

## Chapter 2

### Australia's energy consumption, production, imports and exports

2.1 This chapter provides an overview of Australia's energy consumption, imports and exports, as well as energy production and storage capacity.

#### Australia's energy consumption

2.2 According to the Bureau of Resources and Energy Economics (BREE), Australia's energy consumption has consistently risen over the past ten years at an average annual rate of 1.1 per cent.<sup>1</sup>

2.3 Fossil fuels (coal, oil and gas) dominate Australia's primary energy consumption.<sup>2</sup> In 2012–13, of the 5885 petajoules of energy consumed in Australia, 94 per cent was derived from fossil fuel sources.<sup>3</sup>

2.4 In 2012–13, of Australia's total energy consumption, approximately:

- 38 per cent comprised oil – including crude, condensate and liquefied petroleum gas (LPG);
- 33 comprised coal – both black and brown;
- 24 per cent comprised natural gas; and
- 6 per cent was made up in renewable resources – wind, solar, geothermal, hydro, wave, tidal and bioenergy.<sup>4</sup>

#### Energy consumption within the transport sector

2.5 Australia's demand for oil has risen steadily over recent decades, largely driven by increasing transport sector demand.<sup>5</sup>

2.6 In 2012–13, the transport sector was Australia's second largest energy consumer (behind the electricity sector), accounting for 26 per cent of all energy consumption or 1545 petajoules of energy.<sup>6</sup> Increased energy use in road, rail and air transport resulted in a marginal increase in energy consumption in the transport sector

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1 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 2.

2 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 26.

3 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 24.

4 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 26.

5 Department of Industry and Science, *Submission 41*, p. 3.

6 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 30.

from the previous year.<sup>7</sup> The agricultural sector accounted for 1.7 per cent or 99 petajoules of total energy consumption.<sup>8</sup>

2.7 The Australian economy is dependent on extensive transport networks to move people, goods and resources domestically and offshore. Conventional transport fuels such as petrol, diesel and jet fuel are derived from crude oil and comprise the largest component of fuel sales in Australia.<sup>9</sup> Evidence to the committee highlighted that the country's transport sector is almost totally reliant on refined liquid fuels (oil, refined petroleum products and gaseous transport fuels).<sup>10</sup> The sector consumes 73 per cent of all Australia's liquid fuel supplies (including LPG and refined products).<sup>11</sup> In 2012–13, road transport accounted for 74 per cent of this.<sup>12</sup>

2.8 Alternative transport fuels include biofuels (ethanol and biodiesel), gaseous fuels and synthetic fuels.<sup>13</sup> In 2011–12, over 95 per cent of energy used for all transport modes was crude oil-derived liquid fuels with LPG the most significant alternative fuel comprising 2.7 per cent.<sup>14</sup> Over that period, most of the 32 billion litres of petrol, diesel and LPG used by cars, buses and trucks in Australia was imported.<sup>15</sup>

2.9 Evidence to the committee suggested that energy diversification has taken place in all industries (including agriculture, industry, residential and commercial sectors) except that of transport.<sup>16</sup> While there been some uptake of electric vehicles in the light passenger sector and some electrification in the passenger rail and bulk rail freight sectors, most transport sectors and particularly heavy road freight, maritime and aviation transport are likely to remain wholly or largely oil dependent for decades to come.<sup>17</sup> Therefore, as noted in the 2014 Energy White Paper Issues Paper, changes

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7 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 30.

8 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 31.

9 Department of Industry and Science, Transport fuels, <http://www.industry.gov.au/Energy/EnergySecurity/fuels/Pages/default.aspx> (accessed 5 March 2015).

10 University of Queensland, *Submission 12*, p. 4; National Roads and Motorists' Association, *Submission 18*, Attachment 1, p. 3.

11 National Roads and Motorists' Association, *Submission 18*, Attachment 1, p.8; Bureau of Resources and Energy Economics, *Energy in Australia 2012*, p. 99.

12 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 119.

13 Department of Industry and Science, Transport fuels, <http://www.industry.gov.au/Energy/EnergySecurity/fuels/Pages/default.aspx> (accessed 5 March 2015).

