The Australia Institute
Research that matters.
> Climate & Energy.

National Energy Emissions Audit

September 2018

Providing a comprehensive, up-to-date indication of key greenhouse gas and energy trends in Australia

Hugh Saddler | Author

ABOUT THE AUSTRALIA INSTITUTE

The Australia Institute is an independent public policy think tank based in Canberra. It is funded by donations from philanthropic trusts and individuals and commissioned research. We barrack for ideas, not political parties or candidates. Since its launch in 1994, the Institute has carried out highly influential research on a broad range of economic, social and environmental issues.

OUR PHILOSOPHY

As we begin the 21st century, new dilemmas confront our society and our planet. Unprecedented levels of consumption co-exist with extreme poverty. Through new technology we are more connected than we have ever been, yet civic engagement is declining. Environmental neglect continues despite heightened ecological awareness. A better balance is urgently needed.

The Australia Institute's directors, staff and supporters represent a broad range of views and priorities. What unites us is a belief that through a combination of research and creativity we can promote new solutions and ways of thinking.

OUR PURPOSE – 'RESEARCH THAT MATTERS'

The Institute publishes research that contributes to a more just, sustainable and peaceful society. Our goal is to gather, interpret and communicate evidence in order to both diagnose the problems we face and propose new solutions to tackle them.

The Institute is wholly independent and not affiliated with any other organisation. Donations to its Research Fund are tax deductible. Anyone wishing to donate can do so via the website at https://www.tai.org.au or by calling the Institute on 02 6130 0530. Our secure and user-friendly website allows donors to make either one-off or regular monthly donations.

Level 1, Endeavour House, 1 Franklin St
Canberra, ACT 2601
Tel: (02) 61300530
Email: mail@tai.org.au
Website: www.tai.org.au

Key points

+ ***Australia's energy emissions were almost unchanged between March and June 2018***

During the second quarter of 2018, continuing gradual reductions in electricity generation emissions were almost precisely offset by continuing growth in emissions from use of petroleum fuels.

+ ***Meeting the Paris emissions target will need much larger than pro rata reductions in electricity generation emissions***

There is no evidence that emissions from consumption of petroleum fuels will stop increasing, meaning that pro rata emissions reduction from energy combustion as a whole will require much larger than pro rata reduction from the electricity sector.

+ ***Growing consumption of diesel in road transport continues to drive growth in emissions from consumption of petroleum fuels***

New and improved data shows that almost all the growth in diesel consumption is coming from increased retail sales of diesel, meaning diesel consumption by passenger and commercial vehicles, rather than mining, agriculture or public transport.

+ ***Between 2004 and 2016 there was a small reduction in the emissions intensity of passenger motor vehicles, no change in the emissions intensity of articulated trucks, and a marked deterioration in the emissions intensity of light commercial vehicles***

Fuel consumption and transport task data from the ABS Survey of Motor Vehicle Use have been used to calculate trends in transport energy efficiency and emissions intensity. The results highlight the need for improved fuel efficiency standards.

Introduction

Welcome to the September 2018 issue of The Australia Institute's *National Energy Emissions Audit* (the *Emissions Audit*). The *Emissions Audit* tracks Australia's emissions of greenhouse gases from the combustion of fossil fuels every quarter; this issue contains data up to the end of June 2018. The *Emissions Audit* will therefore give readers the most up to date possible advice on how Australia is tracking towards meeting its emissions reduction commitment under the Paris Agreement.

Fossil fuel combustion accounts for the majority of Australia's emissions – 72 per cent in the most recent *National Greenhouse Gas Inventory* for financial year 2015-16. Fossil fuel combustion emissions also account for most of the year-on-year change in Australia's emissions.

The *National Energy Emissions Audit* is published on a quarterly basis, in September, December, March and June each year, with data to the end of the preceding quarter. Each month the *Electricity Update* of the *Emissions Audit* is produced, reporting on changes to emissions from electricity generation in the National Electricity Market (NEM), and including commentary on other issues relating to the extraordinarily dramatic changes happening in Australia's electricity supply system.

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 consumption. Annualised data 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.

Most data are presented in the form of time series graphs, starting in December 2012, i.e. with the year ending December 2012.

