

# Chapter 5

## Diesel and non-road engines

5.1 The impacts of diesel and two-stroke engine emissions on health were a key concern raised throughout this inquiry. Petroleum diesel (diesel) is a fractional distillate of crude oil widely used as fuel in industrial, transport and domestic machinery.

### Health impacts of diesel emissions

5.2 The potential negative health impacts of diesel emissions are now well known. The WHO has listed diesel emissions as a Group 1 carcinogen.<sup>1</sup> The International Agency for Research on Cancer (IARC), a WHO body that coordinates and conducts research on the causes of human cancer, reclassified diesel engine exhaust as a Group 1 carcinogen based on extensive evidence that exposure is associated with increased risk of lung cancer.<sup>2</sup> The committee heard from the ILAQH that '[diesel] is not a likely cause – it is a cause of cancer.'<sup>3</sup>

5.3 Diesel exhausts release benzene, sulphur dioxide, carbon monoxide, nitrogen dioxide, polycyclic aromatic hydrocarbons and particulate matter, all of which have known adverse health effects.<sup>4</sup>

### Occupational Health and Safety

5.4 Evidence received by the committee pointed towards a potential shortfall in regulating exposure to diesel emissions in an occupational health and safety context. The AMA noted for instance:

Occupational and workplace standards for hazardous air pollution are inconsistent and poorly enforced and major sources of hazardous air pollutants are not currently regulated, as indicated by the lack of standards for off-road diesel engines.<sup>5</sup>

5.5 Dr Adrian Barnett provided evidence to the committee that certain groups such as miners and workers at drive-through businesses may be exposed to unsafe levels of diesel emissions.<sup>6</sup> Unfortunately there have not been sufficient studies

---

1 Dr Hambleton, President, Australian Medical Association, *Committee Hansard*, 16 April 2013, p. 41.

2 International Agency for Research on Cancer, *IARC: Diesel Engine Exhaust Carcinogen*, press release no. 213, 12 June 2012.

3 Professor Ristovski, International Laboratory for Air Quality and Health, *Committee Hansard*, 11 June 2013, p. 5.

4 Dr Adrian Barnett, *Submission 92*, p. 2.

5 Dr Hambleton, President, Australian Medical Association, *Committee Hansard*, 16 April 2013, p. 41.

6 Dr Adrian Barnett, *Submission 92*, p. 2.

undertaken to adequately assess the impacts of emissions on these workers who are often more vulnerable due to being adolescents with developing respiratory systems, and to date industry has not been willing to work with researchers to better assess whether a problem exists.<sup>7</sup>

## **Recommendation 9**

**5.6 The committee recommends that Safe Work Australia undertake research regarding the exposure of workers in the hospitality, transport and mining industry to diesel emissions.**

### **On-road diesel vehicles**

5.7 On-road diesel vehicles have become increasingly popular in recent years as the price of petrol has risen and consumers have sought products with potentially lower recurrent running costs. Since 2006 the proportion of diesel vehicles in the national fleet has increased from 10.6 per cent to 14.7 per cent. Passenger vehicles and light commercial vehicles were the major contributors to this increase.<sup>8</sup>

5.8 The efficiency of these diesel vehicles is regulated by the Australian Design Rules (ADR). ADR 30 stipulates that new vehicles produced on or after 1 January 2002 adhere to the United Nations Economic Commission for Europe Regulation No. 24.<sup>9</sup> It was reported to the committee that despite emission controls on vehicles, they remain a source of dangerous particulate matter:

A major source of particle in Australia are vehicle exhausts. Particles are created by both diesel and petrol engines, and the constituents of vehicle exhaust particles are particularly damaging to health as they often contain metals and sulfates. Filters on modern vehicles stop some particles escaping, but the filters mainly stop larger particles and the smaller particles – which are potentially more damaging to health – still escape in large numbers.<sup>10</sup>

5.9 It was reported to the committee that motor vehicles – particularly diesel powered – are the largest single contributor to UFP in the urban areas.<sup>11</sup> Studies assessing UFP emissions in Los Angeles and Barcelona found that on-road vehicles are responsible for 43 per cent and between 54 and 86 per cent of UFP emissions respectively.<sup>12</sup> Modelling from urban southeast Queensland showed that although