14 AGL Energy Limited, *Submission 8*, p. 1.

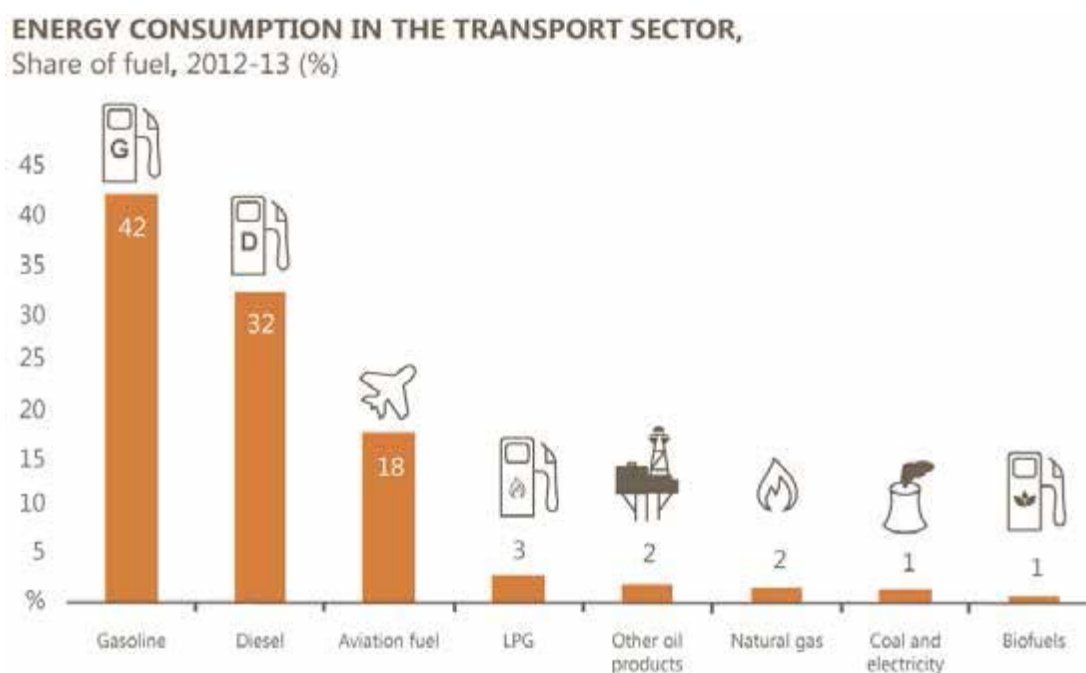
15 Associate Professor Philip Laird, *Submission 3*, p. 1.

16 National Roads and Motorists' Association, *Submission 18*, Attachment 1, p. 6.

17 University of Queensland, *Submission 12*, p. 4.

in energy sources offer the potential to both increase the productivity of energy use and reduce reliance on petroleum-based liquid fuels.<sup>18</sup>

**Diagram 2.1: Energy consumption in Australia's transport sector 2012–13**<sup>19</sup>



### Australia's energy imports

2.10 Australia is a net importer of crude oil and refined petroleum products. In 2013–14, 82 per cent of the crude and other feedstock required for domestic refining was imported, with the balance supplied from indigenous production.<sup>20</sup>

2.11 Almost all of Australia's transport needs are met by oil-derived products including petrol, diesel, jet fuel and LPG.<sup>21</sup> An estimated 91 per cent of Australia's transport fuel (petrol and diesel) is imported either as oil to be refined in Australia or

18 Department of Industry, *Energy White Paper Issues Paper*, December 2013, p. 37.

19 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 120.

20 Department of Industry and Science, *Submission 41*, p. 5. In 2012, Australia imported 83 per cent of its crude oil and other refinery feedstock as well as 43 per cent of its refined petroleum products.

21 Department of Industry and Science, *Submission 41*, p. 3.

as refined fuel products.<sup>22</sup> In 2000, Australia imported 60 per cent of its transport fuel.<sup>23</sup>

2.12 As one of the largest consumers of liquid fuels in Australia, the Qantas Group spent a record \$4.5 billion on aviation fuel in 2013–14, despite a reduction in fuel consumption by 5.4 per cent.<sup>24</sup>

2.13 In 2013–14, Australia's total petroleum imports comprised the majority of energy imports, amounting to almost \$42.8 billion, up on the previous year's \$40.15 billion.<sup>25</sup>

**Diagram 2.2: Australian Petroleum Statistics – Imports of petroleum by product**<sup>26</sup>

Year	Crude oil & other refinery feedstock	TOTAL petroleum imports <sup>27</sup>
2010-11	31,773.9 ML	6,574,906.3 ML
2011-12	29,504.9 ML	5,861,947.5 ML
2012-13	29,519.8 ML	6,569,689.9 ML
2013-14	27,677.7 ML	6,990,150.4 ML

22 National Roads and Motorists' Association, *Submission 18*, p. 7; Engineers Australia, *Submission 2*, p. 1; Mr David G. Lamb, *Submission 4*.

