

Review of the NEM in 2015



Green Market Insights

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Greenhouse emissions increase by 2.0 per cent in 2015
NEM power consumption increases 1.1 per cent
Solar and energy efficiency account for 1 per cent reduction in consumption
Renewables increase market share from 11.8 per cent to 12.2 per cent
Three renewable plants start operating and two fossil-fuel plants cease

1. Summary

Electricity consumption in the National Electricity Market (NEM) has reversed a recent trend and increased by 1.1 per cent in 2015. Underlying electricity consumption is increasing across all states with Queensland experiencing the biggest increase at 5 per cent followed by Tasmania at 3 per cent. Victoria was the only state that experienced any noticeable reduction, falling 2.6 per cent due largely to impact the closure of the Point Henry aluminium smelter at the end of July 2014. If we exclude the impact of Point Henry then Victoria's consumption increased by nearly 1 per cent.

We estimate that the solar energy and energy efficiency activities supported by the Renewable Energy Target and various state based energy efficiency schemes reduced electricity consumption by 1,800 GWh. This is the equivalent of a 1 per cent reduction in consumption.

Renewable generation (excluding roof-top solar) accounted for 12.2 per cent of total generation which was slightly higher than 11.8 per cent market share achieved in 2014. Hydro output fell by 3.9 per cent and was offset by strong growth in wind generation which increased by 17.6 per cent. Large-scale solar made its first contribution in 2015, producing 184 GWh from the Nyngan and Broken Hill power stations in NSW.

Gas-fired generation dropped significantly in 2015 (reducing by 18.6 per cent) due to higher gas prices diverting gas into Queensland's LNG plants. Black and Brown coal generation increased their output during 2015 increasing by 4.7 per cent and 2.6 per cent respectively.

With the increase in coal-fired generation at the expense of gas-fired generation, the emission intensity of generation increased by 1 per cent rising from 0.808 tonnes per MWh in 2014 to 0.817 in 2015. When added to the increase in overall electricity consumption, greenhouse emissions increased by 2 per cent.

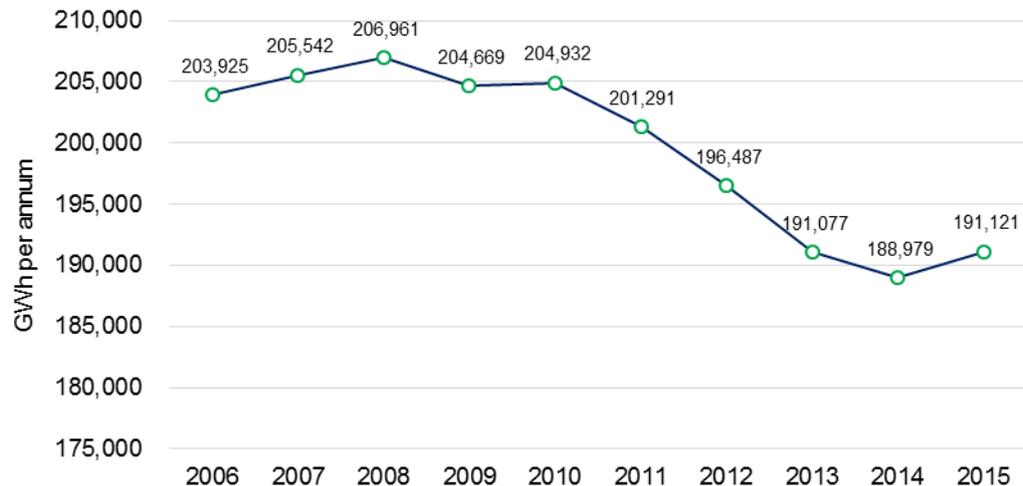
Three new renewable projects started generating for the first time in 2015; Bald Hills Wind Farm (Vic), Nyngan Solar Farm (NSW) and Broken Hill Solar Farm (NSW). Two fossil fuel plants ceased generating in 2015.

This Green Market Insight analyses the changes in electricity generation and consumption in the NEM for the year ending 31 December 2015 and compares it to the same period in 2014. Our analysis is based on scheduled metered demand and metered generation data published by the Australian Energy Market Operator (AEMO) and provided through NEM-Review. The data does not directly measure actual consumption as it includes transmission losses, power station auxiliary use (power used in the power station) and excludes non-scheduled generation. As transmission losses, auxiliary use and non-scheduled generation have been fairly stable over the last three years it nevertheless provides a solid basis for analysing year on year changes to electricity consumption.

