



**National Energy Emissions Audit**  
*Electricity Update*

**June 2019**

Providing a comprehensive, up-to-date  
indication of key electricity trends in Australia

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# Table of Contents

Key points .....	4
Introduction .....	5
AUSTRALIA'S TOTAL GREENHOUSE GAS EMISSIONS .....	6
Trends in national emissions .....	6
Individual state emissions .....	8
Agriculture .....	9
Land sector (LULUCF) .....	9
Emissions associated with extraction and processing of coal and gas .....	9
NEEA ENERGY EMISSIONS .....	11
Appendix: Notes on methodology .....	14

# Key points

- + *The government has belatedly released the National Inventory Report 2017 and December 2018 National Greenhouse Gas Inventory Quarterly Update and they show concerning upward trends in emissions from coal and gas extraction.*
- + *Emissions arising directly from the coal and gas industries in Australia made up about 15% of all national emissions in 2017.*
- + *Australia's total emissions increased by 1.0% between 2016-17 and 2017-18 and are likely to increase by a further 0.3% between 2017-18 and 2018-19.*
- + *Recent sharp increases in stationary and fugitive emissions are largely explained by the boom in extraction of both conventional natural gas and coal seam gas, and the processing of this gas to LNG for export.*
- + *From 2005, emissions from transport have increased by 23% and mining has driven worrying increases in non-electricity stationary energy emissions of 30% and fugitive energy by 55%. Meanwhile, industrial processes, agriculture and waste have all decreased slightly (around 6%) and electricity has decreased rather more, by about 10% from 2005, and 17% from a peak in 2009.*
- + *In Queensland, diesel, gas and electricity used to extract and process coal and gas in total emitted over 18 million tonnes CO<sub>2</sub>-e in 2016-17. This equates to 23% of the state's total emissions and 7% of Australia's total emissions for that year.*
- + *Diesel consumption has risen nearly 50% between 2011 and 2018 and is responsible for the increase in petroleum emissions. Consumption and thus emissions of petrol and LNG have been falling slowly and jet fuel has increased slightly. Most recently, diesel consumption fell in four successive months, from January to April this year. The last prolonged fall in diesel consumption in Australia occurred in 1991, when it was associated with economic recession.*

# Introduction

Welcome to the June 2019 issue of the *NEEA Report*. During the past few weeks the government released two key documents:

- Australia's international stocktake, the National Inventory Report 2017 (NIR), reporting on emissions for the year 2016-17, and associated detailed emissions, termed the National Greenhouse Gas Inventory (NGGI), in an update of the Australian Greenhouse Emissions Information System (AGEIS) on-line tool.
- Quarterly Update of Australia's National Greenhouse Gas Inventory (NGGI) for December 2018.

These are important documents because they are, in the case of the NIR, the authoritative statement of Australia's progress in reducing emissions, subject to formal peer review by international experts. The Quarterly Update is primarily for use in Australia, but has become, since its first publication, under the Rudd government, in March 2009, widely recognised as an important leading indicator of how Australia's greenhouse policies are progressing.

The circumstances of both releases demonstrate just how contemptuous the Australian government is of its obligations to Australian citizens, to the international community, to future generations, and to the future of the planet.

This year all Annex 1 Parties (developed countries) to the United Nations Framework Convention on Climate Change (UNFCCC) were required to submit their NIRs by 15 April. Of the 44 Annex 1 countries (which includes a number of very small European countries) only two, Ukraine and Australia, failed to do so. Ukraine's submission was online on 16 May and Australia's on 24 May. The UNFCCC Secretariat then, as it is required to do, immediately posted Australia's submission on the UNFCCC website, where it was available to any member of the public who knew that it was there. The Australian government did not see fit to make it publicly available on the Environment Department's website until the second week of June.

Last October, the Senate ordered that the government release each Quarterly Update no later than five months after the last day of the month to which it relates. This means that the December Quarterly Update should have been released on or before Friday 31 May, but it was not released until the following Thursday, 6 June 2019.