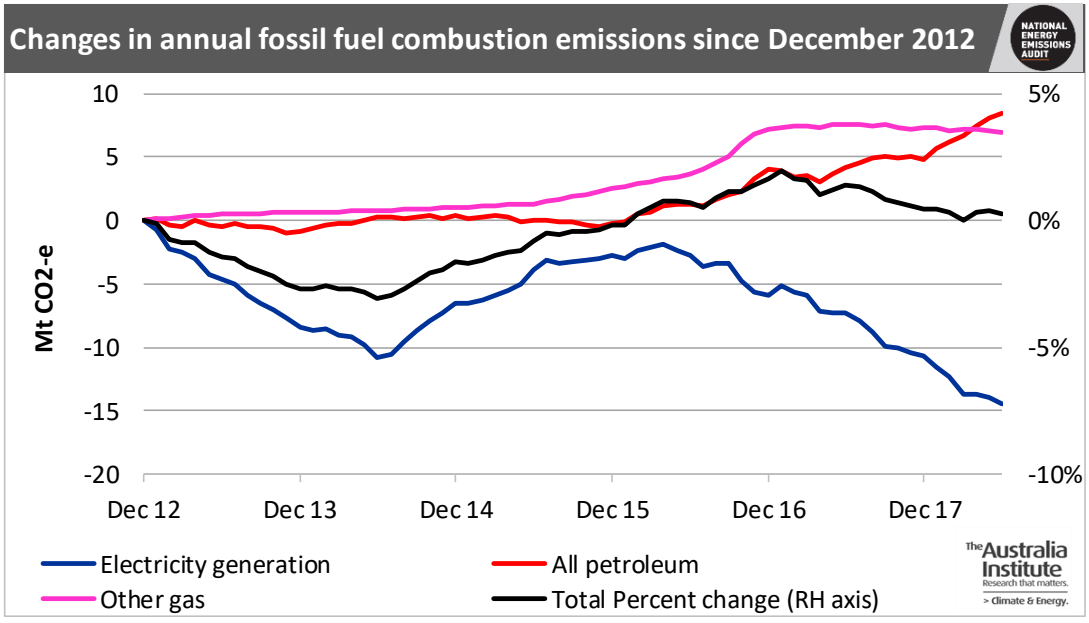
Total energy combustion emissions to June 2018

Overview

Data to the end of June, in this September 2018 *NEEA Report*, show a slow-down in the rate of reduction of electricity generation emissions. This change was anticipated because the end of March was the first anniversary of the closure of Hazelwood power station, previously Australia's largest single source of greenhouse gas emissions. The resultant sharp drop in electricity generation emissions has now worked its way through the annualising calculations. This is precisely what was predicted would occur in the June *NEEA Report*. From now on, further reductions in electricity generation emissions will occur only as and when growing wind and solar generation displaces output from coal fired power stations. Further reductions in total energy combustion emissions will only occur if this gradual reduction from electricity emissions more than offsets what seems certain to be a continuing steady increase in petroleum emissions.

It goes without saying that this balanced relationship between decreasing emissions from electricity generation and increasing emissions from petroleum (mainly diesel) consumption makes a nonsense of the claim that Australia is "on track" to meet its Paris Agreement emissions reduction target. Unless there are large and rapid changes in Australia's petroleum consumption patterns, much larger than *pro rata* reductions in electricity sector emissions will be needed to achieve a *pro rata* reduction in energy combustion emissions. When we account for emissions from other sectors, such as industrial processes and agriculture, most of which are either constant or gradually increasing, the need for even greater reductions in the electricity sector is obvious.

Figure 1



Natural gas (including coal seam gas)

The trend in gas consumption (net of gas used for electricity generation) in eastern Australia, i.e. excluding Western Australia and the Northern Territory, as shown in Figure 1, has three distinct phases. For the first two years, comprising the whole of 2013 and 2014, gas consumption appears to increase very gradually. During 2015 and 2016 there was a rapid increase, but from late 2016 consumption began to decline. Such a reduction is hardly surprising, given the frequently discussed increases in wholesale gas prices, and hence to the total cost of gas to consumers. Some may think it surprising that gas consumption falls have not been larger.