23 National Roads and Motorists' Association, *Submission 18*, Attachment 2, p. 3; Heath Aston, Al Qaeda threatens Australian fuel supply, *Sydney Morning Herald*, 1 November 2014, <http://www.smh.com.au/national/al-qaeda-threatens-australian-fuel-supplies-20141031-11f4t2.html> (accessed 4 December 2014). The Department of Industry defines transport fuels as fuels used to power cars, heavy machinery, aircraft, trains and marine vessels and can come from conventional sources including petrol, diesel and jet fuel or alternative transport fuels including biofuels, gaseous fuels and synthetic fuels. Department of Industry, Transport fuels, <http://www.industry.gov.au/Energy/EnergySecurity/fuels/Pages/default.aspx> (accessed 4 December 2014).

24 Qantas Airways Limited, *Submission 25*, p. 1.

25 Department of Industry and Science, *Australian Petroleum Statistics*, December 2014 and December 2013, Table 4BB: Origin of petroleum imports, by product, by value, by financial year, Australia.

26 Department of Industry and Science, *Australian Petroleum Statistics*, Table 4: Imports of petroleum by product, Australia, Issue 221, December 2014. ML refers to megalitres.

27 Total petroleum imports includes LPG, natural gas originating from International Waters exclusively from the Bayu-Undan field, automotive gasoline, aviation gasoline, aviation turbine fuel, kerosene and heating oil, fuel oil, lubricating oils, greases and basestocks, bitumen and 'other products'. Department of Industry and Science, *Australian Petroleum Statistics*, Table 4: Imports of petroleum by product, Australia, Issue 221, December 2014.

2.14 AGL Energy Limited stated that:

Australia's quarterly imports of fuels and lubricants reached \$10.9 billion in December 2013, more than a 300 per cent increase since 2003 and represented 13 per cent of the value of Australia's total imported goods and services. With the projected rises in petroleum import volumes and oil prices, the value of imported fuels could increase in real terms by over 20 per cent by 2025 and 40 per cent by 2030.<sup>28</sup>

2.15 Australia's largest export markets for crude oil and other refinery feedstock are Singapore, Thailand and Korea.<sup>29</sup> Of total imports, up to 58 per cent of product supply comes from Singapore.<sup>30</sup> However, Australia also imports crude oil and other refinery feedstock from a wider range of countries including Malaysia, United Arab Emirates, Vietnam and Nigeria while refined products are imported from countries including South Korea, Japan and Indonesia.<sup>31</sup> As a case in point, 58 per cent of crude oil imported by ExxonMobil Australia comes from the Asia-Pacific market, 21 per cent from west Africa and approximately 13 per cent from the Middle East while 85 per cent of its finished product comes from the Asia-Pacific region.<sup>32</sup>

### **Australia's energy production, refining and exports**

2.16 Australia produces a range of liquid fuels including crude oil, condensate and LPG. In 2013–14, approximately 75 per cent of Australia's oil production was exported with crude oil exports alone earning an estimated \$11.1 billion.<sup>33</sup>

2.17 The majority of Australia's crude oil production is exported because the qualities and characteristics of Australian oil are more suited to export markets than the Australian refinery market.<sup>34</sup> For example, most of the liquid fuels production from the North West Shelf (Western Australia) is in the form of condensates, which are not suited to the existing infrastructure of Australian refineries.<sup>35</sup>

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28 AGL Energy Limited, *Submission 8*, p. 2.

29 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 111.

30 According to the 2014 Green Paper, the figure was 53 per cent. See Department of Industry, *Energy White Paper – Green Paper 2014*, p. 52. AIP informed the committee that it was 58 per cent. Mr Andrew Warrell, Australian Institute of Petroleum, *Committee Hansard*, 9 April 2015, p. 16.

31 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 109.

32 Mr Andrew Warrell, ExxonMobil Australia and Australian Institute of Petroleum, *Committee Hansard*, 2 February 2015, pp 21–22.

33 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 6; Australian Government, *Energy White Paper: Increasing competition to keep prices down*, April 2015, p. 26.

