# EPA Regulatory Impact Statement – Environment Protection (Vehicle Emissions) Regulations 2013

EPA Victoria August 2013

This Regulatory Impact Statement has been prepared in accordance with the requirements of the *Subordinate Legislation Act 1994* and the *Victorian Guide to Regulation*.

## Regulatory Impact Statement

In accordance with the *Victorian Guide to Regulation*, the Victorian Government seeks to ensure that Regulations are well targeted, effective and appropriate, and that they impose the lowest possible burden on Victorian businesses and the community.

The Regulatory Impact Statement (RIS) process involves an assessment of regulatory proposals and allows members of the community to comment on proposed Regulations before they are finalised. Such public input provides valuable information and perspectives, and improves the overall quality of Regulations.

This RIS has been prepared to facilitate public consultation on the proposed Environment Protection (Vehicle Emissions) Regulations 2013. A copy of the proposed Regulations is attached to this RIS.

Submissions are now invited on the proposed Regulations. Unless requested by the author, all submissions will be treated as public documents and may be made available to other parties.

Written comments and submissions should be forwarded by no later than 5:00pm, 23 September 2013 to:

Vehicle Emissions Regulations Review
Policy and Regulation Unit
Environment Protection Authority
GPO Box 4395
Melbourne Victoria 3001

or email:

veregs@epa.vic.gov.au



ISBN 0 7306 7684 6

This Regulatory Impact Statement (RIS) was prepared for EPA Victoria by Regulatory Impact Solutions Pty Ltd. www.regulatoryimpactsolutions.com.au

The modelling in this RIS was undertaken in 2012 based on an early 2013 commencement of the Regulations (which will now commence in late 2013). The only real impact that readers should note is that all the figures in the RIS are expressed in 2012 dollars.

# EPA Regulatory Impact Statement – Environment Protection (Vehicle Emissions) Regulations 2013

EPA VICTORIA

## Contents

## Abbreviations

**the Act** – *Environment Protection Act 1970*

**the current Regulations** – Environment Protection (Vehicle Emissions) Regulations 2003

**the proposed Regulations** – Environment Protection (Vehicle Emissions) Regulations 2013

**AAQ** – Ambient Air Quality

**ABS** – Australian Bureau of Statistics

**ADRs** – Australian Design Rules

**AQM** – Air Quality Management

**AVSRs** – Australian Vehicle Standards Rules

**DEPI** – Department of Environment and Primary Industries

**EPA** – Environment Protection Authority Victoria

**HVNL** – Heavy Vehicle National Law

**IARC** – International Agency for Research on Cancer

**IGA** – Inter-governmental Agreement for Regulatory and Operational Reform in Road, Rail and Intermodal Transport

**GVM** – Gross Vehicle Mass

**MCA** – Multi-criteria Analysis

**NCP** – National Competition Policy

**NEPM** – National Environment Protection Measure

**NPV** – Net Present Value

**PPAQCR** – Port Phillip Air Quality Control Region

**Premier's Guidelines** – *Subordinate Legislation Act 1994 Guidelines*

**PV** – Present Value

**RIS** – Regulatory Impact Statement

**SCOTI** – Standing Council of Transport and Infrastructure

**SEPP** – State Environment Protection Policy

**VCEC** – Victorian Competition and Efficiency Commission

**VR1** – Stage 1 Vapour Recovery

**VR2** – Stage 2 Vapour Recovery

**WHO** – World Health Organization

## Technical references

**dB(A)** means 'A-weighted' decibels. The A-weighting curve is commonly used to emphasise frequencies around 3–6 kHz where the human ear is most sensitive, while attenuating very high and very low frequencies to which the ear is insensitive

**CO** means carbon monoxide

**HC** means hydrocarbons sometimes referred to as volatile organic compounds (VOCs)

**kPa** means kilopascals, a unit for measuring pressure

**$NO_x$** is the term used for the total oxides of nitrogen; nitric oxide (NO) and nitrogen dioxide (NO2) are the predominant components

**PM** means particulate matter, with an index referring to a maximum size in micrometres of the particles (for example, $PM_{10}$ refers to particulate matter smaller than 10 micrometres)

**RVP** means Reid vapour pressure, a common measure of the volatility of petrol. It is defined as the absolute vapour pressure exerted by a liquid at 37.8°C (100°F) as determined by the test standards

**VOCs** means volatile organic compounds – organic chemicals that have a high vapour pressure at ordinary, room-temperature conditions

# Summary

### *Objectives of the proposed Regulations*

The proposed Regulations deal with 'clean air' and the 'control of noise' under the *Environment Protection Act 1970* (the Act).[1]

The objectives of the proposed Regulations are to:

- prescribe air emission standards and standards of maximum permissible concentration for emissions from motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment
- prescribe noise emission standards for motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment
- provide for offences relating to the supply of petrol to minimise the release of petrol vapours into the environment
- prescribe various matters necessary to be prescribed for the purposes of the *Environment Protection Act 1970.*

### *The need for Regulation*

Motor vehicles are an important part of modern life. They provide a high degree of personal mobility and are critical to the movement of goods and services.

There are over 4 million vehicles in Victoria. The number of vehicles is expected to increase to over 5 million in the next 10 years.

Motor vehicles are a significant source of air pollution emissions (including greenhouse gases) and noise. Pollutants from motor vehicles include oxides of nitrogen ($NO_x$) and hydrocarbons (HCs, sometimes referred to as volatile organic compounds or VOCs) both of which contribute to visible summer time haze, have detrimental health impacts and are precursors to the formation of ozone. They also include a considerable proportion of airborne particles (particulate matter). Fine particles are visible as brown winter haze. Vehicles are also sources of invisible emissions, including carbon monoxide (CO).

Emissions from in-service motor vehicles (i.e. vehicles on the road) significantly contribute to regional and local air pollution. This can contribute to poor health (adversely affecting acute and chronic health conditions) and the loss of amenity (for example, odour and poor visibility). Noisy vehicles can cause annoyance, sleep disturbance and other health impacts.

There are also air emissions associated with the use of petrol. Petrol easily evaporates, causing dangerous HCs to be present in the air. This evaporation occurs within storage tanks at petrol stations and within the petrol tanks of cars. Petrol vapour escapes when the petrol tank of a car is being filled. HCs can also be emitted through evaporation from a vehicle when running and stationary (see section 2.1).

These impacts on health and the environment are known as externalities.[2] Given the impacts from motor vehicles affect people other than those causing the pollution, there is generally no reason or incentive for a driver to voluntarily reduce emissions. Government intervention is necessary to ensure that air emissions and noise do not have an unreasonable impact on the community.

Within Victoria, the vehicle emission Regulations operate in a wide regulatory landscape that includes:

- National vehicle standards – emission and noise standards for new vehicles (at point of manufacture or import) are set by the Australian Design Rules (ADRs)
- Australian Vehicle Standards Rules (AVSRs) – once a vehicle becomes an in-service vehicle (i.e. once it is sold to the consumer for use), emission and noise standards are set by the AVSRs
- Fuel quality Standards – fuel quality and fuel quality information standards are set by the Commonwealth under the *Fuel Quality Standards Act 2000*
- National Environment Protection (Diesel Vehicle Emissions) Measure - provides guidance and administrative measures, for developing programs to minimise the deterioration in exhaust emissions performance, or improve exhaust emissions performance, from diesel vehicles while they are in service
- the Heavy Vehicle National Law which will set emission and noise standards for vehicles with a GVM exceeding 4.5 tonnes.[3] This will come into effect in Victoria in September 2013.

The causes of air pollution and noise from in-service vehicles in Victoria are complex and often interdependent. Only a limited number of causes are directly addressed by the current Regulations.

1 *Environment Protection Act 1970* parts VI and VII.
2 A consequence of an activity that affects other parties without this being reflected in market prices.
3 The Commonwealth has introduced a Heavy Vehicle National Law (HVNL), which will cover vehicles over 4.5 tonnes gross vehicle mass (GVM). The HVNL will cover emissions and noise as well as safety aspects.

**Exhaust emissions**

Over the life of the Environment Protection (Vehicle Emissions) Regulations 2003 ('the current Regulations'), exhaust emissions from vehicles have generally decreased. This has been primarily due to improvements in vehicle design standards and the renewal of the fleet. Enforcement of the current Regulations for in-service emissions has also made a contribution to the reduction. The following table shows the reductions for the primary pollutants targeted over the life of the current Regulations and the relative contribution to overall reductions from vehicles.

### Reduction in Victorian vehicle exhaust-based emissions 2001–2011 (tonnes)[4]

| Pollutant | 2001 | 2011 | Change in emissions | Contribution of current Regulations |
|---|---|---|---|---|
| $PM_{10}$ | 4,800 | 3,400 | -1,400 (-29%) | -84 (-6.0%) |
| $NO_x$ | 177,000 | 86,000 | -91,000 (-51%) | -175 (-0.2%) |
| HCs | 88,000 | 47,000 | -41,000 (-47%) | -625 (-1.5%) |

The following table summarises the projected emissions from vehicle exhausts in 2022.

### Projected vehicle exhaust-based emissions 2011–2022 (tonnes)[5]

| Pollutant | 2011 | 2022 | Change in emissions |
|---|---|---|---|
| $PM_{10}$ | 3,400 | 2,900 | -500 (-15%) |
| $NO_x$ | 86,000 | 45,200 | -40,800 (-47%) |
| HCs | 47,000 | 25,700 | -21,300 (-45%) |

**Evaporative emissions**

In 2002, in the absence of any Regulation targeted at evaporative emissions, there were around 29,300 tonnes of HCs released into the atmosphere from petrol sources. With the phased-in limits on permitted vapour pressure during summer months from 2003, the total amount of HCs released in 2012 is around 29,700 tonnes.

While this is a small increase of 1.4 per cent, petrol sales over the same period have increased by around 25 per cent. In the absence of vapour pressure Regulations, the volume of HCs released from these sources would have been around 36,500 in 2012. The current Regulations therefore have reduced HC emissions from petrol sources by around 18 per cent.

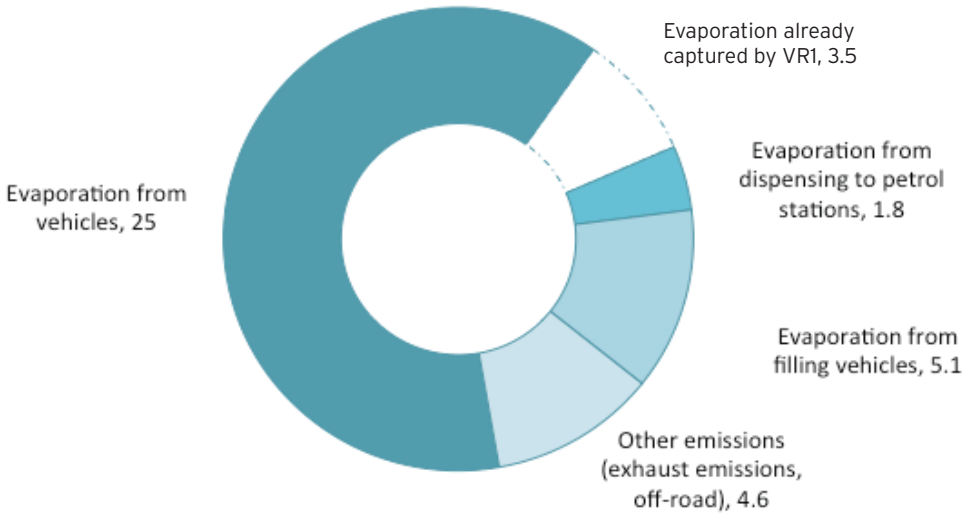
Total petrol sales are expected to increase from 2012 by around 34 per cent by 2022. If the current Regulations related to vapour pressure were not continued, total HC emissions from evaporative sources would increase to around 49,300 tonnes in 2022, an increase of 66 per cent from their current levels. However, even with continuation of the current vapour pressure requirements, HC emissions from these sources would still represent a significant amount – over 40,000 tonnes in 2022. There is therefore merit in considering further measures to reduce emissions from petrol evaporation. The following figure shows the amounts of HC emissions from different evaporative petrol sources in 2012 that would have been emitted if the current Regulations were not in place.

4 The contribution of current Regulations is determined by avoided emissions in g/km (as outlined in Attachment G) based on numbers of vehicles detected over this period. It does not include the impact of other vehicles that may reduce emissions to comply with the Law.

5 Projections are based on the current Regulations not continuing beyond their sunset date (January 2013).

The following figure shows the amounts of HC emissions from different evaporative petrol sources in 2012 that would have been emitted if the current Regulations were not in place.

Sources of evaporative emissions from petrol (figures in '000 tonnes)[6]




Source: EPA calculations based on DRET petroleum data (2012) and Environment Australia emissions factors (1999).

Potential options to reduce evaporative emissions can be identified from the source of evaporation.

Evaporation from dispensing to petrol stations can be reduced by further use of 'Stage 1' Vapour Recovery. The installation of technology known as Stage 1 Vapour Recovery (VR1) captures the vapour displaced from underground storage tanks as the tanks are filled by road tankers. Some evaporation is already avoided by the voluntary use of VR1 at petrol stations (around 3,500 tonnes per year). While a smaller amount of overall emissions, than evaporation from vehicles, Stage 1 Vapour Recovery can capture up to 97 per cent of evaporative emissions from dispensing to petrol stations.

Evaporation from filling of vehicles can be reduced by Stage 2 Vapour Recovery Systems (VR2), which can capture up to 85 per cent of these emissions. VR2 is not currently in place at any petrol station in Victoria.

Further, HC emissions from all sources identified in the above figure could be reduced by reducing the allowed vapour pressure, which slows the rate of evaporation of petrol. Controlling vapour pressure can reduce emissions by around 20 per cent.

Limiting the volatility of petrol (by reducing the vapour pressure) reduces petrol evaporation and hence emissions of HCs. Photochemical smog (of which ozone is a principal component) occurs in summer. Because petrol evaporates more readily when it is hot, control of petrol vapour pressure is only necessary during summer months. Lower petrol volatility over summer reduces the amount of petrol vapour lost during petrol distribution and the transfer of the petrol to a motor vehicle at a service station. The lower petrol volatility also reduces both the amount of petrol vapour that evaporates from a vehicle's petrol tank and the amount that is emitted in the vehicle's engine exhaust.

Vapour pressure is a key fuel variable for evaporative emissions. In general, increasing vapour pressure above 60 kPa increases evaporative emissions.

### *The proposed Regulations*

**Exhaust emissions**

In relation to controlling exhaust emissions from vehicles, the proposed Regulations incorporate the model limits set out in the AVSRs. These are nationally consistent limits that Victoria has agreed to implement at the state level. The limits adopted from the AVSRs are summarised in the table below.

