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National Energy Emissions Audit

March 2018

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

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Key points

+ ***Australia's energy emissions were almost unchanged over the three months from September to December 2017***

Australia's annual energy combustion emissions have now been hovering at or around their highest ever levels for nearly two years altogether.

+ ***Petroleum consumption continues to be is the main driver of emission increases***

Large increases in consumption of petroleum fuels, particularly diesel, continue to offset gradually falling electricity generation emissions, suggesting that if, as is likely, electricity generation emissions stop falling, total energy emissions will increase.

+ ***The government projects that energy combustion emissions will be higher in 2030 than they are today***

Official projections, released just before Christmas, suggest that, on the basis of current policies, energy combustion emissions will continue to keep gradually increasing.

+ ***Rapidly growing consumption of diesel is driving energy consumption increases***

While consumption of all other fossil fuels has been either flat, or declining, for more than three years, diesel consumption continues its rapid growth.

+ ***Road transport is now the main contributor to diesel consumption growth***

Until a year or so ago, mining was making a large contribution to growth in diesel consumption. Now it appears that almost all growth is coming from road transport.

Introduction

Welcome to the December 2017 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 – this issue contains data up to the end of September 2017. 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 – 71% in Australia's most recent *National Greenhouse Gas Inventory*, which was for the year 2014-15. Fossil fuel combustion emissions also account for most of the year on year change in Australia's emissions. Over the last few years the change is an increase.

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 June 2011, i.e. with the year ending June 2011.

Total energy combustion emissions to December 2017

The main message of this March 2018 *NEEA Report*, with data to the end of December, is that the trends in energy related emissions reported in the December 2017 *Report* remain almost entirely unchanged (Figure 1). Total emissions have decreased very slightly since the year to July 2017, in which they reached the highest ever level calculated by the NEEA. As has been the case since last April, declining emissions from electricity generation are largely, but not fully, offsetting the growth in petroleum emissions. Emissions from other use of natural gas in eastern Australia, i.e. excluding electricity generation, have also been near-constant for the past year, with all three LNG plants in Gladstone operating at steady state capacity. As yet, the data show no evidence of any reduction in consumption as a result of the widely publicised rise in the wholesale cost of gas.

Figure 1

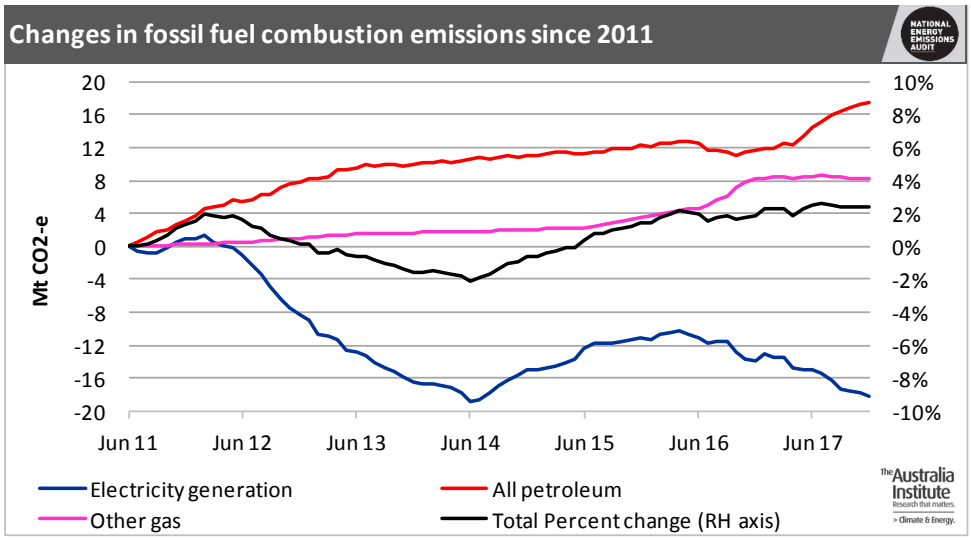
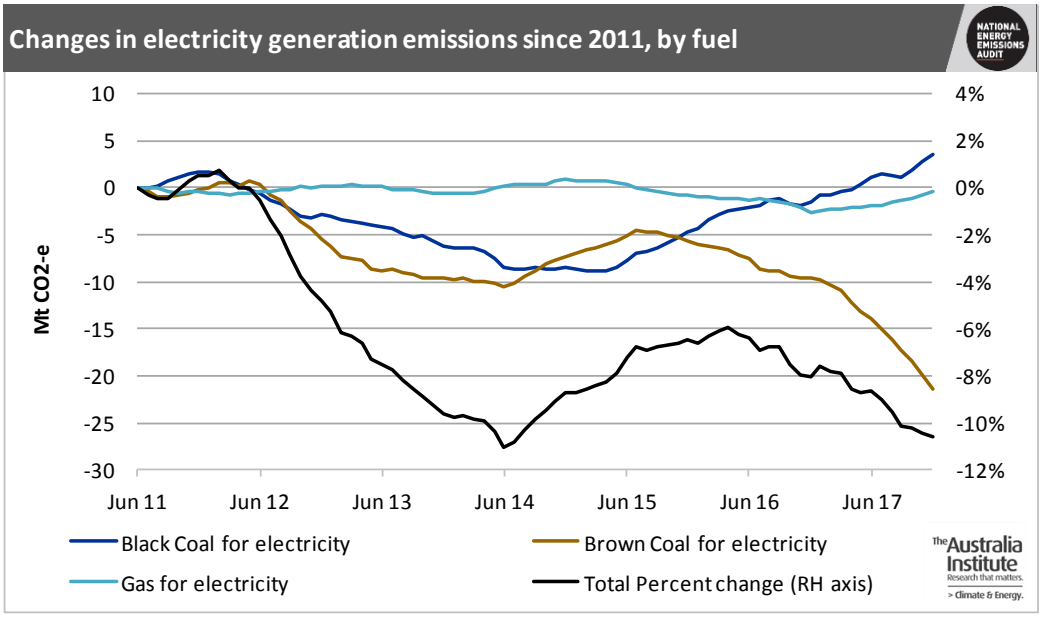