Petroleum products

In the June issue of *NEEA Report* it was explained that past estimates of emissions from combustion of petroleum products had been revised, following the introduction, in January 2018, of mandatory reporting by industry of petroleum production, sales, imports, exports, and stocks held. Since then, further work by the energy statistics staff in the Department of Energy has confirmed that there was significant under-reporting of bulk diesel sales prior to the start of 2012. Accordingly, in this issue of the *NEEA Report* the starting date for all annualised data has been moved forward in time to December 2012, as seen in Figure 1, and all other Figures in this issue.

The effect of this change in the trend in emissions arising from use of diesel can be seen in Figure 2. This confirms what the NEEA has been reporting for several years – that all growth in petroleum consumption is coming from growth in consumption of diesel fuel. Consumption of petrol and auto LPG has fallen slightly over the past six and a half years, while consumption of aviation fuels and fuel oil plus non-auto LPG is unchanged.

However, the shape of the diesel line in the graph has changed quite markedly as an outcome of the new analysis undertaken using the additional data. Instead of increasing rapidly up to around mid 2013, then slowing, the revised data indicate that emissions from consumption of diesel grew quite slowly up to the end of 2015, but have accelerated since then.

Figure 3 shows emissions from the petroleum products which are almost exclusively used for road transport. Non-retail (bulk) sales of diesel are excluded because, although some diesel sold in bulk is used by road freight and bus operators, most is used in mining, agriculture and other non-road transport activities. It can be seen, as the *NEEA Report* and its predecessor have been noting for some years, that diesel is accounting for all the increase in consumption of and emissions from petroleum products used in road transport. This graph, for the first time, includes, for reference, road transport emissions data from the *Quarterly Update of Australia's National Greenhouse Gas Inventory*, produced by the Department of Environment and Energy (still the title on the website). It can be seen that, in terms of the overall increase in emissions since 2012, the NEEA numbers and the Departmental numbers are in reasonably close agreement.