6 The figure shows that if there were no vapour pressure or Vapour Recovery actions taken, total VOC emissions from evaporative sources would be 40,000 tonnes in 2012. The figure notes that around 3,500 tonnes is however avoided by use of voluntary VR1, giving the total emissions in the absence of the current Regulations of around 36,500 tonnes.

## Summary of proposed Regulations – vehicle exhaust emissions and noise

<table>
<tr><th>Area</th><th>Requirements</th></tr>
<tr><td>Vehicle exhaust emissions</td><td>The emission from any motor vehicle that is propelled by an internal combustion engine must not be visible for a continuous period of 10 or more seconds.<br><br>A diesel engine vehicle described in the following table must not have rates of emission of exhaust gases or particles exceeding the relevant level specified in the table:<br><br>
<table>
<tr><th>GVM rating</th><th>Rate of $NO_x$ emissions (g/km/tonne)</th><th>Rate of particle emissions (g/km/tonne)</th></tr>
<tr><td><3.5</td><td>1.5</td><td>0.23</td></tr>
<tr><td>3.5–12</td><td>2.0</td><td>0.23/0.15</td></tr>
<tr><td>12–25</td><td>2.0/1.5</td><td>0.08/0.05</td></tr>
<tr><td>>25</td><td>1.5/1.2</td><td>0.07/0.03</td></tr>
</table>
Where two numbers are indicated, the first relates to vehicles manufactured before 1996 and the second to vehicles manufactured from 1996.<br><br>The exhaust gas emitted by a vehicle must not be greater than 25% opacity averaged over a DT 80 test cycle.[7]</td></tr>
<tr><td>Noise</td><td>A passenger vehicle must not emit noise exceeding 90dB(A) (or 96dB(A) if manufactured before 1 November 1983).<br><br>A motorcycle or motor tricycle must not emit noise exceeding 94dB(A) (or 100dB(A) if manufactured before 1 March 1985).<br><br>A goods vehicle or bus must not emit noise exceeding the level specified according to engine type, gross mass, exhaust height and date of manufacture. The maximum noise that can be emitted ranges from 85 to 109dB(A).</td></tr>
</table>

To provide comprehensive coverage, the proposed Regulations also require the following elements in addition to the AVSR requirements:

- for a passenger vehicle propelled by a spark ignition engine the prescribed maximum permissible concentrations of CO and HC are specified in the table below

## Emission limits for spark ignition engine passenger vehicle's

| Vehicle's date of manufacture | CO level (% by volume) | HC limit (ppm) |
|---|---|---|
| On or after 1 July 1976 and before 1 February 1986 | ≤4.5 at idle | ≤1200 at idle |
| On or after 1 February 1986 | ≤4.5 at idle<br>≤1.0 at high idle[8] | ≤600 at idle<br>≤200 at high idle |

- further noise limits to apply for recreational motor cycles. These are proposed to be the same as the limits in the current Regulations. These requirements are beyond the scope of the AVSRs, which deal with motor vehicles on roads and road-related areas.

**Enforcement**

The proposed Regulations also include specific offences and penalties for non-compliance with the standards, enforced by EPA Victoria (EPA). These include prohibition of selling a motor vehicle that does not comply with a prescribed noise emission standard and use of temporary noise defeating devices. These are important provisions to ensure that EPA can effectively enforce the Regulations.

**Labelling**

The proposed Regulations also specify labelling requirements for certain motorcycles and tricycles. While these provisions appear to create a compliance burden by requiring the fixing of these labels to vehicles, they in fact have limited impact as the fixing of the label, and its prescribed contents, is required under the Australian Design Rules

7 Is the in-service test for diesel vehicles as specified in the Road Transport Reform (Vehicle Standards) Amendment Regulations 2001 published by the National Transport Commission.

8 Engine speed between range of 2500 rpm to 3000 rpm.

(ADRs), ADR 83/00. The replication of this requirement into the Victorian Regulations is necessary to provide that these labels cannot be removed or altered, which assists in enforcement of the noise provisions as noise limits are recorded on the label.

### *Costs and benefits of specifying exhaust emission limits*

Reduced air and noise emissions are quantified into a $/year value. The benefits and costs of these measures are shown in the table below.

### Costs and benefits of specifying exhaust emission limits

| | 2013 | 10-year PV |
|---|---|---|
| ***Benefits*** | | |
| *Reduced vehicle noise* | $778,075 | $24,159,321 |
| *Reduced air emissions* | $3,043,867 | $98,141,692 |
| Avoided HC emissions | $440,316 | $14,196,869 |
| Avoided $NO_x$ emissions | $32,340 | $1,042,720 |
| Avoided PM emissions | $2,452,666 | $79,079,905 |
| Savings to motorists (air) | $118,546 | $3,822,197 |
| **Total benefits** | **$3,821,943** | **$122,301,012** |
| ***Costs*** | | |
| *Reducing noise* | | |
| Rectification costs | $1,165,320 | $9,691,507 |
| Time cost of testing/compliance certificate | $615,682 | $5,120,382 |
| Test fee | $185,107 | $1,539,459 |
| Cost to government | $500,000 | $4,158,303 |
| **Total cost (noise)** | **$2,466,108** | **$20,509,649** |
| *Reducing air emissions* | | |
| Rectification costs | $3,903,491 | $32,463,794 |
| Time cost of testing/compliance certificate | $496,035 | $4,125,323 |
| Test fee | $273,158 | $3,205,984 |
| Cost to government | $500,000 | $4,158,303 |
| **Total cost (air)** | $5,172,684 | $43,953,404 |
| **Total costs** | **$7,638,792** | **$64,463,053** |
| *Net benefits* | | |
| Net benefit (noise) | -$1,688,033 | $3,649,671 |
| Net benefit (air) | -$2,128,816 | $54,188,288 |
| **Net benefit (total)** | **-$3,816,849** | **$57,837,959** |

The proposed Regulations result in a net cost in the first year, but net benefits in all other years, as the benefits accumulate each year while the costs remain steady. Within the net benefit expected from the 'air emissions' components ($54.2 million over a 10-year PV), the net benefit attributable to avoided particulate matter (PM) and $NO_x$ from diesel vehicles is estimated to be $76.7 million over 10 years, while the contribution from avoided HCs from petrol vehicles is estimated as a net cost of $22.2 million. However, this only reflects the *quantifiable* benefits-avoided HCs from petrol vehicles will also have benefits that have not been quantified in this RIS, including

benefits to the natural and built environments. For example, high levels of ozone (from which HCs are a precursor) can reduce forest growth and crop yields and corrode building materials (refer to Attachment E). These benefits are difficult to quantify. Further, detection and rectification of high-emitting vehicles would also lead to reductions in other types of emissions, such as CO, for which EPA has not been able to estimate the benefits.

In addition, EPA considers that the AVSRs should be assessed as a whole package of measures to be implemented, not a 'menu' of options that can be separated. The Inter-Governmental Agreement for Regulatory and Operational Reform in Road, Rail and Intermodal Transport (IGA) allows jurisdictions to impose additional measures where there are good policy reasons for doing so. As discussed above, to address the gaps in the AVSRs' coverage, EPA proposes to impose CO and HC limits, as well as recreational motorcycle noise limits. EPA is satisfied that these additional measures and the AVSRs represent a net benefit to Victoria. Moreover, given the presence of benefits not quantified in this RIS, a net cost (if any) from one element of the AVSRs would only be small within the context of the overall measures.

**Assumptions**

The estimated costs and benefits rely on a range of estimates and assumptions outlined in this RIS.

The impact on the overall net benefit from changes to key assumptions is shown below.

### Impact on expected net benefit from changed assumptions

| Changed assumption | Impact on net benefit | Changed assumption | Impact on net benefit |
|---|---|---|---|
| Value of avoided $NO_x$ is less (see Attachment E) | -$0.2m | Value of avoided $NO_x$ is more (see Attachment E) | +$0.2m |
| Value of avoided HCs is less (see Attachment E) | -$1.3m | Value of avoided HCs is more (see Attachment E) | +$1.0m |
| Value of avoided PM is less (see Attachment E) | -$14.8m | Value of avoided PM is more (see Attachment E) | +$9.9m |
| Value of avoided noise is less (see Attachment F) | -$2.3m | Value of avoided noise is higher (see Attachment F) | +$2.3m |
| Volume of avoided emissions is 10% lower | -$9.8m | Volume of avoided emissions is 10% higher | +$9.8m |
| Detection rates are 10% lower | -$6.3m | Detection rates are 10% higher | +$6.3m |
| Rectification costs are 10% higher | -$4.2m | Rectification costs are 10% lower | +$4.2m |
| Petrol prices* decrease by 10c/L | -$0.4m | Petrol prices increase by 10c/L | +$0.4m |

* Changes in petrol prices affect the value of savings to motorists through improved fuel consumption.

**The overall 'worst case' and 'best case' of the proposed exhaust emission limit Regulations, would be a net benefit in the range $19.8 million to $94.6 million over 10 years (PV). This indicates that even with reasonable uncertainties about the estimated parameters, the proposed Regulations are expected to result in an overall net benefit.**

**Direct impact on motorists**

Adoption of the emission limits will affect motorists. As a result of the enforcement of these Regulations, around 8,100 vehicles will be subjected to remedial action and further testing each year, which is about 0.2 per cent of Victoria's total vehicle fleet. This is slightly higher than the number of vehicles currently detected under the existing EPA programs as EPA anticipates using remote sensing to increase the ability of detecting high-emitting vehicles.

The table below shows the estimated cost impacts on motorists associated with the noise and air emissions components of the proposed Regulations.

### Direct impacts on motorists from specifying exhaust emission limits

| | 2013 | 10-year PV |
|---|---|---|
| Total costs to motorists (noise) | $1,966,108 | $16,351,347 |
| Total costs to motorists (air) | $4,672,684 | $39,795,101 |
| Savings to motorists (air) | $118,546 | $3,822,197 |
| Net cost to motorists | $6,520,246 | $52,324,251 |
| Number of vehicles affected (noise) | 4482 | 44820 |
| Net cost per vehicle affected | $438.67 | $364.82 |
| Number of vehicles affected (air) | 3611 | 36110 |
| Net cost per vehicle affected | $1,261 | $996 |

The beneficiaries of the Regulations are the Victorian environment and the wider Victorian community, with reduced emissions leading to improved overall health and amenity outcomes. The measures benefit both current and future generations. Future generations are benefited generally through the continuation of improvement in Victoria's air quality and noise environment.

**Evaporative emissions**

The proposed Regulations require that petrol supplied during the summer period must have:

- a monthly volumetric average vapour pressure of no more than 62 kPa
- a maximum vapour pressure of no more than 64 kPa.

These levels continue the requirements currently in place, which are estimated to reduce overall HCs emissions from petrol supplied for vehicle use by around 18 per cent.

The current Regulations include a process for exemptions from this requirement. Under the current Regulations, all requests for exemption have related to ethanol fuel. Although ethanol blends produce lower particle emissions, the ethanol content increases volatility by 7 kPa for those with a 5–10 per cent ethanol blend. However, HC emissions from ethanol petrol blends, while higher, are less reactive compared to standard petrol. It is therefore proposed to include separate limits in the Regulations for ethanol fuel, dispensing the need for application for exemptions and payment of a fee. Similar vapour pressure limit provisions apply in New South Wales, Queensland and in the United States. The proposed limit for ethanol fuel is a maximum vapour pressure of no more than 71 kPa.

The proposed Regulations also regulate all alcohol petrol blends more broadly and ensure that new blends either comply with the vapour pressure limits set for petrol or that suppliers seek an exemption under the Regulations. This approach will deal with new petrol blends coming onto the market where there is uncertainty relating to the level of evaporation, for example, methanol petrol blends.

Regulating to reduce vapour pressure results in a reduction of HC emissions from vehicle-related evaporative sources by around 18 per cent. The costs and benefits are shown below.

### Benefits and costs of proposed vapour pressure limits

| Benefit/cost | 2013 | 10-year PV $m |
|---|---|---|
| *Benefits* | | |
| Health benefits from reduced emissions | $28.4m | $236.6m |
| Savings to motorists | $6.6m | $54.9m |
| Savings to distributors (petrol stations) | $0.1m | $0.9m |
| **Total benefits** | **$35.2m** | **$292.5m** |
| *Costs* | | |
| Financial cost to petrol suppliers | $12.0m | $99.8m |
| Compliance cost to petrol suppliers | $0.1m | $0.7m |
| Cost to government | $0.05m | $0.4m |
| **Total costs** | **$12.1m** | **$100.9m** |
| **Net benefit** | **$23.0m** | **$191.5m** |

While not modelled for the purpose of this RIS, it is likely that the cost to petrol suppliers associated with reducing vapour pressure will be passed through to petrol stations and then further to motorists. If all of the costs were passed on through to petrol prices charged to motorists, the incremental cost of the proposed vapour pressure requirements is equivalent to an increase in petrol prices in the order of 0.31 cents per litre.[9]

### Total net benefit of proposed Regulations

The total net benefit of the proposed Regulations is estimated to be $249.3 million over 10 years (NPV), as highlighted in the table below.

### Aggregate net benefits of proposed Regulations

| Option | 2013 | 10-year PV |
|---|---|---|
| Emission limits and controls | -$3.8m | $57.8m |
| Vapour pressure limits | $23.0m | $191.5m |
| **Total net benefit** | **$19.2m** | **$249.3m** |

### Impact on emissions

The following table summarises the total impact on emissions of the proposed Regulations by type and source.

### Aggregate reduced emissions 2013–2022

| Emission type | Reduction (tonnes) | Reduction as a proportion of base case emissions |
|---|---|---|
| *Emissions from vehicles exhausts* | | |
| PM | 613 | 2.1% of PM emissions from motor vehicles |
| $NO_x$ | 1,294 | 0.2% of $NO_x$ emission from motor vehicles |
| HCs | 4,193 | 9.2% of HCs emissions from motor vehicles |
| *Emissions from evaporation of petrol* | | |
| HCs | 77,220 | 18% of HCs emissions due to evaporation of petrol |

9 This is a relatively small amount given the benefits achieved, and compares to the estimate by one petrol supplier that a further reduction in vapour pressure from 62 kPa to 59 kPa would cost a further 0.41 cents/litre. The average vapour pressure is proposed to remain at 62 kPa.

The combined impact of vehicle emission limits and vapour pressure limits is expected to reduce the total HCs emissions from vehicle and petrol sources by 9.4 per cent over the period 2013–2022.