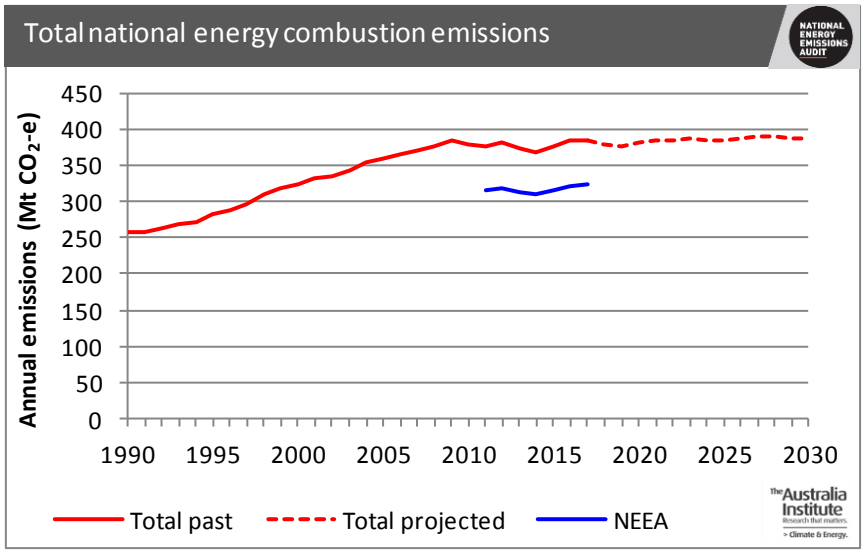
Figure 2



When emissions from the three different fossil fuels used to generate electricity – black coal, brown coal and gas – are separated, Figure 2 shows that it is reduced brown coal emissions which are entirely responsible for the reduction in electricity generation emissions. Lower emissions from brown coal are the consequence of the closure of Hazelwood power station, at the end of March this year. Hence the effect of the closure on emissions is now almost at an end.

