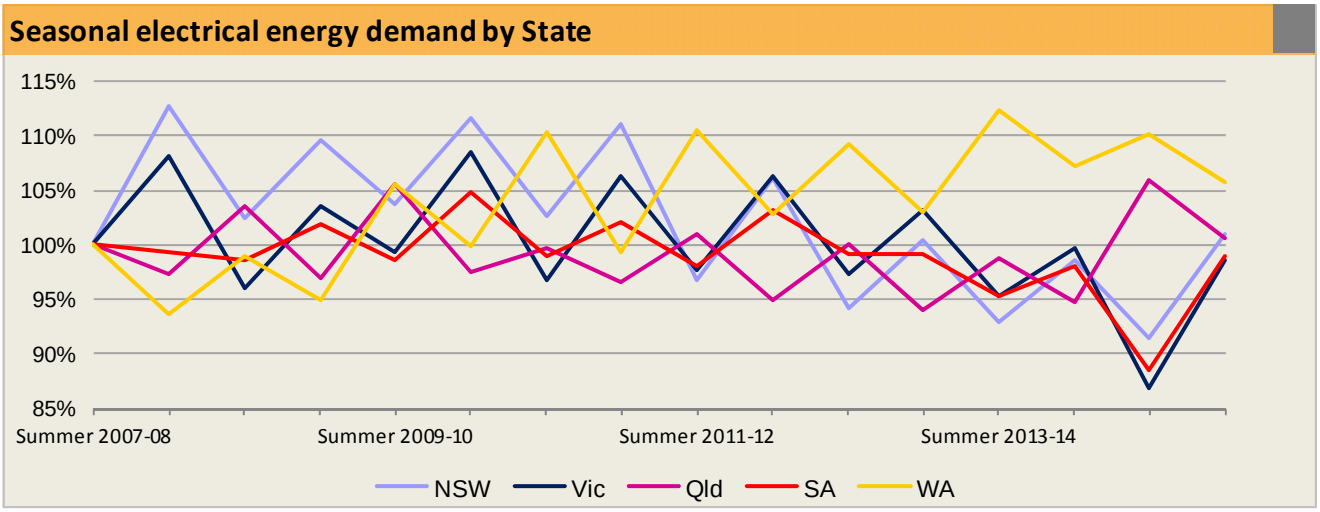


FIGURE 6



Data analysis, text and graphs: Hugh Saddler, Elena Tinch and Mark Johnston.