The impact of the proposed vehicle noise limits is expected to reduce the level of ambient noise perceived by a person outside by 0.26 dB on average by 2022. As noise measured in decibels is a logarithmic measure, this reduction is equivalent to a reduction in perceived volume of 2 per cent, a reduction in sound pressure of around 3 per cent, and a reduction in acoustic intensity of around 6 per cent.

### *Other options considered – exhaust emissions*

This RIS identified a number of alternative options and/or variations to the proposed Regulations. The analysis demonstrated that these options were either not feasible, or did not represent a better option (as determined by NPV) than the proposed Regulations. These options included:

- a mandatory maintenance program instead of setting exhaust emission limits
- an advertising/education campaign to encourage motorists to voluntarily improve the maintenance on their vehicles.

### *Other options considered – evaporative emissions*

This RIS also considered new measures to capture petrol vapours at petrol stations in the Port Phillip Air Quality Control Region (PPAQCR).[10] The installation of technology known as Stage 1 Vapour Recovery (VR1) captures the vapour displaced from underground storage tanks as the tanks are filled by road tankers. EPA understands that around 90 per cent of existing petrol stations in metropolitan areas already have VR1 equipment installed.

In total, this option was estimated to avoid 2,592 tonnes of HCs emissions from evaporation over the life of the proposed Regulations. The net benefit was estimated at $6.2 million over 10 years (PV). However, 207 tonnes of this benefit, equating to a benefit of around $900,000, would be double counting a benefit that is realised through the vapour pressure limits. Of the residual net benefit of $5.3 million, this was found to be sensitive to the assumptions used, with materialisation of feasible negative events (such as higher equipment costs) reducing the overall net benefit to around only $0.5 million. Further, this result did not include industry disruption costs or potential adjustment costs for new reporting requirements. Therefore, the mandated installation of VR1 is not a preferred outcome at this time. Unless greater overall benefits can be demonstrated, VR1 will not be regulated at this time.

This RIS also analysed the introduction of 'Stage 2' Vapour Recovery at petrol stations. The installation of Stage 2 Vapour Recovery (VR2) controls the emissions from filling vehicle tanks at petrol stations. VR2 captures petrol vapours at the petrol pump when motor vehicles refuel. It involves the capture of the vapour in the vehicle's fuel tank and the transfer of these vapours to the underground storage tank, preventing their release into the atmosphere.

This RIS found that the costs associated with installing VR2 are very uncertain, and that costs at the higher end of current industry estimates would make this option not cost-effective. For example, if VR2 equipment and installation costs are $150,000 per petrol station, this would impose a net cost on the community of around $5.9 million over 10 years). VR2 costs include equipment and installation costs, and costs associated with monitoring and recording of equipment. Unless greater overall benefits can be demonstrated, VR2 will not be regulated at this time.

### *Impact on competition*

This RIS found that the proposed Regulations would have no impact on competition.

10 Port Phillip Air Quality Control Region (or PPAQCR) includes Greater Metropolitan Melbourne and Greater Geelong.

### *Changes from the current Regulations*

**Exhaust emissions**

In relation to specific exhaust emission limits, the proposed Regulations include a number of changes from the current Regulations. These are shown in the table below.

#### Emission limits changes from current Regulations

| Current | Proposed | Rationale |
|---|---|---|
| 10-second smoke rule does not apply because of condensation of water vapour, or vehicles manufactured before 1 July 1977. | 10-second smoke rule would also not apply to emissions due solely to heat, or for vehicles manufactured before 1 January 1930. | The change is to align the Victorian Regulations with the wording in the AVSRs.[11] EPA does not expect any material impact to result from this change. |
| | The stationary noise level of a vehicle that is certified to ADR 83/00 must not exceed by more than 5 dB(A), the noise level that is established for the vehicle when it is certified. | This additional provision is to align with the AVSRs. |
| $NO_x$ limit for post-1996 vehicles 12-25 GVM was 0.15 g/km/tonne. | $NO_x$ limit for post-1996 vehicles 12-25 GVM was 1.5 g/km/tonne. | The figure in the current Regulations is a typographical error. |

The proposed Regulations also prescribe maximum permissible concentrations of CO and HC for passenger vehicles propelled by spark ignition engines. This is a similar approach to the current Regulations, which provide that a vehicle must not have a concentration of CO in any exhaust pipe exceeding 4.5 per cent by volume. The proposed Regulations also introduce a HC limit, and, for vehicles manufactured post January 1986, a high-idle test and a more stringent HC concentration. The AVSR's do not set emission limits for spark ignition-engine vehicles. EPA believes the inclusion of CO and HC limits in the proposed Regulations is an important addition to reduce invisible emissions. Under the IGA the Victorian Government has agreed to adopt the AVSRs, and jurisdictions are required to inform the National Transport Commission (NTC) and the Standing Council of Transport and Infrastructure (SCOTI) if they impose additional limits to the AVSRs. As such, Victoria has notified the NTC and SCOTI of its proposal to set limits for CO and HC and the policy rationale.

**Evaporative emissions**

The proposed Regulations include a new vapour pressure limit specific to ethanol-blended fuels, to avoid the current practice of seeking exemptions in individual cases. The proposed Regulations make it clear that other alcohol petrol blends are regulated.

11 The current AVSRs were finalised after the current Victorian Regulations were made.

**Proposed exclusions**

**There are a number of items in the current Regulations that are not being included in the proposed Regulations. These are:**

| Regulation | Reason |
|---|---|
| Constituents of fuel | This is now regulated by the Commonwealth under the *Fuel Quality Standards Act 2000*. |
| Noise emission standards for off-road racing motorcycles | The scope of the proposed Regulations do not include off-road racing motorcycles. |
| Vertical exhaust pipes for diesel vehicles | The vertical exhaust requirements relate to heavy vehicles (over 4.5 tonnes). As of September 2013,heavy vehicles will be regulated under the Heavy Vehicle National Law. See section below. |
| Exhaust system construction | This Regulation has not been remade as the proposed Regulations deal with on-road in-service vehicles. |
| Device or mechanism for idle mixture control | The outcomes-based emission limits for spark ignition engine vehicles will deal with this issue without being prescriptive. In addition the scope of the proposed Regulations is limited to in-service vehicles, rather than construction issues, which pertain to new vehicles. |
| Sale of a vehicle not kept, maintained and adjusted in the prescribed manner | This Regulation has not been remade as it is prescriptive rather than outcomes-based. |
| Labelling of fuel types | This Regulation is no longer considered necessary. The market uses the terms diesel, petrol, premium unleaded petrol and unleaded petrol to describe fuels and is generally understood. Where a new fuel blend is introduced, for example ethanol blend fuels, the Commonwealth can require labelling under the *Fuel Quality Standards Act 2000*. |
| Offence to use non-compliant vehicle | Only Regulation pertaining to noise labelling are remade. Others not remade as already captured by setting noise standards. |
| Unlawful modification of engine, exhaust or fuel system | This Regulation has not been remade as the issue is regulated under the Road Safety (Vehicles) Regulations 2009. |
| Interfering with emission control system | This Regulation has not been remade as the issue is regulated under the Road Safety (Vehicles) Regulations 2009. |
| Interfering with noise reducing equipment | This Regulation has not been remade as the issue is regulated under the Road Safety (Vehicles) Regulations 2009. |
| References to lead replacement fuel | These Regulations were relevant to the phasing out of leaded petrol, which is now completed. |
| Maintenance of unleaded requirements | This Regulation is no longer required as there is no longer a problem as leaded petrol has been phased out. |
| Recording of benzene content of petrol | This Regulation is no longer required as the content of benzene in petrol is controlled nationally through the Fuel Standard (Petrol) Determination 2001. |
| Recording of information concerning petrol | This Regulation is no longer required as it is included in the Annual Compliance Report. |
| Authority may require records | This Regulation is not required as it duplicates s.55(3) of the *Environment Protection Act 1970*. |
| Information provided to the Authority must be correct | This Regulation is not required as it duplicates s.59D of the *Environment Protection Act 1970*. |

### *Exclusion of heavy vehicles*

The Council of Australian Governments agreed to introduce a Heavy Vehicle National Law (HVNL) in 2009. Victoria has agreed to adopt the HVNL in Victoria. The Law will regulate emissions, noise and safety of in-service vehicles over 4.5 tonnes gross vehicle mass (GVM) and hence the proposed Regulations have been revised to only cover light vehicles (less than or equal to 4.5 tonnes GVM). This includes the emission (visible emissions and diesel engine exhaust) and noise limits. The full commencement of the HVNL in Victoria is due to commence in September 2013. The analysis in this RIS excludes the impacts on heavy vehicles.

EPA is not aware of any evidence that there remains a problem with vertical exhausts given recent improvements in diesel fuel quality and diesel engines. If evidence becomes available then this should be considered as part of the NHVL.

### *Exemptions from vapour pressure Regulations*

The proposed Regulations include a mechanism for petrol suppliers to seek exemptions from the vapour pressure limit requirements. Previously, exemptions were made in relation to ethanol-blended fuel, although the proposed Regulations now include specific limits for ethanol-blended fuel different from the existing requirements. As such, the need for exemptions in these cases will be avoided. However, there may be unforeseen circumstances that could arise, and it is therefore prudent to retain the ability to consider exemptions. This may be the case for other alcohol petrol-blended fuel, for example, methanol blends.

To ensure an efficient process, the proposed Regulations prescribe certain information that must be provided with an application for exemption. This is considered to be a minor compliance burden, and the prescribed information has been kept to only the minimum necessary to process the exemption application.

The current fee required to be paid when lodging an application for exemption is 10.4 fee units (currently $133.50). This significantly under-recovers the actual cost of processing the application and granting an exemption. Therefore, consistent with the *Cost Recovery Guidelines*, it is proposed to increase this fee to fully recover the expected administrative costs of processing applications. The proposed change in the fee is shown below.

| Current fee | Proposed Fee | % change |
|---|---|---|
| 10.4 fee units ($133.50) | 70.0 fee units ($898.80) | 573% |

The current value of a fee unit is $12.84 under the *Monetary Units Act 2004*.

While this is a significant percentage increase, the overall fee amount remains low given the nature of the exemption being sought, and would not lead to a significant burden. As no specific exemptions are anticipated, no overall revenue has been calculated.

### *Consultation questions*

The release of this RIS provides an opportunity for all interested parties to provide feedback on the robustness of assumptions made in this RIS, whether there are any unintended consequences not addressed, or whether there are any alternative options that could be considered.

Particular questions stakeholders may wish to consider include:

- Are the objectives of the proposed Regulations valid? Is there sufficient concern about air quality and noise and associated health impacts to warrant ongoing Regulation?
- Is the impact of the proposed Regulations significant? Given other changes to air quality and other sources of pollution (and measures to reduce pollution), will the expected benefits of the proposed Regulations make a perceptible difference?
- Is there evidence that could quantify some of the expected benefits of reducing emissions that are not included in this RIS? For example, studies of the impacts on the natural and built environments.
- The conclusion that the vehicle emission limits are preferable to a mandatory maintenance program or an education program is based on assumptions about the behaviour of vehicles owners in relation to willingness to undertake vehicle maintenance. There is limited reliable data to assess such behavioural changes and a number of working assumptions have been used, with associated sensitivity analysis. Are these assumptions reasonable? Is there additional evidence that these alternative approaches might be more successful?
- The proposed Regulations set limits on the volatility of petrol sold to petrol stations. This includes a monthly average volatility as well as a maximum limit. Does the inclusion of a maximum limit lead to higher costs of complying with these requirements? Would removal of the maximum limit lead to lower costs to industry without leading to unwanted outcomes for the community?
- In relation to Stage 1 Vapour Recovery, there was limited data available on individual petrol stations. A generalised profile was constructed to estimate the break-down of petrol stations based on size and location. Industry stakeholders may wish to comment on whether the assumptions used are appropriate. EPA will be pursuing further feedback on the costs, benefits and assumptions used for VR1, and whether there are implementation issues if it were to proceed.
- This RIS finds that, based on currently available information, Stage 2 Vapour Recovery cannot be certain of achieving a net benefit to the community due to the equipment and installation costs, with considerable risk of a net loss. Stage 2 Vapour Recovery is therefore not included in the proposed Regulations. EPA wishes to seek further feedback on the assumptions used in this assessment, in particular whether the costs of installation can be determined with more precision, or whether there are alternative ways to achieve the same outcome that may be more cost-effective.
- Are there any implementation issues that have not been identified in this RIS that will be important in achieving the objectives of the proposed Regulations?

Written comments on this RIS are required by no later than 5.00pm, 23 September 2013.

# 1 Introduction

## 1.1 Regulation of emissions from motor vehicles

The *Environment Protection Act 1970* (the Act) and its Regulations create a legislative framework to protect the environment through preventing and controlling pollution to air (including noise), water and land.

Key to this framework are the Environment Protection (Vehicle Emissions) Regulations 2003 (the current Regulations). The current Regulations aim to minimise the impact of motor vehicle air emissions, noise and fuel quality on Victorians and the Victorian environment. The current Regulations do this through:

- specifying vehicle emission and noise standards, and test procedures for in-service vehicles (vehicles in use as opposed to vehicles manufactured or imported prior to being offered to the market)
- setting fuel standards for vapour pressure and fuel reporting requirements
- setting exhaust and emission control system construction requirements
- setting emission and noise control maintenance requirements
- prohibiting tampering of (i.e. illegally modifying) emission and noise control systems
- specifying labelling requirements for petrol pumps and motor vehicles.

Air pollution and noise have been regulated for new motor vehicles since the 1970s through the ADRs, which apply nationally. Australia has an approach where the European standards for motor vehicles are adopted (with a 2-3-year delay to allow manufacturers time to comply). The tools provided under the Victorian legislation require emission standards to continue to be achieved throughout the life of motor vehicles.

These tools provide EPA officers with the means to test vehicles for noise, tampering and emissions compliance. The existing arrangements also enable the reporting of vehicles by EPA, VicRoads and Victoria Police for non-compliance.

The current Regulations also set petrol vapour pressure requirements for the summer period which, petrol suppliers are required to meet.

The current Regulations are due to sunset (expire) on 28 January 2014. These Regulations are proposed to be remade, with some changes, in the Environment Protection (Vehicle Emissions) Regulations 2013 (the proposed Regulations).

## 1.2 Purpose of this Regulatory Impact Statement

This Regulatory Impact Statement (RIS) formally assesses the proposed Regulations against the requirements in the *Subordinate Legislation Act 1994* and the *Victorian Guide to Regulation incorporating: Guidelines made under the Subordinate Legislation Act 1994*.

The Victorian Government's principles in relation to Regulation are to:

- ensure that Regulations are well targeted, effective and appropriate
- reduce the regulatory burden on business and not-for-profit organisations.