2. NEM electricity consumption

For the first time in five years electricity consumption in the NEM (as measured by scheduled demand) increased in 2015. Electricity consumption increased by 1.1 per cent and reverses the trend started back in 2009 (refer to Figure 1). Electricity consumption increased by 2,142 GWh for the year which offset the fall experienced in 2014.

Figure 1. Metered scheduled demand from 2006 to 2015



Underlying electricity consumption increased across most states with Queensland and Tasmania recording increases of 5 per cent and 3 per cent respectively (Table 1). The start-up of the LNG plants explains a reasonable proportion of the growth in Queensland. The impact of the closure of the Point Henry Aluminium smelter is responsible for the reduction in Victorian consumption. If we exclude the impact of the smelter closure, Victorian consumption would have increased by nearly 1 per cent.

Table 1 – Metered electricity demand by state - GWh (2015 cf: 2014)

	NSW	QLD	SA	VIC	TAS	Total
2015 Consumption	70,140	52,920	12,288	45,818	9,955	191,121
2014 Consumption	69,588	50,403	12,304	47,020	9,664	188,979
Difference	552	2,517	-16	-1,203	291	2,142
% Change	0.8%	5.0%	-0.1%	-2.6%	3.0%	1.1%

Approximately 660 MW a year of roof-top solar PV was installed in NEM states and created certificates under the Renewable Energy Target over the 2014 and 2015 period. This is estimated to have generated an additional 915 GWh in 2015.

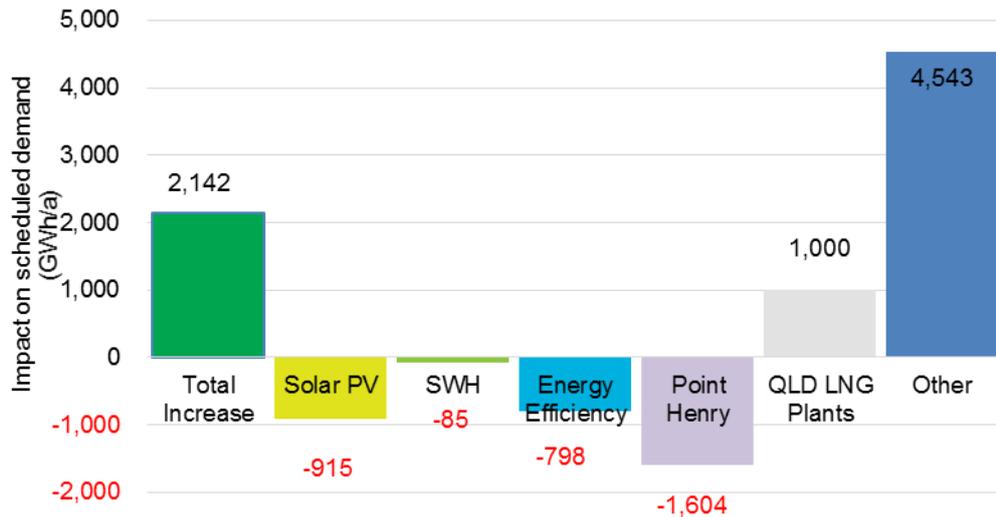
The contribution of solar hot water and an array of energy efficiency activities supported by state based energy savings schemes have also contributed to lower electricity consumption. There are four energy efficiency schemes operating across the NEM; in NSW, Victoria, South Australia and the ACT. We have analysed the number of certificates or abatement that has been generated by a range of approved activities over the 2014 and 2015 period to estimate the full year impact. In total, identifiable energy efficiency activities could reasonably account for 798 GWh of demand reduction in 2015 (Figure 2).

We estimate that solar installations supported by the Renewable Energy Target and energy efficiency activities supported by the various state based schemes will have

contributed 1,712 GWh in 2015, equivalent to a 1 percent reduction in total consumption for the year.

The increase in 2015 consumption due to the Queensland LNG plants is estimated to be 1000 GWh based on an assessment undertaken by Lewis Grey Consulting for AEMO. The impact of a variety of other factors such as population growth, economic growth and weather contributed 4,543 GWh (2.4 per cent of total consumption)