34 National Roads and Motorists' Association, *Submission 18*, Attachment 1, p. 8.

35 Department of Industry and Science, *Submission 41*, p. 5.

2.18 Primary energy (coal, crude oil, natural gas and wood) production in Australia amounted to 19,318 petajoules in 2012–13. Of the total energy produced during this period for both domestic use and export:

- 59 per cent was coal;
- 22 per cent was uranium;
- 13 per cent was natural gas;
- 5 per cent was oil and LPG; and
- 2 per cent was derived from renewable energy (primarily bioenergy and hydro).<sup>36</sup>

2.19 According to the Australian Petroleum Statistics (APS), Australia's production of crude oil and condensate declined from 25,772 megalitres (ML) in 2010–11 to 20,405 ML in 2013–14.<sup>37</sup> BREE noted that this fall in output continued a long term decline in Australia's production of primary petroleum.<sup>38</sup> In this regard, Australia's production of oil and condensate is forecast to decline from 147 million barrels in 2014 to 83 million barrels in 2030.<sup>39</sup>

**Diagram 2.3: Australian Petroleum Statistics – Petroleum production, Australia**<sup>40</sup>

Year	Total crude oil & condensate	LPG (naturally occurring)	Ethane	Natural gas
2010-11	25,772 ML	3,906 ML	407 Mm <sup>3</sup>	47,558 Mm <sup>3</sup>
2011-12	24,068 ML	3,813 ML	416 Mm <sup>3</sup>	45,173 Mm <sup>3</sup>
2012-13	21,267 ML	3,627 ML	419 Mm <sup>3</sup>	52,299 Mm <sup>3</sup>
2013-14	20,405 ML	3,912 ML	445 Mm <sup>3</sup>	52,692 Mm <sup>3</sup>

2.20 Australia has significant volumes of natural gas reserves that are increasingly being developed for domestic use and for liquefied natural gas (LNG) exports.<sup>41</sup> In 2012–13, Australia produced 2439 petajoules (or around 62 billion cubic metres) of

36 Crude oil and condensate accounted for 4.1 per cent and LPG 0.5 per cent. Bureau of Resources and Energy Economics, *Energy in Australia 2012*, pp 1–3.

37 Department of Industry and Science, *Australian Petroleum Statistics*, Issue 221, December 2014, Table 1A: Petroleum production, Australia.

38 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, pp 6 & 100.

39 Australian Coal to Liquids Association, *Submission 33*, p. 13.

40 Department of Industry and Science, *Australian Petroleum Statistics*, Issue 221, December 2014, Table 1A: Petroleum production, Australia.

41 International Energy Agency, *Oil and Gas Security – Australia*, 2011, p. 15.

natural gas, representing a rise in production of 14 per cent from the previous year.<sup>42</sup> BREE noted that, over the past decade, Australia's natural gas production had expanded by 5 per cent a year on average.<sup>43</sup>

2.21 Around 48 per cent of Australia's gas was produced for the domestic market in 2013–14, with the remainder exported as LNG.<sup>44</sup> According to BREE, the share of production consumed by the domestic market fell from 71 per cent a decade ago, with exports increasing at a faster rate than domestic consumption.<sup>45</sup> As the world's third largest exporter of LNG behind Qatar and Malaysia, Australia accounts for 10 per cent of the world LNG trade.<sup>46</sup> In 2013–14, Australian LNG exports amounted to 24.1 million tonnes, an increase from 23.9 million tonnes in 2012–13.<sup>47</sup> In 2013–14, LNG exports were valued at more than \$16 billion.<sup>48</sup>

### ***Domestic refining***

2.22 The refining industry in Australia produces a range of petroleum products including gasoline, diesel oil, aviation turbine fuel, fuel oil and LPG.<sup>49</sup> According to BREE, in 2013–14, Australian refineries produced 34,187 ML of marketable refined petroleum products, down from 36,891 ML in 2012–13.<sup>50</sup>

2.23 In 2010, total refinery intake of the then seven refineries in Australia averaged 666,000 barrels per day (of which 605,000 barrels was crude and condensates). According to IEA, at that time, over two-thirds (or about 66 per cent) of Australia's refinery input requirements came from imports.<sup>51</sup> This figure rose to 80 per cent in 2014 as noted by BREE:

Just over 80 per cent of the feedstock for Australia's five domestic refineries, which are largely based on the east coast, is sourced from imports. Imports also account for a significant share of Australia's consumption of refined products. In 2013–14 imports of refined products equalled 44 per cent of domestic consumption.<sup>52</sup>

2.24 The five petroleum refineries currently operating in Australia have a combined capacity of 32.6 gegalitres a year.<sup>53</sup> By mid–2015 when BP's refining

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42 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 82.