The proposed Regulations have been assessed in the context of these principles.

The assessment framework of this RIS:

- examines the nature and extent of the problem to be addressed
- outlines the objectives of the proposed Regulations
- assesses the costs and benefits of the proposed Regulations
- explains the effects of the proposed Regulations on various stakeholders.

Feasible alternatives to the proposed Regulations are also considered and assessed.

It also examines potential impacts on competition.

A primary function of the RIS process is to allow members of the public to comment on the proposed Regulations before they are finalised. Public input provides valuable information and perspectives and improves the overall quality of Regulations. Accordingly, EPA and DEPI are circulating the proposed Regulations to stakeholders and encourages feedback. See Section 7 for stakeholder consultation to date.

Part of the proposed Regulations formally adopt into Victorian law 'model' Regulations that have been agreed at the national level as part of the Australian Vehicle Standards Rules (AVSRs). These have been subject to regulatory impact assessment by the Commonwealth Government. The Victorian Government has agreed to adopt these rules. Jurisdictions departing from, or imposing additional requirements to, the AVSRs are required to notify the National

Transport Commission (NTC) and the Standing Council on Transport and Infrastructure (SCOTI).

The *Victorian Guide to Regulation* states:

- where it is considered that the costs and benefits of a Regulation or legislative instrument, as adopted in Victoria, are likely to differ substantially from those of the 'model' Regulation contained in a national RIS, then a separate RIS must be completed under Victorian processes. A Victorian RIS will be required for those aspects that were not covered by the COAG RIS.

The overriding policy priority is to adopt the AVSRs unless there is a strong policy reason not to do so. All other Australian states and territories (including Victoria through the current Regulations) have adopted the AVSRs in relation to vehicle air emissions and noise.

## 1.3 The Environment Protection Act 1970

The proposed Regulations must be consistent with the authorising Act, the *Environment Protection Act 1970*. The proposed Regulations are made under sections 53P and 71 of the Act. The purpose of the Act is to create a legislative framework for the protection of the environment in Victoria.

The Act states that it is the intention of Parliament that in the administration of the Act regard should be given to the principles of environment protection. The principles of environment protection are set out in sections 1B to 1L, many of which are relevant to the problem of vehicle emissions and fuel. The principles are:

- Principle of integration of economic, social and environmental considerations
- Precautionary principle
- Principle of intergenerational equity
- Principle of conservation of biological diversity and ecological integrity
- Principle of improved valuation, pricing and incentive mechanisms
- Principle of shared responsibility
- Principle of product stewardship
- Principle of wastes hierarchy
- Principle of integrated environmental management
- Principle of enforcement
- Principle of accountability.

### 1.3.1 National legislative instruments

At a national level, the National Environment Protection Measure (NEPM) on Diesel Vehicle Emissions, which was first made in 2001, has a goal of reducing emissions from diesel vehicles. This NEPM provides guidance for developing programs to minimise the deterioration in exhaust emissions performance, or improve exhaust emissions performance, from diesel vehicles while they are in service. Victoria's approach to testing diesel vehicles for smoke emissions has been informed by the NEPM. There is no similar NEPM for other in-service vehicles.

The National Environment Protection Measure (Ambient Air Quality), (NEPM (AAQ) sets standards, goals, monitoring and reporting protocols for six common pollutants: CO, nitrogen dioxide ($NO_2$), photochemical oxidants (as ozone), sulfur dioxide ($SO_2$), lead and particles as $PM_{10}$.

See Section 2.3 for other national measures related to transport policy.

### 1.3.2 Statutory policies

The State environment protection policy (Ambient Air Quality) ('SEPP AAQ') sets air quality objectives and goals for the whole State of Victoria. The SEPP adopts the requirements of the NEPM(AAQ), and also includes an additional objective for visibility reducing particles.

Victoria's State environment protection policy (Air Quality Management) ('SEPP AQM') establishes the framework for managing emissions into the air environment in Victoria from all sources. The aims of the SEPP AQM are to:

- meet the air quality objectives outlined in the SEPP AAQ
- drive continuous improvement
- achieve the cleanest air possible.

The SEPP AQM sets out EPA's responsibility in managing diffuse emission sources (including emissions from motor vehicles, fuels and other mobile sources) and managing emissions from large line sources (for example, roads). The SEPP AQM does not set specific emission limits for motor vehicles or fuel suppliers. Moreover, there is no direct offence for non-compliance with the SEPP AQM. EPA uses other provisions of the Act, such as pollution abatement notices, licence conditions and other offences, to enforce compliance with the SEPP AQM.

# 2 The reasons for Regulation

## 2.1 Nature of the problem

Air pollution and noise are the costs to society from using motor vehicles for which the vehicle user does not directly pay. This means society bears the cost of this pollution and noise, rather than the vehicle owner or operator. This situation, called an externality, is considered a market failure, whereby the unregulated market does not deliver the most effective outcomes for society.

Externalities occur when an activity imposes costs (which are not compensated) or generates benefits (which are not paid for) on parties not directly involved in the activity. These 'external' costs and benefits (external to the decision maker) are commonly referred to as spillovers. Without Regulation, the existence of externalities can encourage activities that result in a negative burden on external parties. Pollution is the most common example of a negative externality.

The rationale for government intervention is to reduce the effects of negative externalities (noxious air quality and noise impacts on the Victorian population) associated with the use of motor vehicles and fuel.[12]

In economic terms, noxious vehicle emissions are externalities which lead to significant health impacts on people, particularly in urban areas, and which are not effectively addressed by the operation of market forces. Government actions to strengthen vehicle emissions standards and improve fuel quality are internationally recognised as very effective measures to reduce urban air pollution – and such standards have managed to deliver improvements in urban air quality despite growth in vehicle use.[13]

Urban communities have an expectation that the level of air pollution in Australia's major cities does not endanger their immediate and long-term health, and are concerned about the impact of vehicles on the environment.[14]

Noise is also an externality as it impacts on people not associated with the activity. Therefore this is an area that requires government intervention.

## 2.2 Harmful effects of air pollution and noise

*Vehicles are sources of pollutants and noise*

Motor vehicles are an important part of modern life. They provide a high degree of personal mobility and are critical to the movement of goods.

There are over 4 million vehicles in Victoria: 76 per cent of these are petrol vehicles and 16 per cent are diesel vehicles.[15] The number of vehicles is expected to increase to over 5 million in the next 10 years.

The convenience of using motor vehicles, and their benefit to the economy, come at a cost. Among the costs, motor vehicles are a significant source of emissions of air pollution (including greenhouse gases) and noise.[16]

12 Gruenspecht H 1982, 'Differentiated Regulation: The case of Auto Emissions Standards', *American Economic Review*, Vol 72, No 2, pp 328-331.

13 For example, see OECD ,(2004,) *Can Cars Come Clean? Strategies for Low Emission Vehicles* at: http://www.oecdbookshop.org/oecd/display.asp?k=5LMQCR2JFM24&lang=en and ECMT 2001, *Vehicle Emission Reductions* at: http://internationaltransportforum.org/pub/pdf/01VehEmis.pdf

14 ANOP 2005, *National Survey of Motorists Attitudes*, Report prepared for the Australian Automobile Association at: http://www.aaa.asn.au/documents/opinion%2F2005%2FANOP_exec_05.pdf

15 Other vehicles include LPG and hybrid vehicles.

16 Gorham R 2002, 'Air Pollution from Ground Transportation–An Assessment of Causes, Strategies and Tactics, and Proposed Actions for the International Community', *UN Department of Economic and Social Affairs prepared for the Global Initiative on Transport Emissions.*

## *Sources of emissions*

### Exhaust emissions

The combustion process results in emissions of HCs, $NO_x$, particulate matter (PM), and CO, which are released from the exhaust while a vehicle is operating. Pollutants are emitted from the vehicle's exhaust during cold start (when emissions control equipment has not yet reached its optimal operating temperature), during driving and idling after the vehicle is warmed up.

### Evaporative emissions

HCs also escape into the air through fuel evaporation. With today's efficient exhaust emission controls and fuel formulations, evaporative losses can account, on hot days, for a majority of the total HC pollution from current model cars. Evaporative emissions occur in several ways:

- Running losses – The hot engine and exhaust system can vaporise petrol while the vehicle is running.
- Hot soak (Cooling Down) – The engine remains hot for a period of time after the vehicle is turned off, and petrol evaporation continues when the car is parked while cooling down.
- Diurnal emissions (Emissions while Parked and Engine is Cool). Even when the vehicle is parked for long periods of time, petrol evaporation occurs as the temperature rises during the day.
- Refuelling – Petrol vapours escape from the vehicle's fuel tank while the tank is being filled, and while petrol is moved into and out of road tankers.

Source: US EPA. 'Automobile Emissions: An Overview.' Fact Sheet OMS-5. August 1994.

Pollutants from motor vehicles include $NO_x$ and HCs, visible as summer time haze, have detrimental health impacts and are precursors to the formation of ozone. They also include a considerable proportion of air-borne particles (particulate matter) visible as brown winter haze. Vehicles are also sources of invisible emissions, including CO and HC.

While vehicles generally emit a range of different gases, high levels of HCs and CO are characteristic of petrol-based vehicles, while high levels of particulate matter (PM) are characteristic of diesel-based vehicles. $NO_x$ is emitted by both petrol-based and diesel-based vehicles.[17],[18],[19],[20]

Emissions into the atmosphere also occur from the manufacture and dispensing of fuel. While this is sometimes due to poor practices in the dispensing of fuel (for example, lack of consumer/community awareness), sunlight interactions with volatile components and the quantity of volatile components in the manufacture of the fuel play a key part in the quantity of emissions. Petrol is highly volatile and evaporative emissions from motor vehicles, terminals and service stations in summer are significant sources of emissions of HCs. Fuel composition can have a substantial impact on vehicle exhaust and evaporative emissions.[21]

## *These air pollutants and noise are harmful*

Emissions from in-service motor vehicles significantly contribute to regional and local air pollution. This can contribute to poor health (adversely affecting acute and chronic health conditions) and loss of amenity (for example, odour and poor visibility).[22] Noisy vehicles can cause annoyance, sleep disturbance and other health impacts.

### Air

High levels of air pollutants have been shown to result in a wide range of adverse health and visual impacts on society.[23] Health effects associated with air pollution include respiratory effects, ranging in severity from coughs, chest congestion and asthma to chronic illness and possible premature death in susceptible people.[24] Numerous studies have reported an association between hospitalisation and short-term air particle exposure (i.e. exposure to air particles on day of hospital admission or several days before) (see Attachment E for a summary).

17 Lipman T and Delucchi M 2002, 'Emissions of Nitrous Oxide and Methane from Conventional and Alternative Fuel Motor Vehicles', *Climate Change*, Vol. 53, pp. 477-516.
18 Famlund J, Holman C and Kageson P 2001, '*Emissions of Ultrafine Particles from Different Types of Light Duty Vehicles*', Swedish National Road Administration.
19 Environment and Human Health Inc. 2006, *The Harmful Effects of Vehicle Exhaust–Summary of Findings*.
20 Environmental Protection Agency (USA) 2008, *Analysis of Particulate Matter Emissions from Light-duty Gasoline Vehicles in Kansas City*, EPA420-R-08-010.
21 Wenzel T, Singer B and Slott R 2000, 'Some Issues in the Statistical Analysis of Vehicle Emissions', *Journal of Transportation And Statistics, September.*
22 McKeown D, 2007, *Air Pollution Burden of Illness from Traffic in Toronto–Problems and Solutions*, Toronto Public Health.
23 Environment and Human Health Inc. 2006.
24 Pande J et al, 2002, 'Outdoor Air Pollution and Emergency Room Visits at a Hospital in Delhi', *Indian Journal of Chest Diseases and Allied Sciences*, Vol 44, p 14.

An EPA study of air quality and hospital admissions in 2001 found that, for data from 1994 to 1997, ambient levels of air pollution are associated with increases in daily hospital admissions for respiratory and cardiovascular conditions in Melbourne.[25]

Based on detailed data analysis, the study found:

- Fine particles in Melbourne are associated with hospital admissions for respiratory disease for all age groups. Strong associations were also found for admissions for asthma in children (0–14 years) and all age groups. Admissions for cardiovascular disease, particularly for the elderly, and ischaemic heart disease were also strongly associated with exposure to particles. The strongest effects were observed in the cool season, however associations were observed for admissions for asthma (all ages) and respiratory disease (all ages) in the warm season.
- Strong significant positive associations were found between $NO_2$ and daily hospital admissions for respiratory and cardiovascular disease. Effects were particularly strong for the 24-hour concentration, which was significant for most of the outcomes considered in both whole-year and cool season models. Strongest effects were observed for admissions for asthma in the 0–14 years and all age groups. The strongest effects were observed in the cool season but significant effects were also observed for admissions for asthma and respiratory disease in the warm season. Strong significant positive associations were found between CO and hospital admissions for all outcomes considered in the study except respiratory admissions in the 0–14 year age group. The strongest associations were found for admissions for cardiovascular disease in the elderly (65+ years), admissions for ischaemic heart disease (all ages) and admissions for asthma in the 0–14 year age group. The results of the seasonal analysis revealed that the associations were strongest in the cool season, although significant positive associations were also observed for respiratory admissions (65+ years and all ages), asthma admissions (0–14 years) and cardiovascular admissions in the warm season.
- Ozone, a pollutant formed from HCs interacting with sunlight, was significantly associated with hospital admissions mostly in the warm season, although associations were also found in whole-year models for respiratory admissions in the 65+ and all age groups.

The Victorian study was consistent with other interstate and international studies. Nearly all studies to date have focused on short-term impacts (i.e. hospital admission within a short period after a short period of exposure). A more recent study has demonstrated evidence of older adults facing increased risk of being hospitalised for lung and heart disease, stroke, and diabetes following long-term exposure to fine-particle air pollution.[26]

In 2012, the Standing Council on Environment and Water released the findings of a study into the effects of air pollution on children's respiratory health. The Australian Child Health and Air Pollution Study found that $NO_2$ had the strongest association with adverse respiratory effects in children.[27]

Increasing levels of pollution can have significant environmental and economic consequences. Other effects of air pollutants include damage to vegetation, buildings and materials, and reduction in visibility. Reducing the contribution of motor vehicle emissions to air pollution is expected to have a positive impact on human health and the environment.