The December 2017 *NEEA Report* asked "What will happen to electricity generation emissions, and therefore to energy combustion emissions as a whole, after next March?" The official answer to that question was released soon after that Report was published. *Australia's emissions projections 2017* was one amongst many important energy and emissions policy documents released in the final working week of the year, just before Christmas. Figure 3 uses the figures published with the projections report to show actual and projected total energy combustion emissions. These are the emissions which the NEEA follows month by month. For reasons of data availability (more precisely, unavailability), as explained in the Appendix to each issue of *NEEA Report,* the NEEA cannot capture the entirety of Australia's energy combustion emissions. Annual NEEA estimates for the years 2011 to 2017 inclusive are shown for comparison in Figure 3; it can be seen that they closely track the official figures, and are consistently about 16% lower, i.e. they cover about 84% of total national energy combustion emissions.

Figure 3



Interestingly, the NEEA estimate is a slightly lower proportion of the national total in the year ending June 2016. That was the year in which total national energy combustion emissions reached their highest ever level, as seen in Figure 3. By contrast, total NEEA emissions, as noted above, reached their highest ever level in the year to July 2017. The difference in timing is probably caused by the fact that electricity consumption in Western Australia peaked in 2016, and has since declined, and that electricity generation emissions probably followed a similar path.

Figure 3 shows that the government expects energy combustion emissions to resume a very gradual upward path, so that it passes the record level of 2016 in 2022. By 2030, energy combustion emissions are projected to be 1.0% higher than in 2017. Total national emissions are projected to increase over the same period by 3.0%, so that energy combustion emissions as a share of total emissions fall from 69.3% in 2017 to 68.0% on 2030.

Total emissions, including non-energy sources, are projected to reach 570 Mt CO_2-e by 2030, compared with 554 Mt in 2017 and 597 Mt in 2005. A 26% reduction from 2005 emissions, expressed on an annual basis, would mean emissions of 442 Mt CO_2-e in 2030. This is a reduction of 128 Mt or 22% below the projected 2030 level, and 20% below the current (2017) level.

Clearly, if this projection is realised, Australia will comprehensively fail to meet its emissions reduction commitment under the Paris Agreement. The projections report explains that they were prepared on the basis of current policies and measures, which are listed as including:

> "• ERF, total funding allocated to the ERF is $2.55 billion and is projected to contribute 74 Mt CO_2-e to 2020, and 243 Mt CO_2-e over the period 2021 to 2030
> • Large-scale Renewable Energy Target of 33,000 GWh by 2020
> • National Energy Productivity Plan
> • legislated phase-down of HFCs" (p. 36)

Policies and initiatives not taken into account in the projections are listed as including:

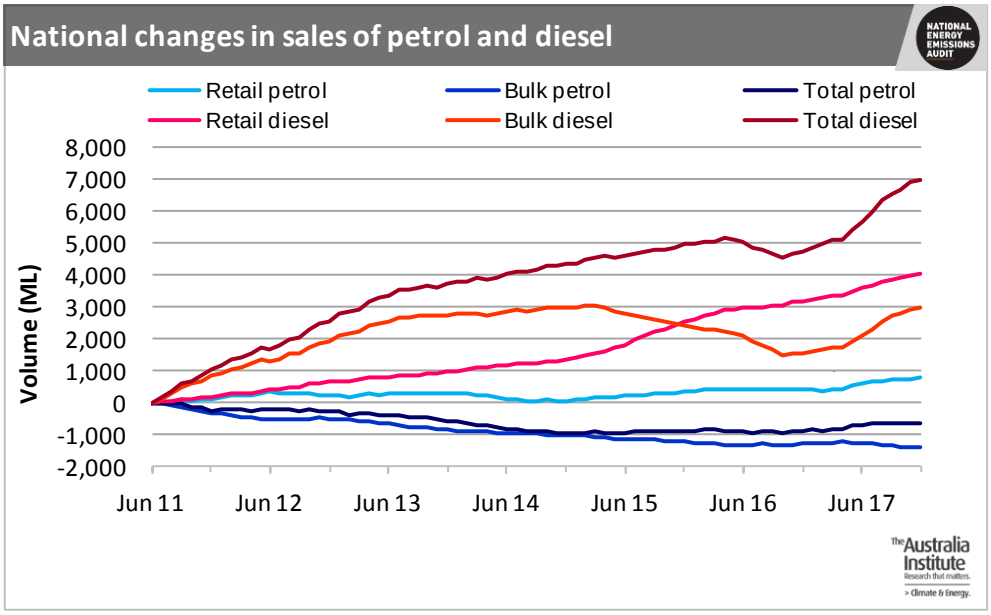
> "• the National Energy Guarantee
> • measures to improve the fuel efficiency of Australia's vehicle fleet, currently being progressed by the Ministerial Forum on Vehicle Emissions
> • proposed state renewable energy targets and plans
> • the work of the COAG Energy Council" (p. 36)

Much will be required from these if Australia is to have any hope of achieving the emissions reductions to which it has agreed.