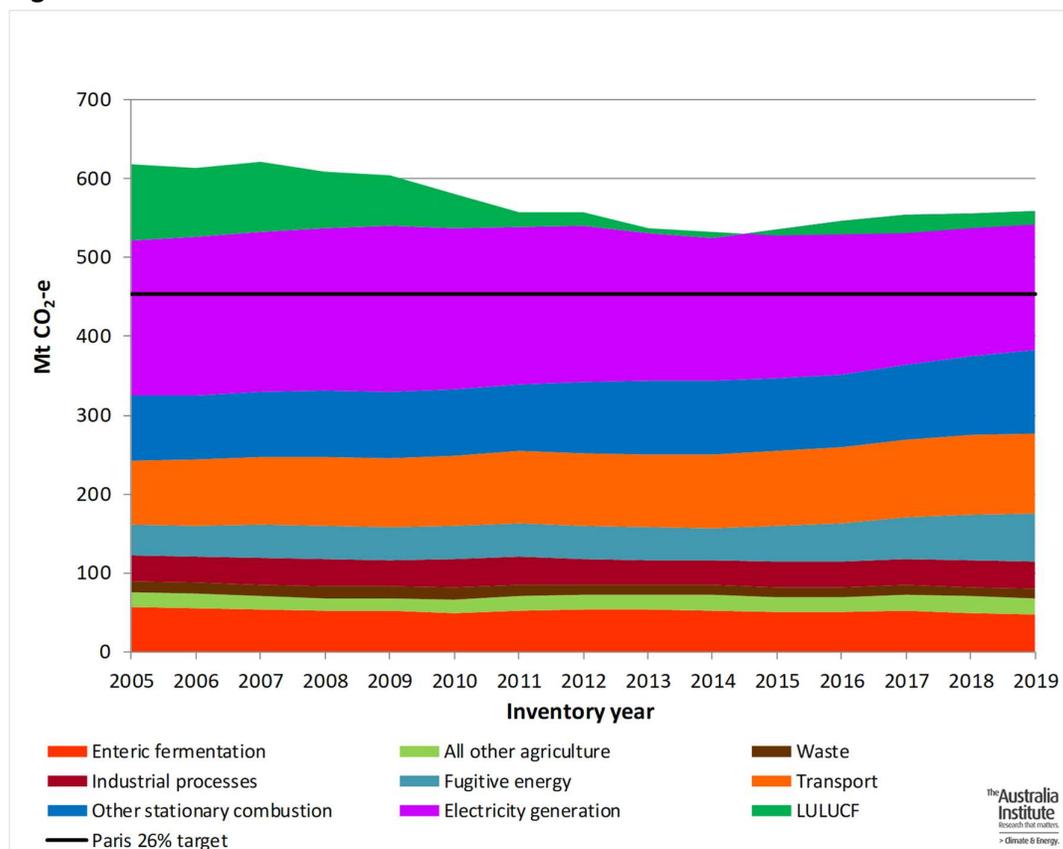
In this NEEA Report we summarise the data in these two important documents. We then use the NEEA model to extend estimated emissions forward to March 2019.

# AUSTRALIA'S TOTAL GREENHOUSE GAS EMISSIONS

## TRENDS IN NATIONAL EMISSIONS

Australia's total annual greenhouse gas emissions for every year from 2004-05 to 2016-17, as reported in the most recent fuel NGGI, are shown Figure 1. As explained in the Introduction, the NGGI is the formal internationally accepted (and internationally reviewed) statement of Australia's emissions. Major components of the NGGI are also shown.

**Figure 1**



Between 2007 and 2012 emissions fell each year because of a steady reduction in emissions from the land sector, called technically Land Use, Land Use Change and Forestry (LULUCF). This decrease was caused by a large decrease in emissions for deforestation (land clearing), though this is still a significant source of emissions, and increases in CO<sub>2</sub> removals through reforestation and forest management (meaning, essentially, that growth of the managed forest biomass has been greater than removals by harvesting). LULUCF emissions fell more

slowly after 2012, but total emissions continued to fall for the next two years because of the effect of the carbon price on electricity emissions. Since 2015 LULUCF emissions have been negative, meaning that this source category is a net carbon sink. As a result, total emissions stayed almost constant, as represented by the top of the purple electricity generation emissions band in Figure 1. Without the LULUCF removals, emissions would have increased, as represented by the top of narrow green band of negative LULUCF emissions.