Figure 2

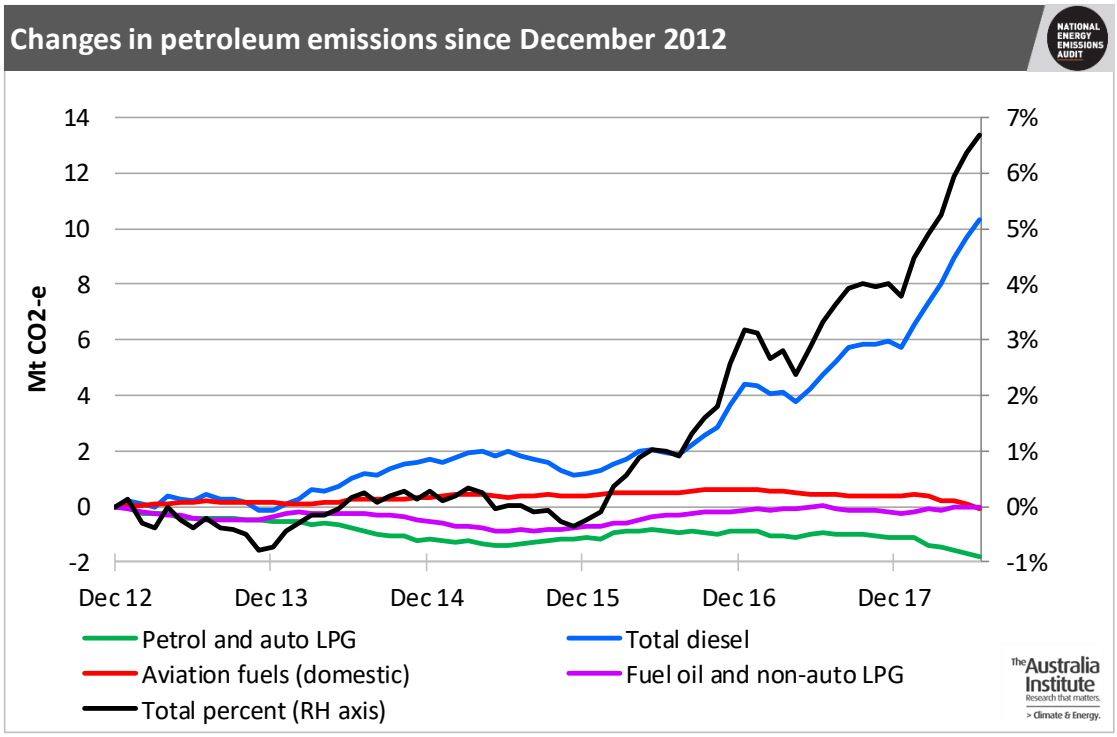


Figure 3

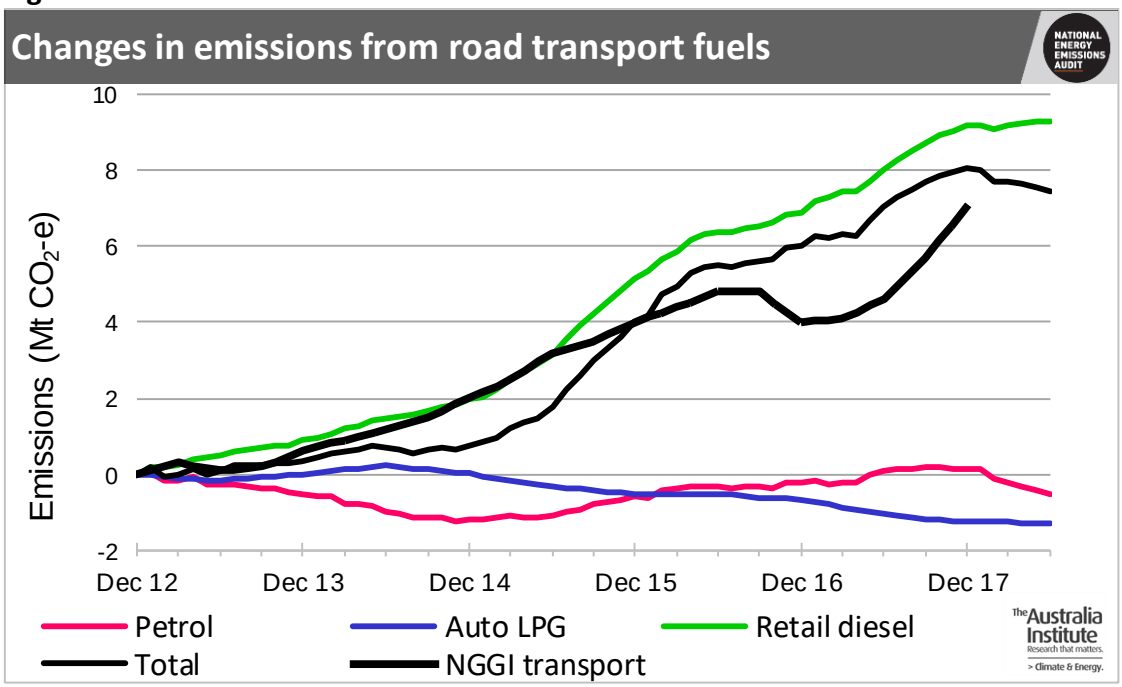


Figure 4 shows changes from December 2012 in the moving annual retail sales of diesel by state. The growth in diesel consumption by road vehicles is following a similar trend right across Australia.