---

7 Dr Adrian Barnett, Queensland University of Technology, *Committee Hansard*, 11 June 2013, pp. 5–6.

8 Western Australian Government, *Submission 155*, p. 2.

9 Vehicle Standard (Australian Design Rule 30/01 – Smoke Emission Control for Diesel Vehicles) 2006.

10 Dr Adrian Barnett, *Submission 92*, p. 2.

11 Centre for Air quality and health Research and evaluation, *Submission 29*, p. 3.

12 Frampton M, Brauer M, Kleeman M, Kreyling W, Ntziarchristos L, Sarnat S. *Understanding the health effects of ambient ultrafine particles*. Boston, MA: Health Effects Institute, 2013, pp. 14 – 21.

diesel engines comprise around 6 per cent of vehicle kilometres travelled, they accounted for more than 50 per cent of daily particle emissions.<sup>13</sup> The committee heard that although significant progress had been made in regulating emissions from vehicles, there are still significant public health gains to be realised through further emission reductions.<sup>14</sup>

5.10 The NSW EPA reported to the committee that 'retrofitting existing diesel vehicles with exhaust treatment devices is a cost-effective strategy to reduce air pollution emissions', and reported that they are currently working to with private enterprise and other stakeholders to retrofit fleet vehicles.<sup>15</sup>

5.11 The committee understands that soon-to-be-released modelling undertaken by the Victorian EPA and the CSIRO indicate that in Victoria particle emissions from on-road diesel engines will be 'significantly reduced' by 2030.<sup>16</sup>

5.12 The committee heard a suggestion, based on international experience, to introduce anti-idling laws:

In the US and Massachusetts, they have laws such as you are not allowed to keep your engine running for more than five minutes and then there are some restrictions, if you are a courier and things like that going in and out of buildings. Again, it is a very simple thing. I pass a school everyday and you see the school buses with the engines on and all the kids next to it. Those are some of our most vulnerable people standing right next to a source that we could just simply turn off. Anti-idling laws are worth investigating. You might not have to do it for long. If you look at utes these days, every single one of them now has a netting over the back. This time last year none of them did. They said, 'You have to put netting now on your ute and we are going to give out fines if you do not,' and now all the utes have them. So, potentially, if there was an anti-idling law, you would hand out a couple of fines and then it would become the norm for people to switch off their engine.<sup>17</sup>

### **Off-road and industrial diesel engines**

5.13 Diesel fuel is widely used for fuel for large machinery such as mining equipment. There are currently no emissions standards for the off-road diesel sector.<sup>18</sup>

---

13 Frampton M, Brauer M, Kleeman M, Kreyling W, Ntziarchristos L, Sarnat S. *Understanding the health effects of ambient ultrafine particles*. Boston, MA: Health Effects Institute, 2013, pp. 17 – 18.

14 NSW EPA, *Submission 80*, p. 34.

15 NSW EPA, *Submission 80*, p. 35.

16 Victoria EPA, *Submission 110*, p. 7.

17 Dr Adrian Barnett, Queensland University of Technology, *Committee Hansard*, 11 June 2013, p. 6.

18 Ms Crotty, Manager – Air Policy, New South Wales Environmental Protection Authority, *Committee Hansard*, 16 April 2013, p. 10.

5.14 In 2010 the Cleaner Non-road Diesel Engine Project – Identification and Recommendation of Measures to Support the Uptake of Cleaner Non-road Diesel Engines in Australia – Final Report (ENVIRON Report) was released. Prepared by international environmental consulting firm ENVIRON Australia on behalf of the NSW Department of Environment, Climate Change and Water and the Commonwealth Department of the Environment, Water, Heritage and the Arts, the ENVIRON Report included a number of key findings including:

- Diesel engines are not manufactured locally but are imported into Australia either as standalone units or as a component of equipment. In 2008 about 74 000 non-road diesel engines/equipment were imported into Australia;
- The non-road diesel sector (excluding rail and marine transport) consumes a similar volume of automotive diesel oil as the on-road diesel vehicle sector;
- Nationally, non-road diesel engines are estimated to emit around 13 500 tonnes of PM<sub>10</sub> per annum; a similar magnitude to emissions from the on-road vehicle sector;
- In Australia there are no regulations or standards in place that limit emissions from non-road diesel engines. Regulated emission limits for non-road engines have been in force in the US and EU since the mid-1990s. China, India, Japan and Canada also have regulated emissions limits for non-road engines;
- When emission profiles of new non-road diesel engines sold in Australia was assessed against US and EU standards, it was found that Australian machinery was behind emission limits apply to comparable non-road engines sold in those jurisdictions;
- Only five per cent of engines were reported by industry as meeting the 2008 US standards;
- PM<sub>10</sub> emission reductions achievable through compliance with latest US standards are estimated to be between 5600 and 10 200 tonnes per annum to 2020, increasing to 7300 to 14 100 tonnes per annum but 2030; and
- Annual environmental health benefits associated with PM<sub>10</sub> and NO<sub>x</sub> emission reductions are estimated to be in the range \$2.5 to \$4.7 billion (2008 AUD) by 2030.<sup>19</sup>

5.15 Diesel emissions are created through a number of various sources such as mining, transport and recreation; these and others are discussed below.