The graph has been extended for two more years, using data in the recently released Quarterly Update. This contains estimated complete emissions for all four quarters of 2017-18, plus seasonally adjusted emissions totals for the first two quarters of 2018-19. We have extended the graph to the end of 2018-19 by assuming no change in the trend, seasonally adjusted, seen in the first two quarters of the year. What the results show is that, on the basis of the government's own official figures, Australia's total emissions increased by 1.0% between 2016-17 and 2017-18 and are likely to increase by a further 0.3% between 2017-18 and 2018-19. Current emissions are significantly impacted by the sharp reduction in cattle and sheep numbers caused by the current drought in eastern Australia (and also the loss of cattle in the north west Queensland floods). If this were a "normal" season, emissions could well be increasing again by as much as a full 1%.

Looking at the individual emission source categories shown in Figure 1, starting from the bottom, it can be seen that emissions from industrial processes, agriculture and waste have all decreased slightly (6% over the whole 14 years). However, emissions from all the energy related sources, except electricity generation, have increased significantly. Transport emissions have increased by 23%, stationary energy emissions other than electricity generation by 30%, and fugitive energy by an astonishing 55%.

Regarding transport, almost every NEEA Report over the past two or three years has drawn attention to the complete absence of any serious policies to address the seemingly inexorable growth of road transport emissions.

We have also explained that the recent sharp increases in both stationary combustion and fugitive emissions have in part been caused by the boom in extraction of both conventional natural gas and coal seam gas, and the processing of this gas to LNG for export. The government has tried to rationalize this away as a problem by claiming that the LNG supplied by Australia will displace coal consumption, and thus reduce fossil fuel combustion emissions. At the same time, however, the government is actively supporting growth in mining coal for export in Queensland, where annual fugitive emissions from coal mining have increased by around 4 million tonnes CO<sub>2</sub>-e, equal to about 50%, over the past ten years, to nearly 13 million tonnes CO<sub>2</sub>-e in 2017. (Over the same period, fugitive emissions arising from Queensland gas production also added about 4 million tonnes to national emissions.)

The only cause for slight optimism is that some of the increase in these emissions is attributable to the Gorgon LNG project in Western Australia. It was a condition of the development approval for this project that the particularly large volumes of CO<sub>2</sub>, associated with the raw gas supply for this project, which have to be removed before the gas is liquefied,

be sequestered underground, not vented to the atmosphere as is standard practice elsewhere in Australia. The project operators, Chevron, have encountered “technical difficulties” in completing the sequestration; over the past year or so several completion dates have been promised, then missed. Despite these extensive delays, Chevron and the other major international companies which own the project were allowed to start producing and exporting LNG back in 2016, and were recently given development approval for a major project expansion. If and when the CO<sub>2</sub> sequestration finally starts operating properly, Australia’s emissions should fall by several million tonnes CO<sub>2</sub>-e per year

## Individual state emissions

Figure 2 shows total and per capita emissions nationally, and in each state and the Northern Territory in 2016-17, as published through AGEIS. Figure 3 shows national and state increases in total emissions over the four years since the carbon price was removed, i.e. from 2013-14 to 2016-17.