The US Environmental Protection Agency classifies diesel exhaust as 'likely to be carcinogenic to humans.'[28] The International Agency for Research on Cancer (IARC), part of the World Health Organization (WHO), previously classified diesel engine exhaust as 'probably carcinogenic to humans'. This has recently (June 2012) been upgraded to 'carcinogenic to humans' (Group 1), based on sufficient evidence that exposure is associated with an increased risk for lung cancer.[29,30]

Exposure to HCs can cause irritation to the eyes, nose and throat; headaches; loss of coordination; nausea; and damage to the liver, kidney and central nervous system. Some HCs are known or suspected to cause cancer in humans.[31]

Attachment E provides further information on the overall cost to society per unit of emissions.

25 EPA Victoria 2001, *Ambient Air Pollution and Daily Hospital Admissions In Melbourne*, Publication 789, ISBN 0 7306 7601 3.
26 Coull BA, Itai Kloog, Zanobetti A, Koutrakis P and Schwartz JD 2012, 'Acute and Chronic Effects of Particles on Hospital Admissions in New England', *PLoS ONE*, April 2012.
27 Standing Council on Environment and Water 2012, Australian Child Health and Air Pollution Study (ACHAPS) Final Report
28 US EPA 2004, Final Regulatory Analysis: Control of Emissions from Onroad Diesel Engines.
29 World Health Organization International Agency for Research on Cancer, *Diesel and Gasoline Engine Exhausts and Some Nitroarenes*, Vol.46,.
30 World Health Organization International Agency for Research on Cancer 2012, Press Release 213, 12 June 2012 http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf.
31 US EPA, *An introduction to Indoor Air Quality: Volatile Organic Compounds* at http://www.epa.gov/iaq/voc.html Accessed 8 April 2012.

**Noise**

'Noise' refers to unwanted sounds, and derives from the same Latin route as *nausea*. Noise health effects are the health consequences associated with elevated sound levels. Elevated noise can cause hearing impairment, hypertension, ischemic heart disease, annoyance, sleep disturbance, and impacts on the immune system.[32]

The effects of noise from motor vehicles includes sleep disturbances (which may also have long term health impacts), amenity (affecting liveability and wellbeing), annoyance (increasing stress), and decreased social cohesion.

Attachment F provides further details on the social impacts of excessive noise and approaches to placing a value on noise damage.

## 2.3 Extent of the problem

### 2.3.1 Measures in place in relation to emissions from vehicles and fuel

The causes of air pollution and noise from in-service vehicles in Victoria are complex and often interdependent. Only a limited number of causes are directly addressed by the current Regulations.

At both a Victorian and Federal level, motor vehicle emissions standards have been highly effective in reducing pollution for more than 30 years. In the 1960s there was emerging concern internationally about urban air pollution, its health effects, and the contribution of motor vehicle emissions to this problem. This led to the development of vehicle emissions standards, beginning in the United States. Comprehensive vehicle emissions standards were introduced in Australia in 1974.

Australia regulates its vehicle emissions principally through the ADRs. The ADRs set the standards that new vehicles are required to comply with prior to their first supply to the Australian market. The ADRs are enforced as national standards under the *Commonwealth's Motor Vehicle Standard Act 1989*, which sets standards for both safety and environmental performance.

Within Victoria, vehicle emission Regulations operate in a wide regulatory landscape that include:

- National vehicle standards – emission and noise standards for new vehicles (at point of manufacture or import) are set by the ADRs.
- AVSRs – once a vehicle becomes an in-service vehicle (i.e. once it is sold to the consumer for use), emission and noise standards are set by the AVSRs. AVSRs are model laws that state and territory governments are obliged to implement. Under the Inter-Governmental Agreement for Regulatory and Operational Reform in Road, Rail and Intermodal Transport (IGA) the Victorian Government has agreed to adopt the AVSRs, and jurisdictions are required to inform the NTC and SCOTI if they impose additional limits to the AVSRs.
- Fuel quality standards – fuel quality and fuel quality information standards are set by the Commonwealth under the *Fuel Quality Standards Act 2000*. Fuel quality standards have been made for petrol, diesel, biodiesel and autogas. A fuel quality information standard has been made for ethanol (in petrol). Where the FQSA is silent on a particular issue, the states and territories can regulate that issue. For example, the current Regulations set vapour pressure standards.
- The National Environment Protection (Diesel Vehicle Emissions) Measure – provides guidance for developing programs to minimise the deterioration in exhaust emissions performance, or improve exhaust emissions performance, from diesel vehicles while they are in service.[33]
- The Heavy Vehicle National Law – which will set emission and noise standards for vehicle with a GVM exceeding 4.5 tonnes. This will come into effect in Victoria in September 2013.[34]

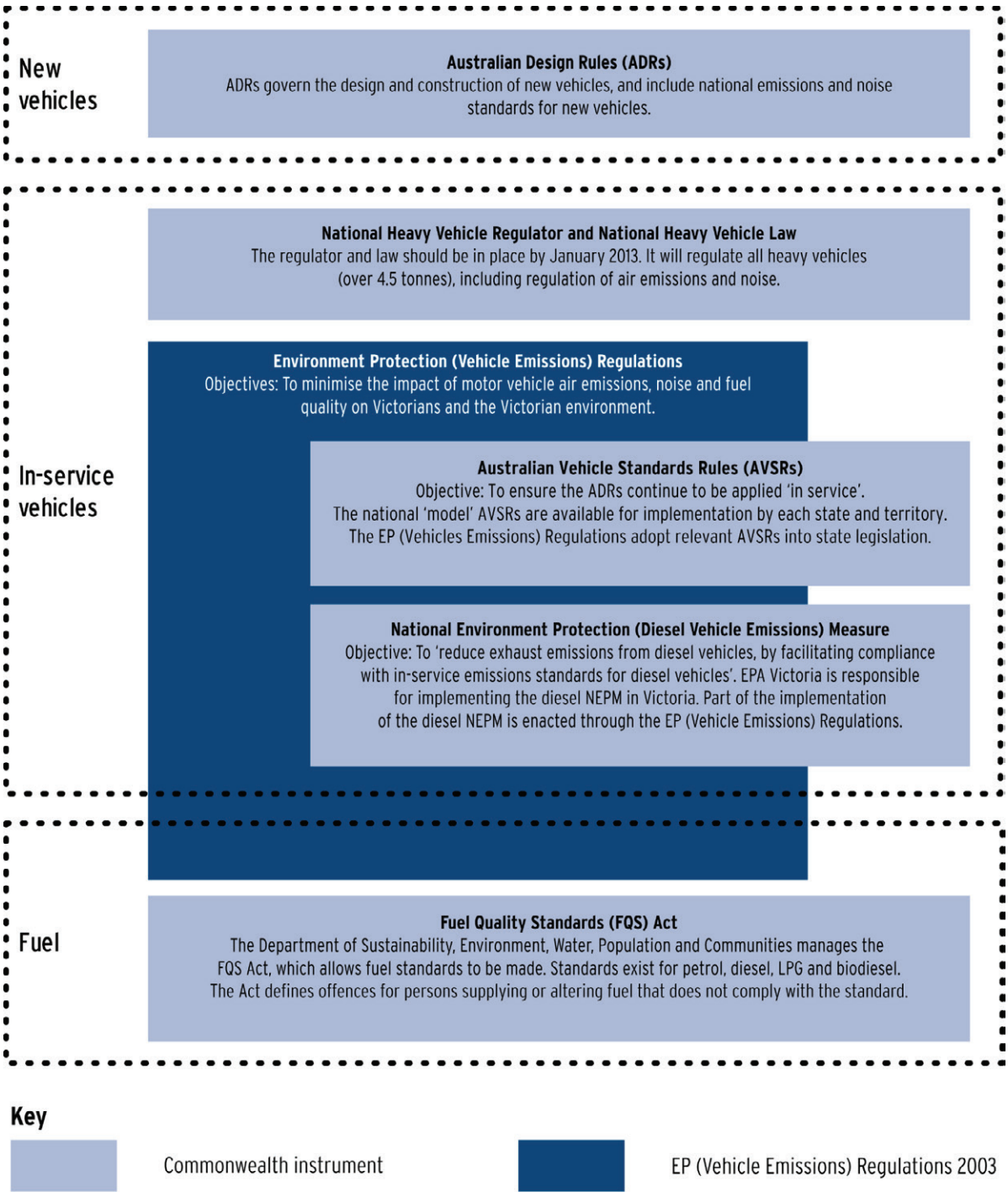
The relationship between these regulatory sources is shown in the figure below.

32 See summaries of health effects in Passchier-Vermeer W and Passchier WF 2000, 'Noise exposure and public health', *Environ Health Perspect, vol.* 108 Suppl 1, pp. 123-31; (US) Senate Public Works Committee, *Noise Pollution and Abatement Act of 1972*, S. Rep. No. 1160, 92nd Cong. 2nd session; University of California, Berkeley 2007, *'Noise: Health Effects and Controls* and United States Environmental Protection Agency Office of Noise Abatement and Control 1978, *'Noise: A Health Problem'*, Washington DC.

33 The National Environment Protection (Diesel Vehicle Emissions) Measure outlines administrative measures (such as improved fuel quality) to reduce exhaust emissions from diesel vehicles.

34 The Commonwealth has introduced a Heavy Vehicle National Law (HVNL) which will cover vehicles over 4.5 tonnes gross vehicle mass (GVM). The HVNL will cover emissions and noise as well as safety aspects.

Figure 2.1: Relationship between the Victorian and Commonwealth Regulations

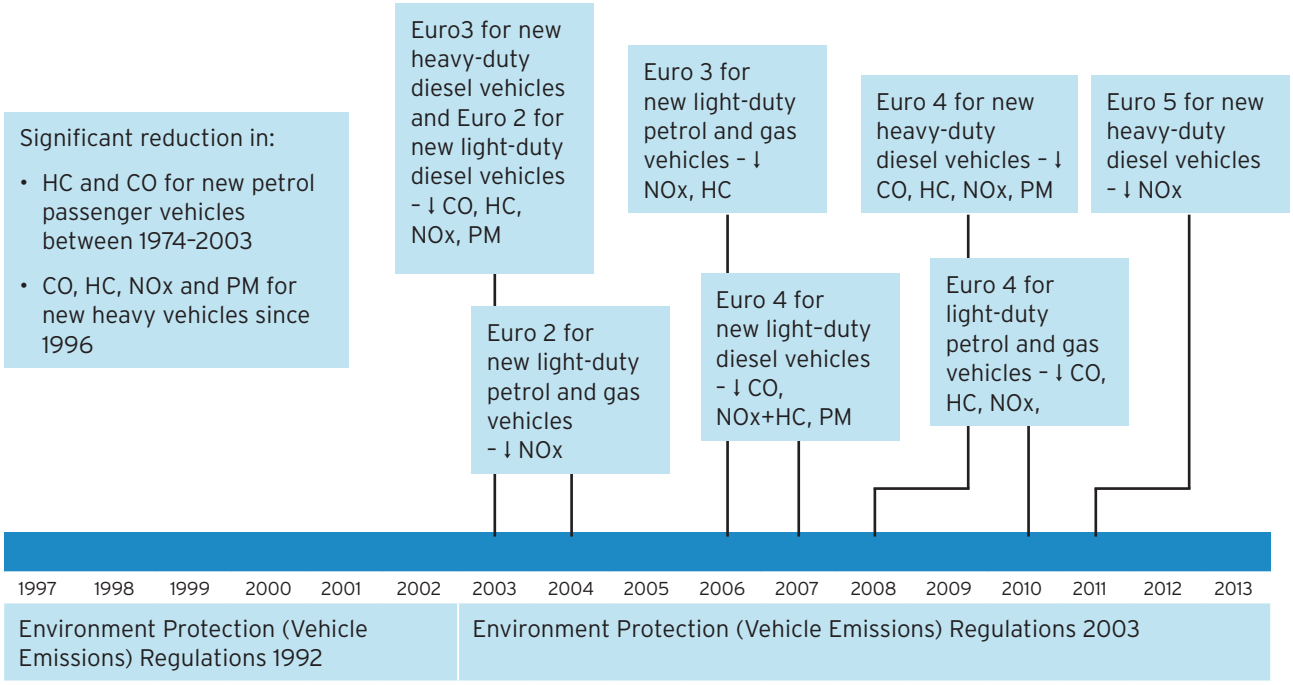


### 2.3.2 Effectiveness of current Regulations

*Exhaust-based emissions*

Regulation of in-service emissions has been in place for the last 40 years. This has been in parallel with limits set for vehicle design.

**Figure 2.2: Timeline for the introduction of vehicle standards for new vehicles and implementation of the Environment Protection (Vehicle Emissions) Regulations**




Over the life of the current Regulations, exhaust emissions from vehicles have generally decreased. This has been primarily due to improved design standards, and the renewal of the fleet. The enforcement of the current Regulations for in-service emissions has made a contribution to the reduction. For the primary pollutants targeted, the following table shows the reductions to date.

**Table 2.1: Reduction in vehicle exhaust-based emissions 2001–2011 (tonnes)[35]**

| Pollutant | 2002 | 2011 | Change in emissions | Contribution of current in-service Regulations |
|---|---|---|---|---|
| $PM_{10}$ | 4,800 | 3,400 | -1,400 (-29%) | -84 (-6.0%) |
| $NO_x$ | 177,000 | 86,000 | -91,000 (-51%) | -175 (-0.2%) |
| HCs | 88,000 | 47,000 | -41,000 (-47%) | -625 (-1.5%) |

The contribution of the in-service emission Regulations is largely driven by the detection activities. From 2004 to 2010, over 8,000 official cautions were issued under EPA's Official Smoky Vehicles Program. Over the same period, a further 4,500 legal notices relating to vehicle tampering were issued, and approximately 11,000 vehicles were inspected by EPA during targeted roadside operations (with a 53 per cent failure rate for vehicles inspected).

Between 2004 and 2010, EPA issued over 31,000 notices for noisy vehicles. It is difficult to measure the effectiveness of the current noise limits, as vehicle numbers and population density have risen over the same period resulting in an increase in the number of people reporting excessive noise from traffic.

35 The change in overall exhaust emissions from vehicles is taken from CTEE VFACTS 2011. Contribution of current emissions is an estimate by EPA based on the methods used in this RIS. The contribution includes only the impact due to vehicles detected and rectified, and does not include other reductions by vehicles seeking to avoid detection.

### *Evaporative emissions*

HCs evaporate from petrol and escape into the atmosphere through vehicles, and when tanks are filled. In 2002, in the absence of any Regulation targeted at evaporative emissions, there were around 29,300 tonnes of HCs released into the atmosphere from fuel sources.[36]

With the phased-in limits via the current Regulations on permitted vapour pressure during summer months, the total amount of HCs released in 2012 is around 29,700 tonnes. While this is a small increase of 1.4 per cent, petrol sales over the same period have increased by around 25 per cent. In the absence of vapour pressure Regulations, the volume of HCs released from these sources would be around 36,500 in 2012. The current Regulations therefore have reduced HC emission from fuel sources by around 18 per cent at the same time that petrol sales have increased by 25 per cent.