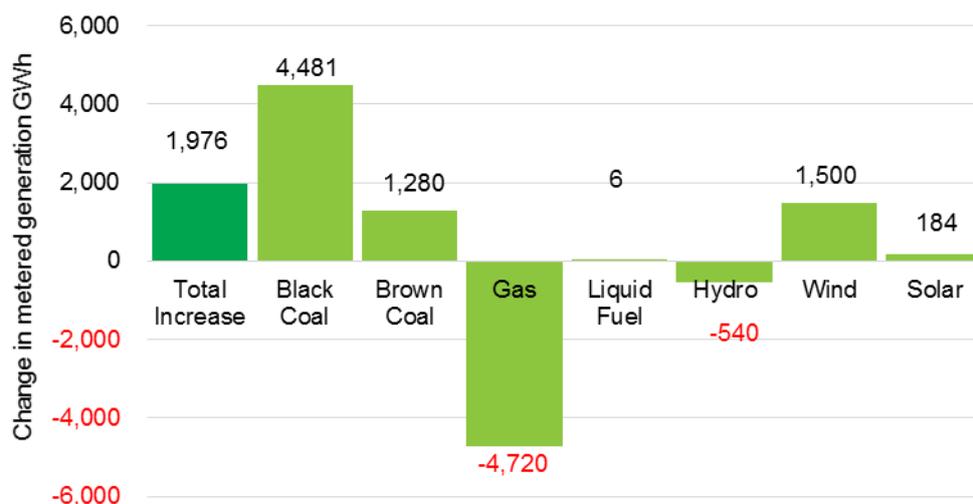
Figure 2. Contributors to changes in electricity consumption (2015 cf: 2014)



3. Power generation in the NEM

In analysing metered generation we have included all generators for which AEMO publishes generation data. This includes all scheduled generation and also larger non-scheduled generators which are predominantly hydro and wind generators. The total metered generation figures are thus slightly higher than the scheduled demand.

Changes in the generation mix in the NEM for 2015 are summarised in Figure 3. Hydro generation continued to fall in 2015, dropping by 8.2 per cent. Black coal-fired generation increased by 4.7 per cent in 2015, largely due to higher output from Queensland generators. Gas-fired generation reduced by 18.6 per cent, largely due to higher gas prices and the diversion of gas to the Queensland LNG plants.

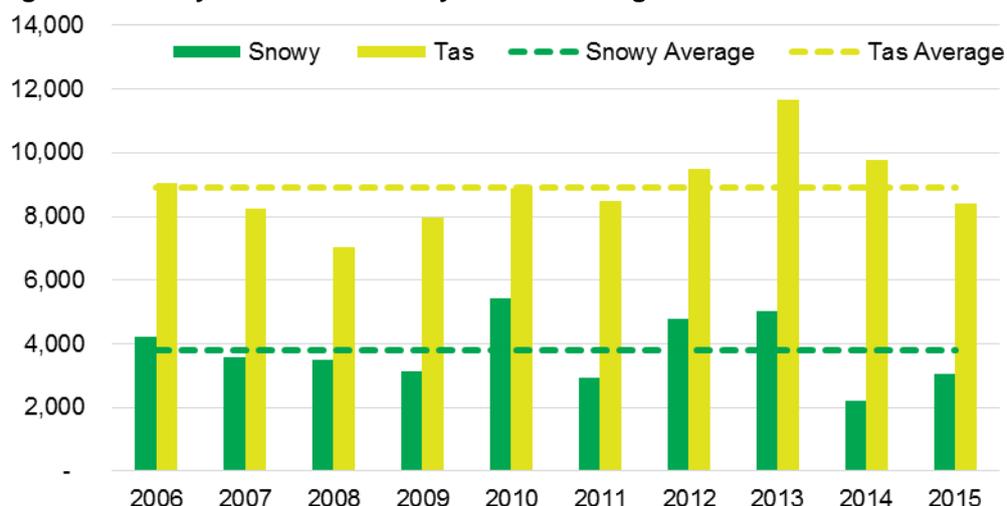
Figure 3. Differences in metered generation by fuel (2015 cf: 2014)

Wind generation increased by 17.6 per cent in 2015. This was due the commencement of the Bald Hills wind farm, expansion of the Portland wind farm and a full year's output of several wind farms that commenced operating in 2014. In addition wind resources were more favourable in 2015, with those wind farms that were fully operational on 1 January 2013 producing 2.6 per cent more in 2015 than in 2014. The average capacity factor for these wind farms increased from 30.9 per cent in 2014 to 31.8 per cent in 2015. Wind accounted for 37 per cent of South Australia's total generation in 2015, slightly higher than the 34 per cent achieved in 2014.