**Figure 2**

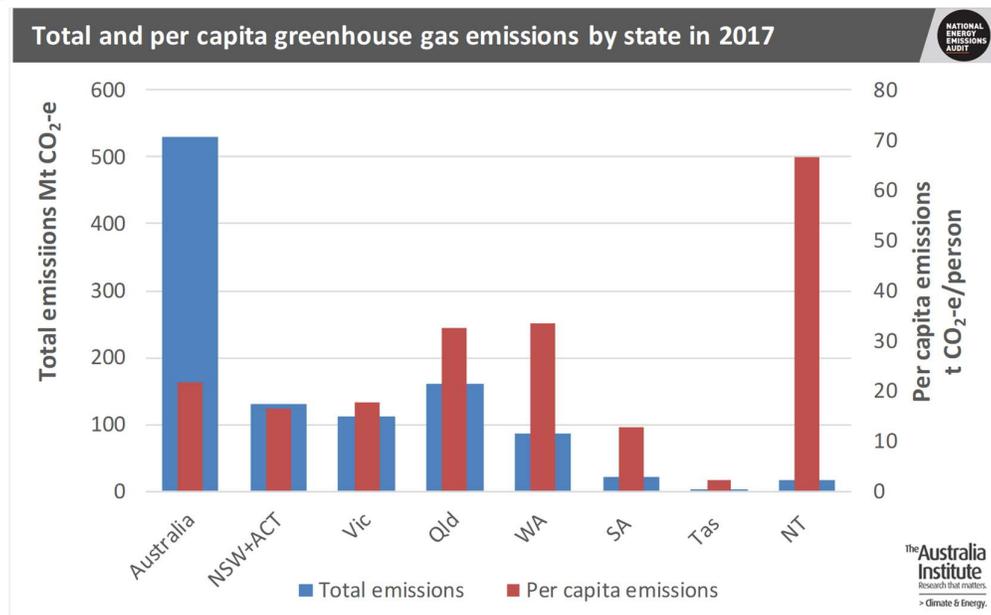


Figure 2 shows that two states, Queensland and Western Australia, plus the Northern Territory, have per capita emissions well above the national average, and Queensland has significantly higher total emissions than any other state. The other four states have per capita emissions well below the national average. Furthermore, Figure 3 show that total state emissions increased between 2014 and 2017 in Queensland, Western Australia and the Northern Territory, while emissions decreased in the other four states.

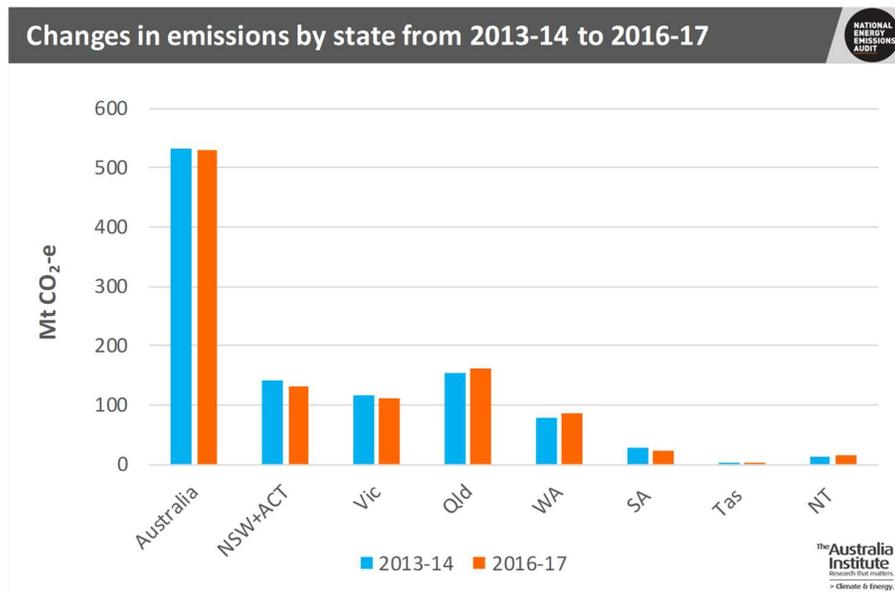
What is driving high and growing emission in Queensland, Western Australia and the Northern Territory? The three jurisdictions share several common features, as revealed in detailed

sectoral emissions data available through AGEIS. The following emission source categories are particularly significant.

## Agriculture

Emissions from enteric fermentation (methane belched by ruminant livestock) is higher in both absolute and per capita terms in Queensland and per capita in the other two jurisdictions, primarily because of the high numbers of beef cattle.

**Figure 3**



## Land sector (LULUCF)

This sector is a net source rather than a net sink of greenhouse gas emissions in Queensland and the Northern Territory, because of much higher levels of deforestation, changes to grazing lands, and controlled burning, all of which result in losses of stored carbon above and below ground.

## Emissions associated with extraction and processing of coal and gas

These emissions are large in all three jurisdictions. In Queensland, it can be calculated from detailed energy consumption data published in Australian Energy Statistics that diesel, gas and electricity used to extract and process coal and gas in total emitted over 18 million tonnes CO<sub>2</sub>-e in 2016-17. Fugitive emissions resulting from the extraction of both coal and coal seam gas contributed just under 18 million tonnes. This means that Queensland oil and gas was responsible for 23% of the state's total emissions and 7% of Australia's total emissions in 2017.