## 2.3.3 Ongoing government action is still required

As stated in a 2004 World Bank report on reducing urban air pollution, 'the imposition and enforcement of [vehicle emissions] standards have proven a very effective environmental policy in many countries.'[37]

Despite these reductions in emissions, meeting the standards for ground-level ozone and particle pollution set by the NEPM for Ambient Air Quality (NEPC 1998) remains a challenge, due to increases in population, motor vehicles and economic growth. Climate change is expected to further exacerbate summertime smog as the number of days above 30 degrees celsius is expected to increase.

Further reductions in emissions from new vehicles are planned with reductions of 70 per cent and 90 per cent for $NO_x$ and PM, respectively, required by 2018 with the introduction of Euro 5/6 Emission Standards for Light Duty Diesel Vehicles[38].

The ADRs related to vehicle emissions and to noise have been instrumental in reducing their impacts. However, air emissions and noise from in-service motor vehicles can exceed the ADR limits due to vehicle age, lack of maintenance, tampering, vehicle use, and the use of some aftermarket equipment and service providers.[39],[40],[41],[42]

Regulation of in-service emissions is still required because as vehicles age and accumulate mileage, their emissions tend to increase. This is both a function of the normal deterioration of emission controls of properly functioning vehicles, resulting in moderate emissions increases, and malfunction or outright failure of emission controls on some vehicles, possibly resulting in very large increases in emissions. The degree to which owners maintain their vehicles, by providing tune-ups and servicing according to manufacturers' schedules, can affect the likelihood of engine or emission control system failure and therefore the amount of exhaust emissions.[43]

Tampering of the emission control system can also lead to increased exhaust and/or evaporative emissions. The first *National In-service Emission Study* (NISE1) tested 10 modified vehicles to determine whether exhaust emissions and evaporative emissions were higher than the normal fleet. All the modified vehicles tested had extremely high evaporative emissions and did not respond to tuning.[44]

Continuation of existing regulatory and non-regulatory measures, together with additional emission reduction strategies, will be required to ensure Victoria meets national ambient air quality objectives.

According to the 2010 *Green Light Report*, noise from traffic and air pollution from motor vehicles, were the key recognised local pollution sources for Victorians.[45]

Relative to other states, all of which regulate emissions and noise of in-service vehicles, Victoria has a lower vehicle turnover rate than the national average (every 10.4 years versus 10.0 years) and has higher average kilometres travelled per vehicle per year (14,600km per vehicle versus 14,100km).

36 Emission estimates for evaporative emissions are based on retail petrol sales data published monthly by the Australian Government (DRET) and emission factors published by Environment Australia, 1999.

37 World Bank, (2004, *'Reducing Air Pollution from Urban Transport'* Gwilliam K, Kojima M and Johnson T for the World Bank, Washington DC, June 2004 at: http://www.cleanairnet.org/cai/1403/article-56396.html.

38 Department of Infrastructure and Transport (2010), 'Final Regulation Impact Statement for Review of Euro 5/6 Light Vehicle Emission Standards'.

39 Baltas N and Xepapadeas A 1999, 'Accelerating Vehicle Replacement and Environmental Protection – The case of passenger cars in Greece', *Journal of Transport Economics and Policy*, Vol 33, Part 3, pp 329-42.

40 European Commission 2004, 'Comparison of the EU and US Experiences with Respect to Controlling Emission from High Emitting Vehicles', Case Study developed for the *Assessment of the Effectiveness of European Air Quality Policies and Measures.*

41 Dill J 1995, 'Older Vehicles and Air Pollution', *Insights from the 1995 NPTS.*

42 Wenzel T, Ross M and Sawyer R 1997, *Analysis of Emissions Deterioration of In-use Vehicles, Using Arizona IM240 Data*, Presented at the Society of Automotive Engineering Government/Industry Meeting, Washington DC.

43 Wenzel T, Singer B and Slott R 2000, 'Some Issues in the Statistical Analysis of Vehicle Emissions', *Journal of Transportation And Statistics*, September.

44 Australian Government, Federal Office of Road Safety, 1996, Motor Vehicle Pollution in Australia, Report on the *National In-Service Vehicle Emissions Study*.

45 The *Green Light Report* has been produced by the Victorian Government every year since 2008 and provides insight into the environmental attitudes, behaviours and household features of Victorians. The 2010 *Green Light Report* collected data from 5,448 Victorians (via surveys and interviews).

### *Air quality*

Victoria's air quality compares favourably with that of other jurisdictions and with the SEPP objectives. International comparisons of air quality place Melbourne's ozone, sulphur dioxide, $NO_2$ and particle levels at the lower end of the range. However, levels of CO place it in the mid-range when compared with other cities.[46],[47]

Over time, the number of vehicles and vehicle kilometres travelled is projected to increase.[48] However, it is likely that by 2030 there will be a reduction in CO, $NO_x$, HCs, $PM_{2.5}$ and $PM_{10}$ emissions from the motor vehicle fleet notwithstanding a likely increase in diesel passenger vehicle use. This will happen through the progressive replacement of older vehicles with newer vehicles meeting tighter emission standards, and through the greater use of intrinsically low-emission vehicles (electric vehicles and hybrids).[49] This assumes that the age profile of the vehicle fleet remains stable, and that emission controls from the fleet do not deteriorate dramatically over time; and there are no widespread non-compliance issues (for example through effective Regulations).

However, concerns remain regarding the contribution of vehicle emissions to photochemical smog (particularly in Melbourne) and the health impacts of particulate matter, $NO_x$, CO, benzene and other HCs, particularly in an environment of increasing population growth in our major urban centres and resultant increases in vehicle numbers.[50]

EPA estimates that vehicles contribute up to 70 per cent of total urban air pollution. Motor vehicles are one of the major emitters of air pollutants in the Port Phillip region (Greater Metropolitan Melbourne, including Geelong), contributing more than 60–70 per cent of the $NO_x$ and up to 40 per cent of the HCs.[51] The major source of $NO_2$ emissions in Australian cities are motor vehicles.[52] While motor vehicles are not the major source of PM emissions in most urban areas, fuel combustion sources such as motor vehicles are a significant contributor to $PM_{2.5}$.[53]. Emissions from motor vehicles are also a significant source of air toxins such as benzene.[54]

While Victoria's air quality is generally good, motor vehicles[55] still continue to be a significant source of emissions into the air environment. Melbourne's day-to-day air pollution continues to be largely caused by motor vehicle use.[56] This is consistent with concerns expressed by communities about the impact of motor vehicle emissions on their health, particularly from people living near busy roads with high volumes of diesel vehicle traffic. Other sources of air pollution, such as major fires and dust storms, tend to affect large areas of Victoria over shorter time scales (days to weeks) in summer. In winter, domestic heaters (for example, wood heaters) make a significant contribution to air pollution.

Increased frequency and severity of bushfires, and low rainfall attributed to climate change, will produce added pressures on air quality for example increased smoke and dust.[57] Despite the improvements in air quality, visibility remains an issue in Victoria. While the number of days with poor visibility has decreased since 1979, the NEPM AAQ goal regarding visibility has not consistently been met.

Data for New South Wales, which has a limit on vapour pressure the same as Victoria, indicates that compliance with the existing regulated limits reduces HC emissions equivalent to removing 20 per cent of cars from the road in summer (over 4,000 tonnes each summer).[58] Lowering petrol volatility also reduces air toxics and has greenhouse gas benefits.

The following table summarises the projected emissions from vehicle exhausts in 2022, if the current Regulations were not continued.

46 Auditor-General of Victoria 2002, *Managing Victoria's Air Quality*, 4 June 2002.
47 Australian State of the Environment Committee 2011, *State of the Environment 2011*, Independent report to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities.
48 Greenhouse gas emissions from Australian Transport: Projections to 2020, Working paper 73.
49 Data from emissions inventory and projections assumed from 'Most Likely Future Scenario for 2030' (part of EPA and CSIRO Future Air Projections Project - unpublished).
50 Marshall J, McKone T, Deakin E and Nazaroff W 2005, 'Inhalation of Motor Vehicle Emissions: Effects of Urban Population and Land Area', *Atmospheric Environment*, Vol. 39, pp. 283-295.
51 Sourced from EPA's *2006 Air Emissions Inventory*. The latest air emissions inventory prepared by EPA for Victoria and the Port Phillip Control Region is for 2006. The Inventory is updated every five years to align with the census as this data is used to provide activity data for many of the emission sources. The next full update will be for the year 2011 and will be finalised in 2014.
52 In 2006 motor vehicles in Melbourne contributed 70 per cent of all nitrogen oxide emissions. Sourced from EPA's 2006 Air Emissions Inventory.
53 EPA 2006, *Air Emissions Inventory*.
54 EPA 2006, *Air Emissions Inventory.*
55 'Motor vehicles' includes passenger vehicles, freight-carrying road vehicles (light and heavy), buses and motorcycles.
56 EPA 2006, *Air Emissions Inventory.*
57 Commissioner Environmental Sustainability Victoria 2008, *Key Findings and Recommendations - State of the Environment Victoria 2008, 17 October 2008.*
58 DECCW (NSW), *Regulatory Impact Statement: Proposed Protection of the Environment Operations (Clean Air) Regulation 2010.*

Table 2.2: Projected vehicle exhaust-based emissions 2011–2022 (tonnes)[59]

| Pollutant | 2011 | 2022 | Change in emissions |
|---|---|---|---|
| $PM_{10}$ | 3,400 | 2,900 | -500 (-15%) |
| $NO_x$ | 86,000 | 45,200 | -40,800 (-47%) |
| HCs | 47,000 | 25,700 | -21,300 (-45%) |

These projections have incorporated the introduction of Euro 5/6 (motor vehicle standards for new light vehicles), but do not include the introduction of Euro 6 for heavy vehicles or provide for any impact of the Commonwealth's carbon pricing mechanism. The Commonwealth's clean energy future legislation applies a carbon price to transport fuels used in rail, shipping and aviation. All passenger and light vehicles are excluded from the carbon pricing Commonwealth Treasury modelling and confirms that transport activity is projected to be relatively unaffected by carbon pricing, and abatement (through changes to vehicle fleet and fuel use) will be limited until after 2020.[60]

In relation to evaporative emissions, total petrol sales are expected to increase by around 34 per cent by 2022. Assuming there is no change to petrol composition due to voluntary industry changes or other Regulation changes, the volume of petrol sales will determine the level of expected evaporative emissions.

If the current Regulations related to vapour pressure were not to be continued, total HC emissions from evaporative sources would increase to around 49,300 tonnes in 2022, an increase of 66 per cent from their current levels. However, even with continuation of the current vapour pressure requirements, HC emissions from these sources would still represent a significant amount – over 40,000 tonnes in 2022. This is driven primarily by increased fuel consumption, and is an ongoing concern as the number of people exposed to these emissions increases in the future.

Therefore, there is merit in considering further measures to reduce emissions from fuel evaporation.

While there are other sources of emissions affecting air quality, motor vehicle use makes a significant contribution to overall emission levels, and this is expected to continue in the future. In particular, motor vehicle use contributes:

- around 35 per cent of $NO_x$ emissions in Victoria and around 70 per cent within the PPAQCR – by 2022, motor vehicle use is expected to contribute to around 45 per cent of $NO_x$ emissions within the PPAQCR
- around 5 per cent of HC emissions in Victoria and around 30 per cent within the PPAQCR – by 2022, motor vehicle use is expected to contribute to around 22 per cent of HC emissions within the PPAQCR
- around 15–20 per cent of PM emissions within the PPAQCR – by 2022, motor vehicle use is expected to contribute to around 10–15 per cent of PM emissions within the PPAQCR.

$NO_x$ and HCs are precursors to ozone formation. Ground-level ozone has significant health and environmental impacts (see Attachment E). Global warming would be expected to increase ozone formation because the higher the temperature, the greater the evaporative emissions of precursor HCs from both biogenic and anthropogenic sources. Also, the chemical reactions that create ozone run faster under warmer temperatures.

Modelling from a study in Sydney indicates that the impact of global warming on ozone formation (assuming that anthropogenic emissions stay constant at 2003 levels) will cause exceedences of the Air NEPM standards to increasing by 27–30 per cent between 2021 and 2030 and 45–92 per cent in the decade from 2051.[61] Studies have also been undertaken for Melbourne, which show a similarly large increase in ozone exceedences as a result of climate change.[62],[63]

The link to global warming is self-perpetuating, as ground-level ozone is not only affected by global warming but as a greenhouse gas it is also a contributor.[64]

59 The projections are based on unpublished work Victorian Transport Facts undertaken by the Centre for Transport Energy and the Environment, completed in June 2011. The review made projections based on detailed analysis of trends in vehicle use, fuel consumption, and regulatory changes. The projections assumed continuation of the current Victorian Regulations, and EPA has made adjustments to these projections to reflect the effects of removing the current Regulations, based on the methodology used in this RIS.

60 Australian Government 2011, *Strong Growth Low Pollution: Modelling a Carbon Price*, Canberra.

61 Cope, ME, Lee, S, Physick, B, Abbs, D, Nguyen, K &and McGregor, J 2008, *A methodology for determining the impact of climate change on ozone levels in an urban area*, Report by Commonwealth Scientific and Industrial Research Organisation, Division of Marine and Atmospheric Research, for the Department of the Environment, Water, Heritage and the Arts (Clean Air Research Program), Canberra, available at www.environment.gov.au/atmosphere/airquality/publications/pubs/climate-change/climate-change.pdf.

62 Walsh S, Cope M, Goudey R, Bisignanesi V. and Dewundege P2009, *Urban Ventilation and Photochemical Smog in Melbourne for a Future Climate Scenario*, Proceedings of the 9th International Conference on Southern Hemisphere Meteorology and Oceanography, Melbourne, 9-13 Feb 2009, available at: www.bom.gov.au/events/9icshmo/manuscripts/M1500_Walsh.pdf.

63 Cope M, Lee S, Walsh S, Bannister M, Delaney W, Marshall A and Katzfey J 2011, *Predicting Future Air Quality: Modelling the Effect of Climate Change on Air Quality in Melbourne*, 20th International Clean Air & Environment Conference, Auckland, 31 Jul – 2 Aug 2011.

64 Intergovernmental Panel on Climate Change at www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-faqs.pdf page. 100.

### *Noise*

Evidence for Victoria suggests that there are concerns similar to that surrounding air quality in relation to vehicle noise affecting Victorians. The *2010 Green Light Report* indicates that one of the key locally recognised pollution issues is noise (specifically from traffic). Noise from traffic was found to be a greater issue in metropolitan than regional areas.