---

19 ENVIRON Australia Pty Ltd., Cleaner Non-road Diesel Engine Project – Identification and Recommendation of Measures to Support the Uptake of Cleaner Non-road Diesel Engines in Australia – Final Report, April 2010, pp. 8–9.

## **Mining**

5.16 The committee heard that the emissions from diesel engines, particularly in mines, can contribute significantly to poor air quality with approximately one litre of diesel fuel used per tonne of coal produced.<sup>20</sup> The NSW EPA reported to the committee that in the Upper Hunter region non-road diesel equipment is responsible for 13.2 per cent of PM<sub>2.5</sub> and 3.1 per cent of PM<sub>10</sub>.<sup>21</sup>

5.17 The committee was assured by the NSWMC that they are working with regulatory bodies to better understand and minimise mining related diesel emissions:

The New South Wales Minerals Council and the mining industry are fully cooperating with the EPA to better understand PM<sub>2.5</sub> emissions from diesel. The industry, through the Australian Coal Association Research Program—which is a well-established research program—is also commissioning pieces of work to invest in technologies that reduce emissions from diesel equipment on site.<sup>22</sup>

5.18 Professor Ristovski from the ILAQH explained some of the technical difficulties in limiting emissions from subterranean diesel powered coalmining equipment:

There is a standard but the biggest problem with coalmines is that all the machines used there have to be explosion proof. And to make a machine explosion proof you cannot use the latest technology and the newest diesel engines. There are certain technical issues with them. So, essentially, the standards that the engines have to comply with are much behind – several generations behind – the standards that the above-ground engines comply with. In simple words, they are much dirtier than engines that would be allowed on the streets.<sup>23</sup>

5.19 The NSW EPA is currently assessing ways to reduce emissions from non-road vehicles and equipment at coal mines, and that:

If warranted, it is proposed that coal mines will be required, via [Pollution Reduction Programs] attached to their environment protection licences, to take feasible measures to reduce diesel emissions.<sup>24</sup>

## **Trains**

5.20 Diesel trains are extensively used in the transportation of goods from the site of their production to ports which tend to be in heavily populated areas such as

---

20 Mr Krey, Member, Hunter Valley Protection Alliance, *Committee Hansard*, 16 April 2013, p. 12.

21 NSW EPA, *Submission 80*, p. 15.

22 Ms Brown, Policy Manager – Environment and Health, New South Wales Minerals Council, *Committee Hansard*, 16 April 2013, p. 12.

23 Professor Ristovski, International Laboratory for Air Quality and Health, *Committee Hansard*, 11 June 2013, p. 4.

24 NSW EPA, *Submission 80*, p. 30.

Brisbane and Newcastle. For historical reasons, train lines also tend to pass through smaller regional communities.

5.21 The committee heard concerns from resident groups about the health impacts of particulate emissions from diesel trains moving through communities. Newcastle's Professor Higginbotham reported:

When we learned that the coal industry was aspiring to transport up to 330,000,000 tonnes into the Port of Newcastle, we became gravely concerned that this would bring industrial workplace emissions into the homes and schools along the rail corridor. As James mentioned, there are 32,000 residents who live within half a kilometre of the rail line from the port up to Rutherford. In fact, there are 23,000 schoolchildren who also attend school within this zone...What would be the fine particulate and diesel emissions from the 108,000 yearly train movements needed to get this amount of coal into ships?<sup>25</sup>

5.22 Dr Jeremijenko of the Australasian Faculty of Occupational and Environmental Medicine suggested to the committee that diesel trains could be replaced by electric locomotives in heavily built up areas to prevent diesel emissions.<sup>26</sup>

### ***Marine engines, recreational diesel engines and appliances***

5.23 Diesel engines are widely used in recreational engines, small power generators, and domestic appliances such as lawn mowers. These engines are not subject to any standards and emit a disproportionately large quantity of emissions compared to their size. For example, despite their small size, a lack of emissions standards means that an Australian lawnmower may emit up to 40 times the pollution of a small car per hour.<sup>27</sup> Although the contribution of any one source may seem minor, when scaled nationally the emissions from unregulated outboard engines are significant as highlighted by the Australian Marine Engine Council (AMEC):