In both Western Australia and the Northern Territory gas extraction and LNG production activities in total were responsible for about 15% of total emissions in 2017, though the absolute volume was more than five times larger in Western Australia.

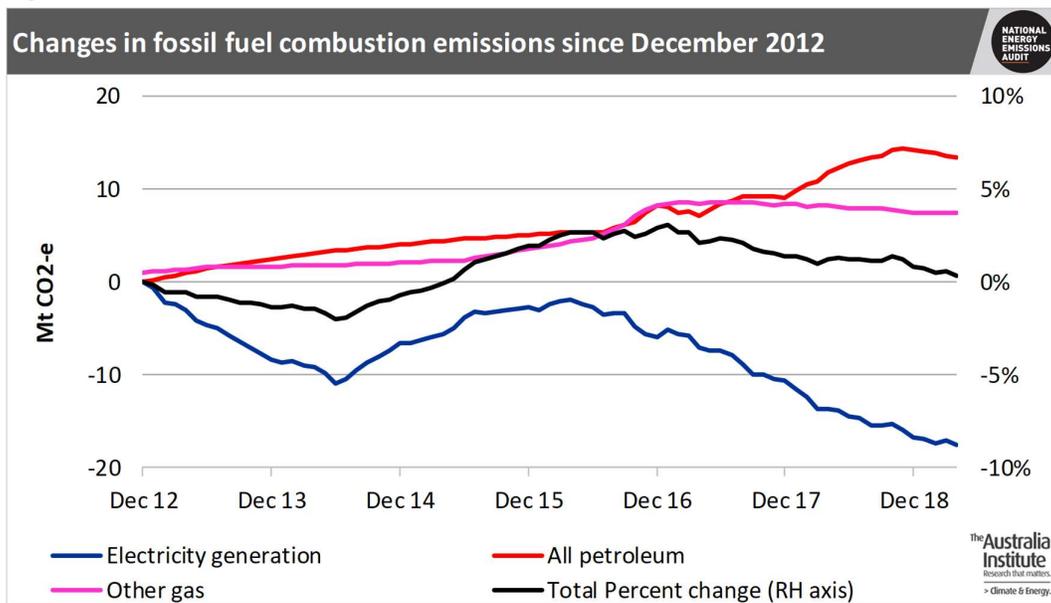
There are also significant emissions arising from coal mining in New South Wales and gas extraction and processing in Victoria and South Australia. Adding these to the figures for the other three jurisdictions brings all emissions arising directly from the coal and gas industries in Australia up to about 15% of all national emissions in 2017.

This figure includes emissions associated with extraction and processing for both domestic consumption and exports, with exports of coal and LNG responsible for well over half the total. The great majority of emissions in Queensland, Western Australia and the Northern Territory are associated with exports of coal (in Queensland) and LNG (in all three jurisdictions). The majority of New South Wales fugitive emissions are also associated with exports of coal, but the considerably smaller emissions in Victoria and South Australia arise exclusively from the production of gas for domestic use.

# NEEA ENERGY EMISSIONS

Total energy combustion emissions as reported by NEEA fell slightly between December 2018 and April 2019, as shown in Figure 4. The data show a particularly steep fall because, for the first time for many years, reported sales of petroleum products have fallen in each successive month since last December. Falls in consumption of petroleum fuels have thus added to the ongoing reductions in NEM electricity generation emissions, resulting in a more decisive fall in total NEEA energy combustion emissions.