Petroleum emissions

In preparation of this issue of *NEEA Report*, some further analysis of petroleum sales data, has been undertaken, with the aim of gaining better understanding of what is driving the observed changes. The new analysis suggest that the somewhat sigmoid shaped trend in consumption of bulk diesel may, at least in part, be caused by a change in fuel purchasing arrangements by road transport operators, rather than real changes in fuel consumption. The data indicate that during calendar years 2015 and 2016 there was a marked shift from refuelling at company depots, using fuel supplied under bulk purchase arrangements, to refuelling on the road from retail service stations, in the same way that most fleet passenger cars refuel. This would appear, in the aggregate statistics, as a decline in bulk sales and an increase in retail sales of diesel, which can be seen quite clearly in Figure 4.

Figure 4



It seems likely that this shift has been a consequence of changing commercial arrangements and procedures by the oil companies, following refinery closures in New South Wales and Queensland in recent years. It follows that the distinction between bulk and retail sales of diesel can no longer provide guidance as to the industries and economic sectors contributing to changes in diesel consumption, at least in some states, and nationally.

WE have taken alternative approach to greater understanding, by comparing the increase in annual diesel consumption over the four years from 2011-12 to 2015-16 with the changes in estimated diesel consumption, as reported in ABS' biannual *Survey of Motor Vehicle Use*[1]. The ABS data suggest that, of the total 3,374 megalitres increase in consumption, road freight vehicles accounted for 56%, and passenger vehicles for a further 18%. Thus all other consumption, mainly by mining and agriculture, accounted for the other 26% of the total increase over these four years. Note that this consumption, and emissions, do not include

[1] ABS Cat. No. 9208.0

diesel used for electricity generation in the NEM, but do include diesel used for electricity generated elsewhere, including in Western Australia, the Northern Territory and small and off-grid locations in the NEM states.

Figure 5 shows changes in emissions since 2011 from the four main groups of petroleum products arranged as: total petrol plus auto LPG, total diesel, aviation fuels, and fuel oil and non-auto LPG. Figure 6 shows total emissions from each group of fuels over the same period. Figure 5 shows that, for more than two years, diesel has accounted for all the growth in petroleum fuel consumption, and consequent emissions, while Figure 6 shows that diesel is now the source of well over half the total emissions arising from combustion of petroleum products.

Fuel consumption by domestic aviation, which has been discussed in several previous issues of *NEEA Report*, remains constant, while consumption of petrol and auto LPG continues a very slow decline.