Outboard engines currently push out unnecessary pollutants directly into the waters of the Great Barrier Reef, our creeks, our rivers and our drinking water supplies—and then it bubbles into the atmosphere. The department's own cost-benefit analysis shows that regulations on outboards would save the environment more than 30,000 tonnes of hydrocarbons alone. The senators from Queensland will remember the Pacific Adventurer oil spill in Moreton Bay, which was 250 tonnes. In other words, what comes out of outboards is equivalent to a Pacific Adventurer oil spill every three days. Atmospheric pollutants will also be cut. Emissions standards will mean

---

25 Associate Professor Higginbotham, Member – Dust and Health Committee, Hunter Community Environment Centre, *Committee Hansard*, 16 April 2013, p. 14.

26 Dr Jeremijenko, Occupational and Environmental Physician – Australasian Faculty of Occupational and Environmental Medicine, *Committee Hansard*, 11 June 2013, p. 61.

27 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 27.

---

40,000 tonnes less carbon dioxide, less carbon smog, from the hydrocarbons bubbling up from the exhaust.<sup>28</sup>

5.24 It was reported to the committee that there are no technological impediments to introducing tighter emissions as:

The clean products are on the shelf, they are being sold now. They are 50 per cent of the market. The products are on the shelves, they are in the brochures, the mechanics are trained, the spare parts are here—<sup>29</sup>

5.25 The committee heard that regulating small engine emissions is a 'low-hanging fruit' when it comes to improving air quality as there is support from industry and the public for better, more stringent regulation.<sup>30</sup> It was argued by AMEC that there has not been regulation of small diesel engines because 'there has been no political will to push it'.<sup>31</sup> As a result of this lack of political impetus, the committee heard that:

Bureaucrats have taken it from an easy-to-finish project to a national plan for clean air, which will take until 2020 at least to make a difference.<sup>32</sup>

5.26 It was suggested by AMEC that Australia should move immediately to the current United States' standard for small diesel engines as those engines already exist, are readily available, and represent the world's toughest standard.<sup>33</sup>

### **Regulating off-road diesel emissions**

5.27 The AMA argued that in response to this finding by the WHO it is necessary to focus on introducing standards for off-road diesel emissions.<sup>34</sup>

5.28 It was recognised by the NEPC that Australia lags behind international competitors when it comes to regulating harmful emissions from off-road diesel sources. As noted by the NEPC:

Regulated emissions limits for [non-road diesel engines] have been enforced in the US and EU since the mid-1990s, and more recently in Canada, Japan, China and India.<sup>35</sup>

---

28 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 27.

29 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 29.

30 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 27.

31 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 28.

32 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 28.

33 Mr Fooks, Committee Member, Australian Marine Engine Council, *Committee Hansard*, 17 May 2013, p. 31.

34 Dr Hambleton, President, Australian Medical Association, *Committee Hansard*, 16 April 2013, p. 42.

5.29 The NSW EPA highlighted non-road diesel engines and small spark ignition engines (outboard motors and gardening equipment) as significant emitters that should be addressed under the NPCA.<sup>36</sup> The committee heard that the NSW EPA supports the develop of standards for new diesel equipment:

As part of the national process that is going on for the National Plan for Clean Air, we are very keen to see the development of standards for new diesel equipment.<sup>37</sup>

### ***Committee View***

5.30 The evidence appears to be incontrovertible that diesel emissions are harmful to human health and should be minimised as far as possible through regulation. In a number of sectors the technology already exists to radically improve emission profiles from diesel engines. While the committee accepts that in specific cases such as underground coal mining there are genuine impediments to using more efficient diesel technology, on the whole the committee is of the view that off-road and small engine diesel emissions should be regulated.

### **Recommendation 10**

**5.31 The committee recommends that the Commonwealth develop a national emissions standard for diesel engines.**

### **Recommendation 11**

**5.32 The committee recommends that the Commonwealth implement a national emissions standard for small non-road engines equivalent to the US EPA standards.**

---

35 National Environmental Protection Council, *Diesel*, available from: <http://www.nepc.gov.au/taxonomy/term/95> (accessed: 17 April 2013).

36 NSW EPA, *Submission 80*, p. 37.

37 Ms Crotty, Manager – Air Policy, New South Wales Environmental Protection Authority, *Committee Hansard*, 16 April 2013, p. 10.