Figure 4

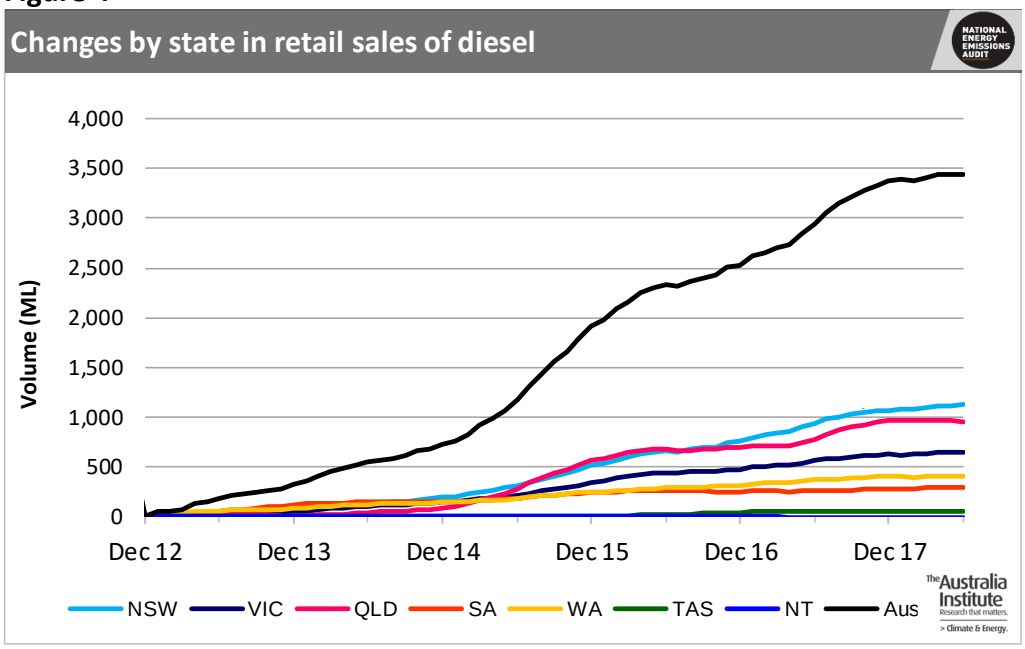
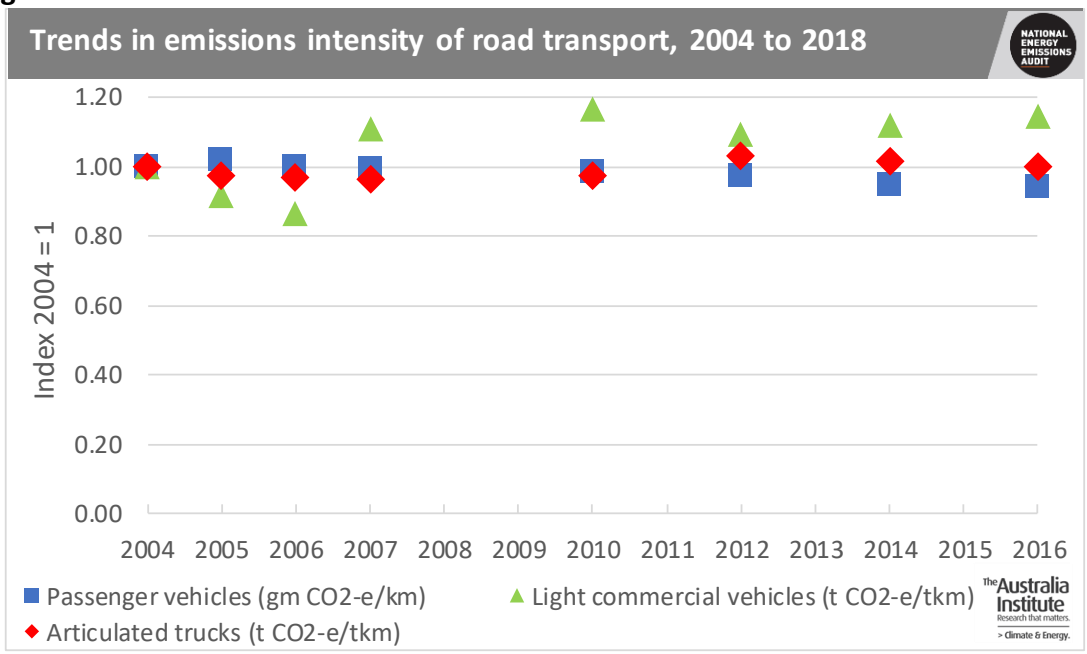


Figure 5 below looks more closely at road transport, by plotting trends in indices of the emissions intensity of the main types of road transport. The source for all data used to calculate the indices is the *Survey of Motor Vehicle Use*, conducted periodically by the Australian Bureau of Statistics (Cat. No. 9208.0). Surveys were conducted annually until 2007, then in 2010 and every two years since then. Data on total annual consumption of each fuel type (petrol, diesel LPG) were converted to emissions, and then summed. Data on annual vehicle kilometres and annual tonne kilometres transported were taken directly from the published survey results.