43 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 82.

44 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 85.

45 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 85.

46 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, pp 82 & 91.

47 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 91.

48 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 91.

49 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 104.

50 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 104.

51 International Energy Agency, *Oil and Gas Security – Australia*, 2011, p. 8.

52 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 100.

53 Bureau of Resources and Energy Economics, *Energy in Australia 2014*, p. 105.

operations at the Bulwer Island refinery in Brisbane close, Australia will only have four refineries – Vitol in Geelong, BP at Kwinana, Western Australia, Caltex in Lytton, Brisbane and ExxonMobil in Altona, Melbourne.<sup>54</sup>

2.25 With the reduction in Australia's refining capacity, a larger percentage of refined product will have to be imported.<sup>55</sup> NRMA noted that between mid-2012 and mid-2015, Australia is expected to lose 40 per cent of its oil refining capacity.<sup>56</sup>

2.26 Since 2002, the proportion of refined petroleum, oils and lubricants sourced from overseas rose from 11 per cent to 37 per cent in 2012 and was expected to reach 43 per cent in 2014 with the closure and conversion of the NSW refineries.<sup>57</sup> Evidence to the committee suggested that without discovery and commercialisation of substantial new oil reserves, this supply-demand imbalance will become more pronounced. In fact, projections suggest that by 2035, Australian production will be equivalent to only 12 per cent of consumption.<sup>58</sup>

### **Australia's storage capacity**

2.27 All storage capacity in Australia is held commercially within the supply chain, with no capacity for emergency reserves in the form of government-held or compulsory industry stocks.<sup>59</sup>

2.28 In response to Australia's growing dependence on imported oil, petroleum companies have responded by converting existing oil refineries into fuel storage facilities for finished fuel products sourced from international refineries. The conversion of the Caltex Kurnell refinery was the most recent of these conversions.<sup>60</sup> AIP made the point that the conversion of refineries to import terminals led to a substantial increase in the availability of finished product tankage.<sup>61</sup> Similarly, the Department of Industry and Science (department) noted that:

While product imports are increasing, crude oil imports are decreasing, gross import dependency remains similar. Each refinery closure has been accompanied by conversion of these facilities to product import terminals to provide the necessary infrastructure for maintaining domestic supply.<sup>62</sup>

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54 Engineers Australia, *Submission 2*, p. 2.

55 Mr Andrew Warrell, Australian Institute of Petroleum, *Committee Hansard*, 9 April 2015, p. 12.

56 National Roads and Motorists' Association, *Submission 18*, p. 2.

57 Engineers Australia, *Submission 2*, p. 3.

58 Bureau of Resources and Energy Economics cited in AGL Energy Limited, *Submission 8*, p. 2.

59 International Energy Agency, *Energy Policies in IEA Countries – Australia 2012 Review*, p. 145.

60 Australasian Convenience and Petroleum Marketers Association, *Submission 37*, p. 3.

61 Mr Andrew Warrell, Australian Institute of Petroleum, *Committee Hansard*, 2 February 2015, p. 29.

62 Department of Industry and Science, *Submission 41*, p. 6.



2.29 A 2009 study by ACIL Tasman commissioned by the then Department of Resources, Energy and Tourism estimated that the storage capacity of the main storage facilities across Australia was just over 42 million barrels (6.7 million cubic metres). This figure did not, however, take into account all storage capacity across the country as information from smaller industry participants and independent importers was not included in the study.<sup>63</sup>

2.30 The central argument of many submitters to this inquiry was that Australia's growing inability to comply with the IEA 90 day requirements is a consequence of a progressive decline in Australia's oil production coupled with growing oil demand. They argued the point that this decline and corresponding dependence on oil imports exposes Australia's fuel supply to considerable risk of interruption and insecurity. The following chapter explores the evidence regarding Australia's supply security.

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63 ACIL Tasman, *Petroleum Import Infrastructure in Australia*, prepared for the Department of Resources, Energy and Tourism, August 2009, cited in International Energy Agency, *Oil and Gas Security – Australia*, 2011, p. 10.