Figure 5

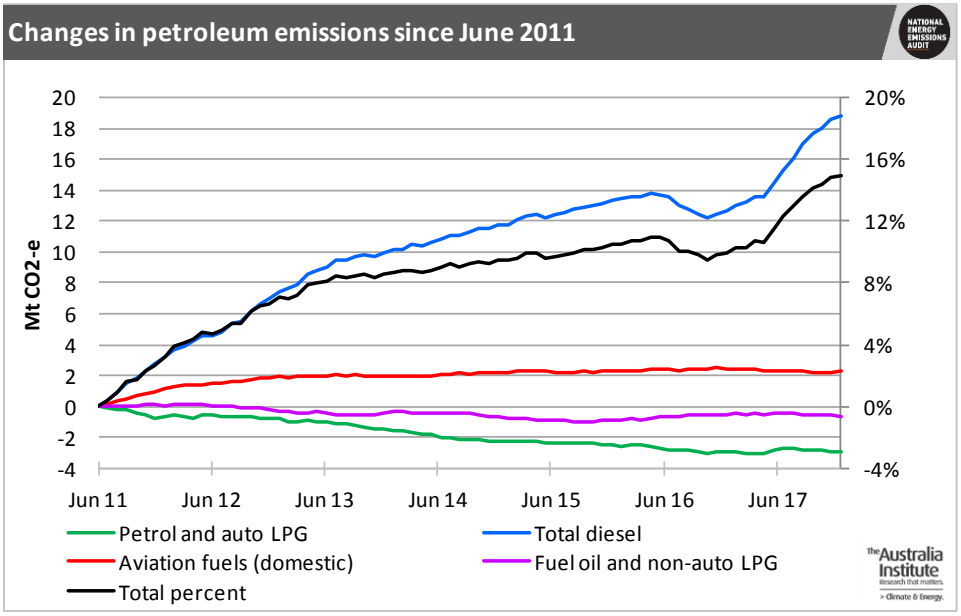
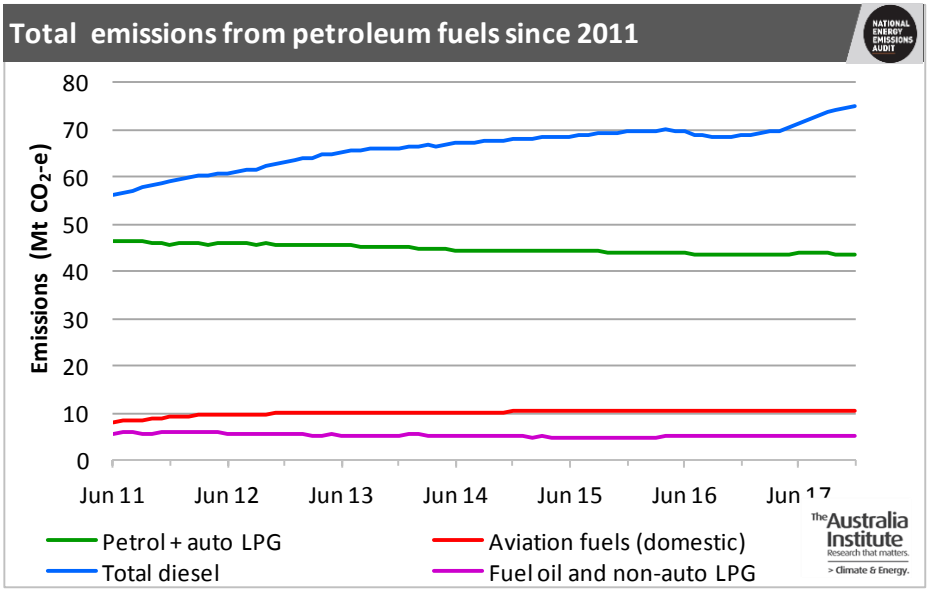


Figure 6



The remainder of this *Report* examines similarities and differences between states, in terms of their emissions from petroleum consumption. Figure 7 shows emissions from total consumption of diesel and petrol. Figure 8 shows the sum of emissions from petrol, auto LPG and retail sales of diesel in absolute terms, while Figure 9 shows the same data but in relative terms, so as to make the various rate of growth easier to see.