ABS 2010–2011 data indicates that noisy driving (33 per cent) and dangerous driving (34 per cent) are the two most commonly reported types of social disorder in Victoria. This is ahead of other social disorder issues such as public drunkenness, offensive language and noisy neighbours. Seventy-eight per cent of respondents said noisy driving was a moderate or large issue.[65]

An EPA survey of 1,213 Victorians in 2006 indicated that 20 per cent of respondents had been 'moderately' or 'extremely' annoyed by road traffic noise in the previous 12 months. This translates to approximately a million Victorians. Road traffic noise, neighbour noise, audible alarms and construction noise are the four sources of noise most annoying to Victorians.[66]

Respondents who were slightly to extremely annoyed by road traffic noise were asked if there was a particular type of road traffic noise that annoyed them (in their home) over the preceding 12 months. The following table provides the responses to this question and the percentage of times the noise source was identified as annoying (multiple answers were allowed).

#### Table 2.3: Road traffic noise sources

| Noise source[67] | Responses that identified the noise source |
|---|---|
| Trucks | 14.3% |
| Hotted up cars/modified cars | 11.2% |
| Private cars | 8.8% |
| Motor bikes | 6.7% |
| Truck engine brakes or air brakes | 4.3% |
| Car stereos/music from vehicles | 3.3% |
| Garbage trucks | 2.8% |
| Buses | 1.7% |
| Delivery vehicles/vans | 1.0% |

Source: EPA 2007, Community Noise Survey

Respondents found noise from modified cars most annoying at night, and noise from motorbikes most annoying during the evening.

As part of a survey to determine how EPA is tracking against its 5 Year Plan, 799 Victorians were surveyed in three waves in October 2011, February/March 2012 and May 2012 regarding whether they had been affected at home or in their local neighbourhood by noise, odour or dust in relation to a number of sources. The methodology was based on the ISO/TS 15666:2003 standard for social measurement of noise impacts. The survey indicated that 23 per cent of Victorians had been disturbed in the home by road traffic from individual vehicles. A similar number (25 per cent) indicated busy roads as a source of disturbances in the home.[68]

The average level of disturbance (excluding those that were not disturbed) was moderate at 5.9 out of 10. However nearly half of those disturbed by these two sources (57 per cent for busy roads, 59 per cent for individual vehicles) were very to extremely disturbed (6 out of 10).

An early international study found that the external cost associated with the annoyance caused by motor vehicle noise in the United States, based on a method of inferring costs by analysing property values (see Attachment F) was between $100 million and $5 billion per year (1991 dollars).[69]

65 Australian Bureau of Statistics 2011, *Crime Victimisation 2010-11*, Cat. no.ABS 4530.0.

66 EPA 2007, *Community Noise Survey*.

67 Only relevant noise sources to the proposed Regulations have been included in the Table. For the complete table refer to the *Community Response Noise Survey Final Report* which can be accessed at http://www.epa.vic.gov.au/noise/full_reports.asp

68 EPA Victoria 2012, *EPA Victoria 5 Year Plan Outcomes Social Research*, unpublished.

69 Delucchi and Hsy 1996, 'The External Damage Cost of Direct Noise from Motor Vehicles', Report 14 in series *The Annualized Social Cost of Motor Vehicle Use in the United States*, December 1996.

The social costs of traffic noise has been estimated to be over €40 billion per year for the Euro countries (approximately 0.4 per cent of total GDP), with passenger cars and trucks equally responsible for bulk of costs.[70] Traffic noise alone is harming the health of almost every third person in the European Region, with one in five Europeans regularly exposed to sound levels at night that could significantly damage health.[71] The social costs of road traffic noise are estimated to be equal to about one-third of those associated with road traffic accidents.

The social cost estimates for the Euro countries indicates a social cost per capita of €60 per year from vehicle noise, or around €190 per year for those actually exposed to excessive noise. Averaged over the number of vehicles, the social costs amount to around €235 per vehicle.[72] Translated to the number of vehicles in Victoria, this would amount to social costs of vehicle noise in the order of $1 billion per year or $250 per vehicle.

Attachment B outlines recent changes and future projections in Victoria's vehicle fleet. Attachment C outlines recent performance in relation to emission reductions. These demonstrate that the current Regulations have been effective in reducing emissions, but that continuing action is needed to achieve the goals of the NEPM, and particularly in recognition of the projected increase in the number of vehicles over the next decade.

### 2.3.4 Proposed changes to the current Regulations

The current Regulations include a process for granting exemptions to the vapour pressure requirements. To date, the only exemptions granted have related to ethanol-blended fuels, which inherently have a higher volatility. As the exemption process involves time and resources, EPA considers that it is more effective to establish a separate limit for ethanol-blended fuels, avoiding the need for suppliers to apply for exemptions. The proposed Regulations make it clear that other alcohol petrol blended fuels are covered by the Regulations and will need to comply with the petrol limit or apply for an exemption to the Regulations.

There are also a number of changes proposed in relation to exhaust emissions. These are:

- For passenger vehicles propelled by a spark ignition, maintaining the current CO concentration and introducing a HC concentration, and, for vehicles manufactured post January 1986, a high-idle test and a more stringent HC concentration. A number of other minor changes to align to the AVSRs (the current Regulations were introduced prior to the AVSRs being finalised).[73]

There are a number of items in the current Regulations that are not being included in the proposed Regulations. These are:

**Table 2.4: Current Regulations not continued**

| Regulation | Reason |
|---|---|
| Constituents of fuel | This is now regulated by the Commonwealth under the *Fuel Quality Standards Act 2000.* |
| Noise emission standards for off-road racing motorcycles | The scope of the proposed Regulations do not include off-road vehicles. |
| Vertical Exhaust Pipes for diesel vehicles | The vertical exhaust requirements relate to heavy vehicles (over 4.5 tonnes). It is more appropriate that these Regulations are included in the Heavy Vehicle National Law if required. See section below. |
| Exhaust system construction | This Regulation has not been remade as the proposed Regulations deal with on-road in-service vehicles. |
| Device or mechanism for idle mixture control | The outcomes-based emission limits for spark ignition engine vehicles will deal with this issue without being prescriptive. In addition the scope of the Regulations is limited to in-service vehicles, rather than construction issues. |
| Sale of a vehicle not kept, maintained and adjusted in the prescribed manner | Lack of transparent way to prescribe manner in which vehicle must be kept, maintained and adjusted. |

70 Den Boer LC and Schroten A 2007, *Traffic noise reduction in Europe*, CE Delft. (Note: figure is based on 2006 prices.)
71 World Health Organization 2012, www.euro.who.int/en/what-we-do/health-topics/environment-and-health/noise Accessed 12 January 2012.
72 Regulatory Impact Solutions calculations based on United Nations Economic Commission for Europe's statistical database.
73 High-idle test engine speed between range of 2500 rpm to 3000 rpm.

| | |
|---|---|
| Labelling of fuel types | This Regulation is no longer considered necessary. The market uses the terms diesel, petrol, premium unleaded petrol and unleaded petrol to describe fuels and is generally understood. Where a new fuel blend is introduced, for example ethanol blend fuels, the Commonwealth can require labelling under the *Fuel Quality Standards Act 2000*. |
| Offence to use non-compliant vehicle | Only Regulation pertaining to noise labelling remade. Others not remade as already captured by setting noise standards. |
| Unlawful modification of engine, exhaust or fuel system | This Regulation has not been remade as the issue is regulated under the Road Safety (Vehicles) Regulations 2009. |
| Interfering with emission control system | This Regulation has not been remade as the issue is regulated under the Road Safety (Vehicles) Regulations 2009. |
| Interfering with noise-reducing equipment | This Regulation has not been remade as the issue is regulated under the Road Safety (Vehicles) Regulations 2009. |
| References to lead replacement fuel | These Regulations were relevant to the phasing out of leaded petrol, which is now completed. |
| Maintenance of unleaded requirements | This Regulation is no longer required as there is no longer of a problem as leaded petrol has been phased out. |
| Recording of benzene content of petrol | This Regulation is no longer required as the content of benzene in petrol is controlled nationally through the Fuel Standard (Petrol) Determination 2001. |
| Recording of information concerning petrol | This Regulation is no longer required as it is included in the Annual Compliance Report. |
| Authority may require records | This Regulation is not required as it duplicates s.55(3) of the *Environment Protection Act 1970*. |
| Information provided to the Authority must be correct | This Regulation is not required as it duplicates s.59D of the *Environment Protection Act 1970*. |

### 2.3.5 Exclusion of heavy vehicles

The Council of Australian Governments agreed to introduce a Heavy Vehicle National Law (HVNL). Victoria has agreed to adopt the HVNL in Victoria. The Law will regulate emissions, noise and safety of in-service vehicles over 4.5 tonnes gross vehicle mass (GVM) and hence the proposed Regulations have been revised to only cover light vehicles (less than or equal to 4.5 tonnes GVM). This includes the emission (visible emissions and diesel engine exhaust) and noise limits. The full commencement of the HVNL in Victoria is due to commence in September 2013. The analysis in this RIS excludes the impacts on heavy vehicles.

EPA is not aware of any evidence that there remains a problem with vertical exhausts given recent improvements in diesel fuel quality and diesel engines. If evidence becomes available then this should be considered as part of the NHVL.

# 3 Reducing pollution from use of vehicles

## 3.1 Objective

The proposed Regulations deal with the 'clean air' and 'control of noise' parts of the *Environment Protection Act 1970*. A primary source of air pollution and noise is from the operation of motor vehicles (see section 2 for detailed information).

Two objectives of the proposed Regulations are to:

- prescribe air emission standards and standards of maximum permissible concentration for emissions from motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment
- prescribe noise emission standards for motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment.

## 3.2 Base case

The base case is a hypothetical 'do nothing' scenario, against which real options for action can be assessed. It reflects the likely outcomes over the next 10 years if the current Regulations are allowed to lapse and are not replaced, and all other activities continue on a business-as-usual basis.

Under the base case, new vehicles in Victoria would continue to be required to meet the ADRs, which include standards that vehicles must meet in relation to emissions and noise.

There would be no specific requirement that vehicles continue to meet these, or any, standard once in service.

However, it is recognised that even in the absence of any specific Regulations (or other government actions), many vehicles will not be a source of excessive emission or noise as:

- most vehicles that meet the ADRs at time of sale are likely to continue to have low emissions during the time that their emission control equipment continues to operate effectively
- most owners have regular vehicle servicing, which assists in limiting emissions
- it can be assumed that a number of drivers will voluntarily take action for vehicles that they perceive to be excessively noisy or visibly smoky
- vehicle fuel would still be required to meet national fuel standards
- vehicle emission and noise standards for heavy vehicles will be regulated under the HVNL.

The Australian and Victorian Governments also have a suite of other strategies and initiatives that address emissions from vehicles, which are assumed to continue under the base case. These include:

- Nationally – the Department of Infrastructure and Transport released a discussion paper examining the introduction of $CO_2$ emission standards for light vehicles
- in Victoria – the Government is encouraging changes to more sustainable travel options including public transport (construction of the Regional Rail Link, extension of the rail network to South Morang and purchase of 50 new low-floor trams) and walking and cycling (Box Hill to Ringwood shared path, Melbourne Bike Share and the Westgate Punt ferry services). The Government is also supporting increased utilisation of low-emission vehicles (Electric Vehicle Trial and initiatives to enable fleet managers to improve the efficiency of their fleets).

EPA estimates that, in the absence of Regulations, there would be a weakening of the current downward trends in tailpipe emissions of air pollutants. The proportion of vehicles that would be tampered with and have deleterious environmental impacts or neglected in the absence of Regulations is not known, but it is likely that emissions from such vehicles would partly offset the expected benefits of progressive replacement of older vehicles with newer vehicles. EPA estimates noise levels in the next 10 years are likely to increase. This is because of the projected increase in the number of vehicles, the projected small uptake of quieter vehicles (for example, hybrid or electric vehicles), and no planned tightening of national noise standards for new vehicles.

Under the base case, sections of the *Environment Protection Act 1970* relating to limiting emissions and noise would still operate, however they could not be used by EPA in relation to use of motor vehicles.

### Table 3.1: Existing provisions of the Act related to emissions and noise

| Section of Act | Application to use of vehicles |
|---|---|
| Section 40 requires emission of wastes into the atmosphere to be in accordance with declared SEPP specifying acceptable conditions for emitting wastes into the atmosphere. | The SEPP AAQ sets air quality objectives and goals for the whole State of Victoria. The SEPP AQM establishes the framework for managing emissions into the air environment in Victoria from all sources of air pollutants, so that the air quality objectives outlined in the SEPP AQM are met. The SEPP AQM provides a framework for reducing motor vehicle emissions but does not set specific emission limits for individual motor vehicles or fuel. |
| Section 41 prohibits a person from polluting the atmosphere so that the condition of the atmosphere is so changed as to make or be reasonably expected to make the atmosphere noxious or offensive to the senses of human beings, harmful or potentially harmful to human beings, or detrimental to the atmosphere. | While standards can be set under s 41(2) that define when a breach of s41 is deemed to occur, the prohibition also exists without the need for further Regulations. However, without any clear standard, EPA could not effectively enforce compliance. |

Table 3.1: Existing provisions of the Act related to emissions and noise (continued)

| | |
|---|---|
| Section 46 requires emission of noise to be in accordance with State Environment Protection Policy specifying acceptable conditions for emitting noise. | SEPPs have been created relating to control of music noise from public premises and control of noise from commerce, industry and trade. Nothing in these SEPPs are applicable to use of motor vehicles on the road. |
| Section 48A creates an offence for a person who emits or causes unreasonable noise from any residential premises. Regulations may be made that prescribe particular noises that, if they can be heard in a habitable room in any other residential premises, they are deemed to be unreasonable noise. | The Environment Protection (Residential Noise) Regulations 2008 prescribe an item for a motor vehicle (except a vehicle moving in or out of premises), during the following times:<br>Monday to Friday: before 7am and after 8pm.<br>Weekends/public holidays: before 9am and after 8pm.<br>The section has no application when a vehicle is not at a residential premises. |

The provisions in the Act that relate specifically to motor vehicles (sections 43A, 48B and 48D) would not be operative as they require standards to be prescribed in Regulations. Also, the more general section 48 (which creates an offence for a person who emits or causes objectionable noise) would also require Regulations to define objectionable noise.

## 3.3 Options to achieve the objectives

This section identifies three options for addressing the objective that have been assessed. These are:

1. specify maximum emission limits
2. implement a mandatory maintenance regime
3. a non-regulatory approach.