Table 2 – AEMO metered electricity generation by state and fuel (2015 cf: 2014)

GWh	Black Coal	Brown Coal	Gas	Liquid Fuel	Hydro	Wind	Bio-energy	Solar	Total
2014									
NSW	54,396	-	3,835	0	1,405	944	-	-	60,580
QLD	41,693	-	13,260	25	816	-	378	-	56,173
SA	-	2,592	5,258	2	-	4,079	-	-	11,930
VIC	-	46,567	2,204	-	1,889	2,539	-	-	53,199
TAS	-	-	756	-	9,784	948	-	-	11,488
Total	96,089	49,158	25,312	27	13,895	8,510	378	-	193,370
Market Share	49.7%	25.4%	13.1%	0.0%	7.2%	4.4%	0.2%	0.0%	100.0%
2015									
NSW	54,512	-	3,946	1	1,869	1,683	-	184	62,011
QLD	46,058	-	11,151	26	504	-	347	-	58,086
SA	-	2,693	4,482	6	-	4,202	-	-	11,382
VIC	-	47,746	1,001	-	2,600	3,136	-	-	54,483
TAS	-	-	11	-	8,382	990	-	-	9,384
Total	100,570	50,438	20,592	33	13,355	10,010	347	184	195,346
Market Share	51.5%	25.8%	10.5%	0.0%	6.8%	5.1%	0.2%	0.1%	100.0%
Change (GWh)	4,481	1,280	-4,720	6	-540	1,500	-31	184	1,976
% Change	4.7%	2.6%	-18.6%	21.5%	-3.9%	17.6%	-8.2%		1.0%

Snowy and Tasmanian hydro generation reduced by 4.3 per cent in 2015 and is 9.6 per cent below average generation levels (Figure 4).

Figure 4. Snowy and Tasmanian Hydro historical generation levels

4. New generation projects

Three large metered renewable generators came on line in 2015, including two large solar power stations in NSW (Table 3).

Table 3 – New power projects that started operating in 2015

	State	Fuel Source	First Generation	Capacity (MW)
Bald Hill	VIC	Wind	Feb-15	107
Nyngan	NSW	Solar	Mar-15	102
Broken Hill	NSW	Solar	Sep-15	53

Note: Stage 4 of the Portland wind farm (47 MW) in Victoria also become operational in 2015

5. Generators that were closed or mothballed

Two fossil fuel power stations ceased operating during 2015 (Table 4).

Table 4 – Power projects that ceased operating in 2015

	State	Fuel Source	Last Generation	Capacity (MW)
Callide A	Qld	Black coal	Mar-15	30
Anglesea	VIC	Brown coal	Aug-15	165

Note: Callide A was demonstrating carbon capture and trial completed

6. Greenhouse gas emissions

Greenhouse gas emissions increased by 2 per cent in 2015. Half of the increase was due to an increase in electricity consumption and the other half was due to the increase in generation from more emissions intensive generators.

The average emission intensity of electricity generation increased by 1 per cent rising from 0.809 tonnes/MWh in 2014 to 0.817 tonnes/MWh in 2015. This was largely due

to the significant reduction in gas fired generation which was replaced by an increase in black coal and brown coal generation.

Table 5 – NEM Greenhouse gas emissions by fuel (2015 cf 2014)

'000 tonnes	Black Coal	Brown Coal	Gas	Liquid Fuel	Total
2014					
NSW	47,215	-	1,586	0	48,802
QLD	36,008	-	6,067	23	42,098
SA	-	2,592	2,673	2	5,266
VIC	-	58,774	1,149	-	59,923
TAS	-	-	313	-	313
Total	83,223	61,366	11,788	25	156,402
2015					
NSW	47,152	-	1,642	1	48,796
QLD	39,612	-	5,552	24	45,189
SA	-	2,693	2,429	5	5,127
VIC	-	60,170	530	-	60,700
TAS	-	-	7	-	7
Total	86,764	62,863	10,161	31	159,819
2015 Increase	4.3%	2.4%	-13.8%	21.1%	2.2%

Notes and references:

- Electricity consumption data has been sourced from AEMO (NEM-Review) and reflects the level of scheduled generation required to meet that demand. This therefore includes power station auxiliaries and losses;
- The AEMO metered generation data includes scheduled generators and some of the larger non-scheduled generators. Smaller non-scheduled renewables are excluded and we estimate that this amounts to at least 3,500 GWh (1.8 per cent of total generation);
- Roof-top solar PV is not included as a generation source and is included as lower electricity consumption;
- Emissions intensity data by NEM generator has been sourced from the ACIL Allen Report to AEMO dated 11 April 2014 "Emission Factors – Review of Emission Factors for use in the CDEII"; and
- State and fuel source classifications for generators has also been based on the ACIL Allen Report dated 11 April 2014.

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