**Figure 4**

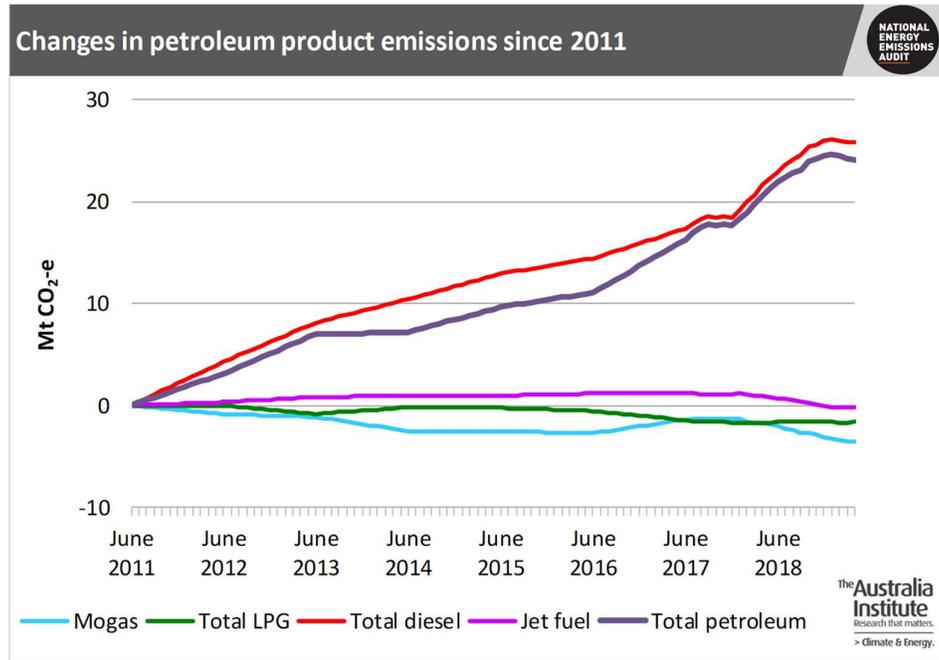


Readers will note that for the period from December 2012 to June 2016 a smooth line has been used for petroleum emissions, rather than the month by month figures based on reported monthly sales of petroleum products. The data plotted is calculated by simple month by month linear interpolation between each annual NGGI value of total petroleum combustion emissions in the financial year. Since mandatory reporting was applied to the collection of data from the petroleum companies, a year or so ago, it has become clear that the previous data was often incomplete, but in an inconsistent manner, which means that it could not be relied upon as an accurate record of Australia’s changing petroleum product consumption.

For this issue of NEEA Report two new graphs have been introduced, using NGGI data. Figure 5 uses NGGI data, in the way described above, for each year to 2016-17, and then extends the graph using monthly petroleum product sales data. Most of this recent sales data is more reliable, because it is backed by mandatory reporting. The graph confirms in general terms what NEEA been reporting for many years: consumption of mogas (petrol) and LPG, and the resultant emissions, have been falling very slowly for a long time. Consumption of jet fuel for

domestic aviation has scarcely increased, although passenger numbers have been growing steadily. All the growth in emissions has been caused by the rapid growth in diesel fuel consumption, which was nearly 50% higher in 2018 than in 2011.

**Figure 5**



**Figure 6**

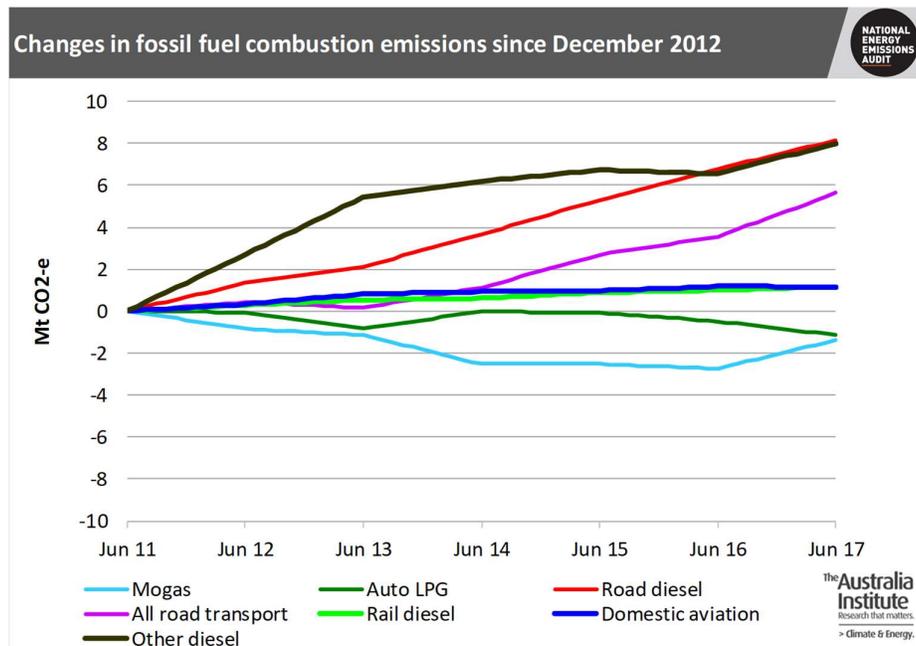


Figure 6 plots NGGI data only, to show how diesel consumption and emissions are distributed between road transport, rail transport, and non-transport activities, such as mining,