Figure 7

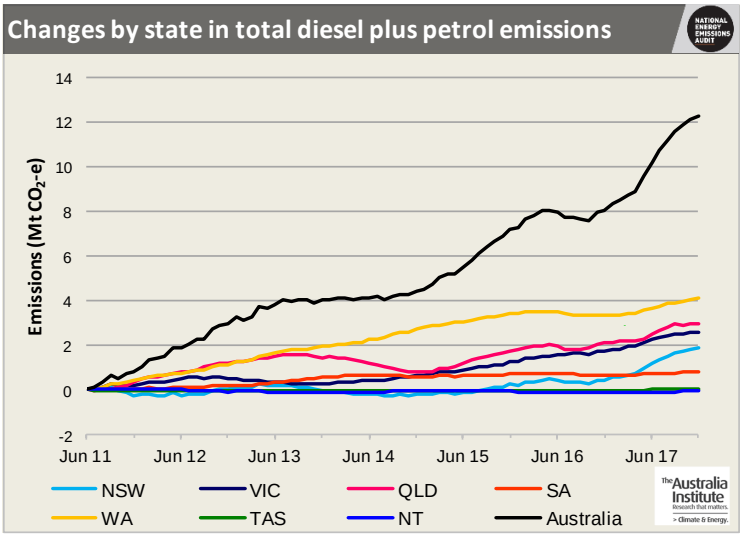


Figure 8

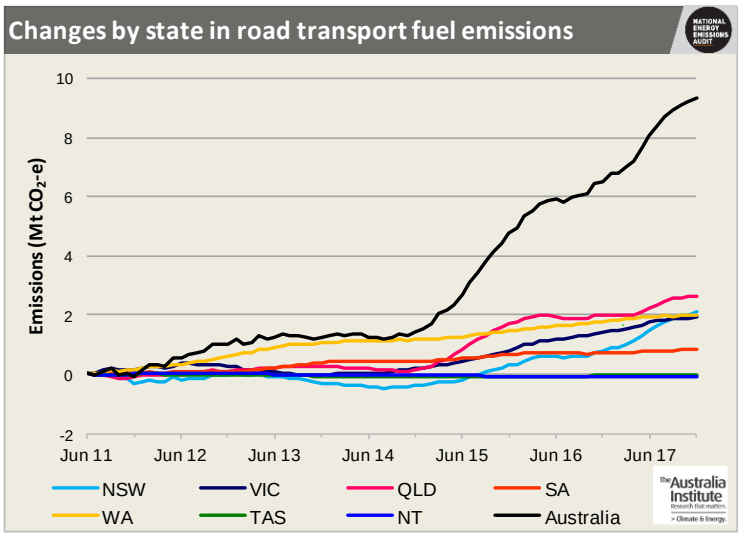
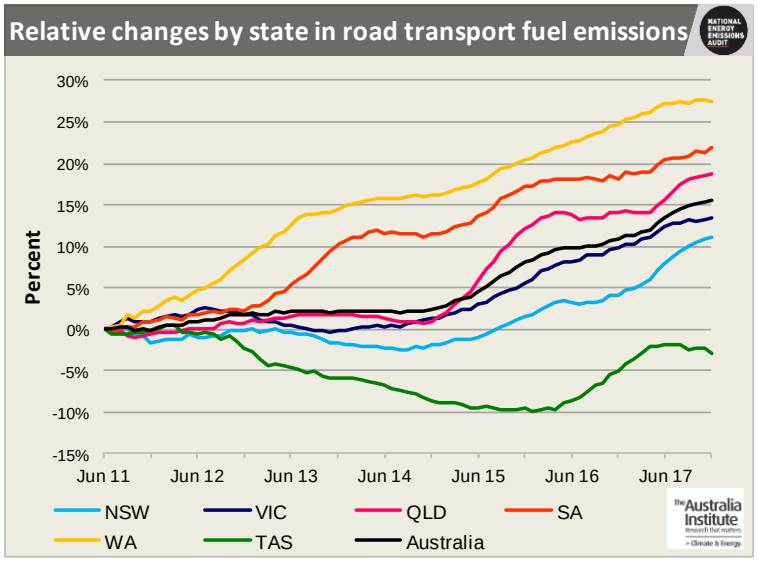


Figure 9



The largest increase in emissions from combined total consumption of petrol and diesel has clearly been in Western Australia. Consumption of diesel by the mining industry, and the associated rail transport, has clearly been the major cause of this dramatic increase. *Australian Energy Statistics*[2] show that between 2011 and 2016 (the most recent year for which data are available) consumption of diesel by mining and rail transport combined almost doubled, and in 2016 accounted for 46% of total diesel consumption (excluding diesel used for electricity generation). Mining also made a major contribution to diesel consumption increases in New South Wales and Queensland, though increases in consumption by road transport were larger. In Victoria, by contrast, road transport accounted for all of the increase between 2011 and 2016.

[2] https://www.energy.gov.au/publications/australian-energy-update-2017

Looking ahead, it seems unlikely that there will be further large increases in diesel consumption by the mining industry. This would mean that growth in consumption in Western Australia and, to a lesser extent Queensland and New South Wales, may slow. Finally, the day when more diesel is used for road transport than petrol is steadily approaching. In 2011, according to *Australian Energy Statistics*, diesel accounted, in energy units terms, for 38% of all energy used for road transport. In 2016 this figure had risen to 47%. Both Western Australia and Tasmania now use more diesel than petrol. As mentioned above, the ABS *Survey of Motor Vehicle Use* finds a similar trend, and suggest that the increase in road freight transport accounts for about three quarters of the total road transport diesel consumption, with the shift to diesel fuelled passenger vehicles accounting for the other quarter.

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. It is important to note that earlier this year 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.

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.