Figure 5



It can be seen that, apart from what was probably a statistical discrepancy in the results for light commercial vehicles in 2005 and 2006, all results show a reasonably smooth trend. In summary, over the twelve years from 2004 to 2016, the emissions intensity of passenger motor vehicle use fell by 6%, i.e. 0.5% per year, on average. For articulated trucks, the emissions intensity of transporting freight increased by 1% over twelve years, while for light commercial vehicles it increased by 15%. The underlying data show a strong shift to diesel use in both passenger vehicles and light commercial vehicles. However, for light commercial vehicles the relative shift was much larger: from 33% to 62% of total fuel consumed. For passenger vehicles, the corresponding shift in diesel consumption was from 5% to 13% of total fuel consumption.

Further analysis shows that the energy intensity of passenger vehicle use also decreased by 6%, while the energy intensity of light commercial vehicle use increased by 13%, i.e. almost as much as the emissions intensity. A diesel engine has to be at least 15% more efficient, on a fuel volume basis, than a petrol engine to deliver any reduction in emissions, because diesel is a more emissions intensive fuel than petrol. Most well maintained diesel engines do exceed this benchmark, though it is likely that the shift to diesel would have contributed modestly to the reduced emissions intensity of passenger vehicle use. In the case of light commercial vehicles, however, it appears that any improvement in emissions intensity from the shift to diesel engines has been swamped by other factors which have reduced efficiency, such as a shift towards heavier and/or more powerful vehicles.

Appendix: Notes on methodology

The quarterly NEEA Report ("the Audit") reports greenhouse gas emissions arising from the use of fossil fuels to provide useful energy. The format in which data are presented in the Audit is determined by the data sources available. This means that the Audit has three major components: electricity generation, consumption of petroleum products and consumption of gas for purposes other than electricity generation.

For electricity generation, the data are those presented monthly in the NEEA Electricity Update. This means that they include all emissions from electricity generators supplying electricity within the National Electricity Market (NEM). The Audit does not include emissions arising from off-grid generation located in the five eastern states. It also excludes all emissions from electricity generation, both grid and off-grid, in Western Australia and the Northern Territory.

For emissions from consumption of petroleum products, the key data source is the monthly government publication, Australian Petroleum Statistics. The specific figures used are monthly sales of petroleum products, published in Tables 3A and 3B. This means that the emissions cover the whole of Australia, not just the eastern states. The emissions calculated are adjusted to net out emissions arising from the small quantities of diesel used at power stations supplying the NEM. In 2017 the Department of Environment and Energy applied a rigorous quality audit and upgrade process to *Australian Petroleum Statistics*. The outcome was changes to some previously published, i e. "historic", data and a new starting date of July 2010 for the improved data series. This new starting date is one reason that many graphs start with annual emissions for the year to June 2011. However, this upgrade was unable to correct under-reporting in past years, under the voluntary reporting arrangements then applying. For this reason, emissions calculated from *Australian Petroleum Statistics* sales data have been replaced by the *National Greenhouse Gas Inventory* emissions data for the years 2011 to 2016 inclusive.

The estimates of emissions from natural gas are, like electricity emissions, confined to the eastern states. Two separate sources are used. For the period to June 2016, annual gas consumption data by industry and state (Table f) of Australian Energy Statistics is used to provide total gas consumption, net of gas used to generate electricity, in the five eastern states. Linear interpolation is used to estimate moving annual gas consumption for each intermediate month. From July 2016 onward the source data are constructed from the pipeline gas flow data published in the weekly Gas Market Report of the Australian Energy Regulator (AER). The NEEA estimates of emissions from gas used for electricity generation in the NEM are subtracted from these totals. The Gas Market Report explains that some gas consumption may not show up in its reported pipeline flow data, i.e. that these data may somewhat underestimate total gas consumption. Comparison with the Australian Energy Statistics data confirms that to be the case, which is why the latter data have been used for all periods up to June 2016.

All data are reported as annual moving averages. This approach removes the impact of seasonal changes on the reported data. Annualised data reported in the quarterly NEEA Report ("the Audit") 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. Most data are presented in the form of time series graphs, starting in June 2011, i.e. with the year ending June 2011. Some graphs start in June 2008. These starting dates have been chosen to highlight important trends, while enhancing presentational clarity.