construction and agriculture. Interestingly, over the six years shown, the increase in diesel emissions from road transport almost exactly equals the growth in diesel use for non-transport, activities, of which mining is the largest. The growth in diesel consumption for rail transport appears relatively small, but that is because total rail diesel consumption is also relatively small; the increase in consumption and emissions by rail transport between 2011 and 2017 was over 40%. Virtually all of this growth occurred in Western Australia, where emissions more than doubled. Most rail energy consumption and emissions are associated with transporting iron ore and other minerals from mine to port.

Turning again to the apparent decrease in diesel consumption since the end of 2019, it is of course too soon to be certain that this will become a new trend. That said, it does appear to be the largest decrease in diesel consumption for a number of years. It already appears large enough to question the last few months of the extrapolation to the end of June 2019 shown in Figure 1. That said, it is certainly too early to say that total diesel consumption in 2018-19 will be lower than in 2017-18.

Interestingly, should that happen, it will be a most significant occurrence. Forty years ago the world petroleum market was severely disrupted by very large and sudden increases in the price of crude oil, imposed by the main oil exporting countries. Unsurprisingly, petroleum consumption in Australia, as elsewhere, fell over the next year or so. Since then, however, only in one year was diesel consumption lower than in the immediately preceding year. That year was 1990-91, the low point of the last economic recession experienced in Australia. As is the case now, this fall in consumption could not be explained by either higher oil prices or on policies designed to encourage more efficient use of diesel. The obvious reason was the fall in the level of economic activity. Is that what is about to happen now?

## APPENDIX: NOTES ON METHODOLOGY

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Data on annual consumption of electricity, and seasonal peak demand, are for each of the six states. All other data are for the states constituting the National Electricity Market (NEM) only, i.e. they exclude Western Australia. All data are reported as annual moving averages. This approach removes the impact of seasonal changes on the reported data. Annualised data reported in *NEEA Electricity Update* 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.

Defining the particular meaning of the various terms used to describe the operation of the electricity supply system will help in understanding the data discussed.

Demand, as defined for the purpose of system operation, includes all the electricity required to be supplied through the grid level dispatch process, operated by AEMO. This includes all the electricity delivered through the transmission grid to distribution network businesses, for subsequent delivery to consumers. It also includes energy losses in the transmission system and auxiliary loads, which are the quantities of electricity consumed by the power stations themselves, mostly in electric motors which power such equipment as pumps, fans, compressors and fuel conveyors. Auxiliary loads are very large: in 2011 they amounted to 6.3% of total electricity generated and currently about 5.6%. Most of this load is at coal fired power stations, where it can be as high as 10% of electricity generated at an old brown coal power station and 7% at a black coal fired power station. Auxiliary loads are much lower at gas fired power stations, and close to zero at hydro, wind and solar power stations. Both demand and generation, as shown in the *Electricity Update* graphs, are adjusted by subtracting estimates of auxiliary loads. Thus demand, as shown, is equal to electricity supplied to distribution networks (and a handful of very large users that are connected directly to the transmission grid) plus transmission losses.

Generation is similarly defined to include only electricity supplied by large generators connected to the transmission grid. It does not include electricity generated by rooftop PV installed by electricity consumers, irrespective of whether that electricity is used on-site (“behind the meter”) by the consumer or exported into the local distribution network. From the perspective of the supply system as a whole, the effect of this generation, usually termed either “embedded” or “distributed” generation, is to reduce the demand for grid supplied electricity below the level it would reach without such distributed generation. That effect can be clearly seen in the regular total generation graph; the gap between the red line – electricity sent out to the grid from large grid connected power stations – and the yellow line – that electricity plus estimated electricity generated by distributed solar systems – is the electricity supplied by those systems.