### 3.3.1 Specifying maximum emission limits

Prescribing maximum air and noise emission limits, consistent with those in the AVSRs, is the approach proposed in the Regulations.

Under this option, the limits will be set to reflect those in the AVSRs. The AVSRs are based on the ADRs and allow for a reasonable level of deterioration in the performance of a vehicle over its life. The AVSRs are model rules that have already been subjected to regulatory impact assessment, which has established that the AVSRs provide a net benefit to the community.[74] Adopting the AVSRs as the relevant standards contributes to uniform vehicle standards throughout Australia, which promote safety, efficiency and environmental protection. The AVSRs have been adopted by all other Australian jurisdictions, and harmonisation, where appropriate, is good public policy. Under the IGA the Victorian Government has agreed to adopt the AVSRs. The IGA recognises that in exceptional circumstances, an agreed reform may not be able to be fully implemented (for example, where a jurisdiction has adopted all aspects of the reform but imposes other material requirements) due to policy or practical constraints. In this case, the jurisdiction must inform the NTC and SCOTI as early as practicable of the reason for the decision.

74 Despite the regulatory impact statement for the AVSRs finding the net benefit, it is prudent to re-examine this option in terms of updated information (the most recent national assessment was in 2003), assessment of costs and benefits specific to Victoria, and to evaluate this option against other options that were not previously assessed.

The limits adopted from the AVSRs are summarised in the table below.

### Table 3.2: Summary of proposed Regulations

<table>
<tr><th>Area</th><th>Requirements</th></tr>
<tr><td>Vehicle emissions</td><td>The emission from any motor vehicle that is propelled by an internal combustion engine must not be visible for a continuous period of 10 or more seconds.[75]<br><br>A diesel engine vehicle described in the following table must not have rates of emission of exhaust gases or particles exceeding the relevant level specified in the table:<br><br>
<table>
<tr><th>GVM rating</th><th>Rate of $NO_x$ emissions (g/km/tonne)</th><th>Rate of particle emissions (g/km/tonne)</th></tr>
<tr><td><3.5</td><td>1.5</td><td>0.23</td></tr>
<tr><td>3.5–12</td><td>2.0</td><td>0.23/0.15</td></tr>
<tr><td>12–25</td><td>2.0/1.5</td><td>0.08/0.05</td></tr>
<tr><td>>25</td><td>1.5/1.2</td><td>0.07/0.03</td></tr>
</table>
Where two numbers are indicated, the first relates to vehicles manufactured before 1996 and the second to vehicles manufactured from 1996 onwards. (See note above in relation to the planned National Heavy Vehicle Law.)<br><br>The exhaust gas emitted by a vehicle must not be greater than 25% opacity averaged over a DT 80 test cycle.[76]</td></tr>
<tr><td>Noise</td><td>A passenger vehicle must not emit noise exceeding 90dB(A) (or 96dB(A) if manufactured before 1 November 1983).<br><br>A motorcycle or motor tricycle must not emit noise exceeding 94dB(A) (or 100dB(A) if manufactured before 1 March 1985).<br><br>A goods vehicle or bus must not emit noise exceeding the level specified according to engine type, gross mass, exhaust height and date of manufacture. The maximum noise that can be emitted ranges from 85 to 109dB(A).<br><br>These requirements only apply to light vehicles (see below).</td></tr>
</table>

**Changes from the current Regulations**

In relation to specific limits, the proposed Regulations include a number of changes from the current Regulations.

### Table 3.3: Emission limits changes from current Regulations

| Current | Proposed | Rationale |
|---|---|---|
| 10-second smoke rule does not apply because of condensation of water vapour, or vehicles manufactured before 1 July 1977. | 10-second smoke rule would also not apply to emissions due solely to heat, or for vehicles manufactured before 1 January 1930. | The change is to align the Victorian Regulations with the wording in the AVSRs.[77] EPA does not expect any material impact to result from this change. |
| - | The stationary noise level of a vehicle that is certified to ADR 83/00 must not exceed, by more than 5 dB(A), the noise level that is established for the vehicle when it is certified. | This additional provision is to align with the AVSRs. |
| $NO_x$ limit for post-1996 vehicles 12-25 GVM was 0.15 g/km/tonne | $NO_x$ limit for post-1996 vehicles 12-25 GVM was 1.5 g/km/tonne | The figure in the current Regulations is a typographical error. |

75 This Regulation does not apply if the emission is visible solely because of heat or the condensation of water vapour; or the motor vehicle was manufactured before 1 January 1930.

76 The DT* in-service test is for diesel vehicles as specified in the Road Transport Reform (Vehicle Standards) Amendment Regulations 2001 published by the National Transport Commission

77 The current AVSRs were finalised after the current Victorian Regulations were made.

Heavy vehicles will no longer be regulated under the proposed Regulations. This is because they will be regulated under a Heavy Vehicle National Law (HVNL). The Council of Australian Governments agreed to introduce a HVNL to regulate emissions, noise and safety of in-service vehicles over 4.5 tonnes gross vehicle mass (GVM). The full commencement of the HVNL in Victoria is due to commence in September 2013, hence the proposed Regulations have been revised to only cover light vehicles (less than or equal to 4.5 tonnes GVM). This includes the emission (visible emissions and diesel engine exhaust) and noise limits. The analysis in this RIS excludes the impacts on heavy vehicles.

**Beyond national standards**

The AVSRs are the most appropriate method for regulating emissions from in-service vehicles, given they are based on the ADRs, and provide a performance-based approach, which is preferred. The IGA does however allow jurisdictions to impose additional measures where there are good policy reasons for doing so. To address the gaps in the AVSRs' coverage EPA proposes to impose CO and HC limits, as well as recreational motorcycle noise limits. EPA is satisfied that these additional measures and the AVSRs represent a net benefit to Victoria.

The AVSRs are also the basis for in-service emissions Regulations in all other Australian jurisdictions.[78]

The AVSR's do not set emission limits for spark ignition-engined vehicles. EPA believes the inclusion of CO and HC limits in the Regulations is an important addition to reduce invisible emissions. Given Victoria's commitment under the IGA it has notified the NTC and ATC of this proposed option in this RIS.

Excess CO and HC in the vehicle exhaust are usually indicators of poor maintenance or tampering. Vehicles that are poorly maintained or have been tampered with contribute disproportionally to air pollution. The Second *National In-Service Emission Study* (NISE2) found that 20 per cent of vehicles are responsible for 70 per cent of emissions. Excess HC in the exhaust are an indication of incomplete combustion from unburnt fuel, which is not covered by the current Regulations.

Therefore to provide a comprehensive approach, the proposed Regulations also require:

- a passenger vehicle propelled by a spark ignition engine must be kept, maintained and adjusted so that it complies with the prescribed maximum permissible concentrations of CO and HC specified in the table.

| Vehicle date of manufacture | CO (% by volume) | HC limit (ppm) |
|---|---|---|
| On or after 1 July 1976 and before 1 February 1986 | ≤4.5 at idle | ≤1200 at idle |
| On or after 1 February 1986 | ≤4.5 at idle<br>≤1.0 at high idle | ≤600 at idle<br>≤200 at high idle |

This is a similar approach to the current Regulations, which provide that a vehicle must not have a concentration of CO in any exhaust pipe exceeding 4.5 per cent by volume. The proposed Regulations also introduce a HC limit, and, for newer vehicles, a high-idle test and a more stringent HC concentration.

The high-idle test (engine rotational speed between 2500 and 3000 rpm) aims to detect further unseen internal tampering and emission control system faults not detected when the vehicle is at idle. The high-idle CO and HC limits for passenger vehicles manufactured on or after 1 February 1986 and the idle HC limits are based on vehicle emission testing data from NISE1. The main study tested 540 cars for HC, $NO_x$ and CO that complied with early Australian Design Rules ADR27 and ADR37. Given that the majority of Victorian passenger vehicles are newer than this, and need to comply with more stringent ADRs, most vehicles will be able to meet these limits. The proposed limits aim to capture only high polluters.

Vehicles detected through the official smoky vehicle program would be tested against these limits as part of the inspection with the vehicle tester. These limits would also be used as a threshold for detecting high-emitting vehicles through remote sensing. A continuation of the idle test is proposed as these tests are relatively quick and inexpensive to perform, and the existing tester network already has the capital equipment required to undertake the test. The high-idle test uses the same equipment.

The AVSRs do not set limits for recreational motorcycles as they are beyond the scope of the AVSRs, which deal with motor vehicles on roads and road-related areas. Therefore, noise limits are specified for recreational motor cycles. These are proposed to be the same as the limits in the current Regulations.

The proposed Regulations also include specific offences and penalties for non-compliance with the standards, used within EPA's enforcement approach. These include prohibition of selling a motor vehicle that does not comply with a prescribed noise emission standard and use of temporary noise defeating devices. These are important provisions to ensure that EPA can effectively enforce the Regulations.

The proposed Regulations also specify labelling requirements for certain motor cycles and trikes. While these provisions appear to create a compliance burden by requiring the fixing of these labels to vehicles, they in fact have

78 NTC 2007, *Evaluation of the Implementation of the Vehicle Standards – Report* confirms the adoption of AVSR limits in Australian jurisdictions.

limited impact as the fixing of the label, and its prescribed contents, is required under the ADRs, ADR 83/00. The replication of this requirement into the Victorian Regulations is necessary to provide that these labels cannot be removed or altered, which assists in EPA's enforcement of the noise provisions.

**Authorising provisions**

The limits would be prescribed by the proposed Regulations and enforced through the following provisions of the Act.

- Section 42(1)(b) creates an offence for the selling of a vehicle other than a new vehicle capable of emitting into the atmosphere any matter that does not comply with any prescribed emission standard; or standard of maximum permissible concentration for visible emissions or the emission of carbon monoxide when the engine of the vehicle is idling.
- Section 43A(1)(b) creates an offence for using a vehicle that is capable of emitting into the atmosphere any matter that does not comply with any prescribed emission standard or standard of maximum permissible concentration for emissions. The maximum penalty is 60 penalty units.
- Section 48B creates an offence for using a motor vehicle capable of emitting noise that does not comply with any standard prescribed. Penalty is not more than 30 penalty units.
- Section 48D(3A) further creates an offence for selling a noise control device which when fitted to a vehicle in accordance with the fitting instructions, still leaves the vehicle capable of emitting noise that does not comply with the standard prescribed.

### 3.3.2 Mandatory maintenance regime

A feasible option that has been assessed is the introduction of a vehicle inspection and maintenance program. The program would require that certain vehicles undergo compulsory servicing and maintenance at specified times. Owners of vehicles would need to provide certificates of maintenance to EPA as a means of continued use of their vehicle.

The logic of the program is that regularly serviced vehicles are less likely to show significant deterioration in emission and noise performance from the ADRs, and therefore an overall increase in servicing should lead to a reduction in emissions and noise.

A vehicle inspection and maintenance program could be directed towards:

- all vehicles; or
- vehicles in predefined groupings, such as those based on vehicle age, distance travelled, or vehicle model.

It is not practical to require all vehicles to be part of a mandatory program, as this would be poorly targeted and inconsistent with EPA's risk-based approach to Regulation.[79]

As it is expected that the age of a vehicle, as a proxy for its use, is linked to how much it may have deteriorated from its original design specifications if not regularly maintained, a more targeted program would be established. It is also noted that action taken on a gross polluting diesel vehicle tends to lead to a higher benefit to community than a similarly polluting petrol vehicle, as particulate matter has a higher impact on health than a similar amount of HCs.

This option is assessed on the basis that Regulations could require that all 12-year-old light commercial vehicles must provide evidence of vehicle maintenance before the vehicle can be re-registered. The choice of 12 years has regard to the average age of the light commercial fleet (11 years), and for being a level that would capture a population size that was significant enough to produce a meaningful benefit, while not being too large.

This targeting reflects that light commercial vehicles have a lower replacement rate, and higher average annual kilometres travelled, than other vehicles (excluding heavy vehicles). Light commercial vehicles also have a higher than average proportion of diesel engines. While heavy vehicles tend to be both higher emitters and travel more kilometres per year, they would not be included in this option as these vehicles will no longer be covered under the proposed Regulations.

**Authorising provisions**

The maintenance regime would be mandated through Regulations. Section 71(gaa) of the Act allows for the making of Regulations for or with respect to regulating the repair or maintenance of any vehicle so as to prevent or minimise pollution. Section 71(n) further allows Regulations to be made generally for the prevention, control, abatement, or mitigation of pollution and noise.

79 A review of inspection/maintenance programs concluded that in general this approach suffered from cost-ineffectiveness due to targets being too broad, and recommended any inspection/maintenance program to be very narrowly targeted. The review found that vehicle age, engine size, and odometer reading are the most relevant factors in determining the probability of emission test failure–Bin O 2003, *A logit analysis of vehicle emissions using inspection and maintenance testing data*, Transportation Research Part D: Transport and Environment, Vol. 8, Issue 3, May 2003, pp 215-227.

### 3.3.3 Non-regulatory options

The following table considers whether common types of non-regulatory approaches are suitable or feasible in relation to the defined objectives.

Table 3.4: Non-regulatory options

| Non-regulatory option | Assessment |
|---|---|
| Self-Regulation, quasi-Regulation or co-Regulation | Not feasible for emissions from in-service vehicles. |
| Increased enforcement of existing provisions | None available in 'base case'. |
| Extending the coverage of existing legislation | Use of existing sections of the Act would require additional Regulations to set standards and offences. |
| Removing other legislative impediments | None identified. |
| Rewarding good behaviour | Nearly all vehicles would comply with desired emissions levels, with most emissions coming from a small number of vehicles. Rewarding good behaviour (i.e. all vehicles that meet a particular threshold) is likely to be cost prohibitive. |
| Negative licensing | The proposed Regulations do not establish any licensing. Registration of vehicles is based on road-worthiness and would require additional Regulations to be made if noise was also to be considered. |
| Public information and education campaigns | Feasible – discussed below.<br>Most cases of breaches of the current Regulations reflect drivers' unawareness of their vehicles' emission and noise levels, or their impacts. Therefore, it is feasible that increased education could lead to a reduction in vehicle emission and noise levels. |
| Information disclosure | Not applicable. |
| Market-based instruments (e.g. taxes, subsidies, user charges, tradeable permits) | Feasible – discussed below.<br>Taxes/subsidies could theoretically be used to accelerate vehicle turnover to more fuel-efficient vehicles. For more complex options that target the actual emissions, the need to measure emissions from individual vehicles would make such an approach administratively unfeasible or expensive. |

This assessment indicates that a public education campaign is a feasible non-regulatory option to be assessed.

Under such an approach, EPA would undertake a campaign targeted at vehicle owners and drivers that:

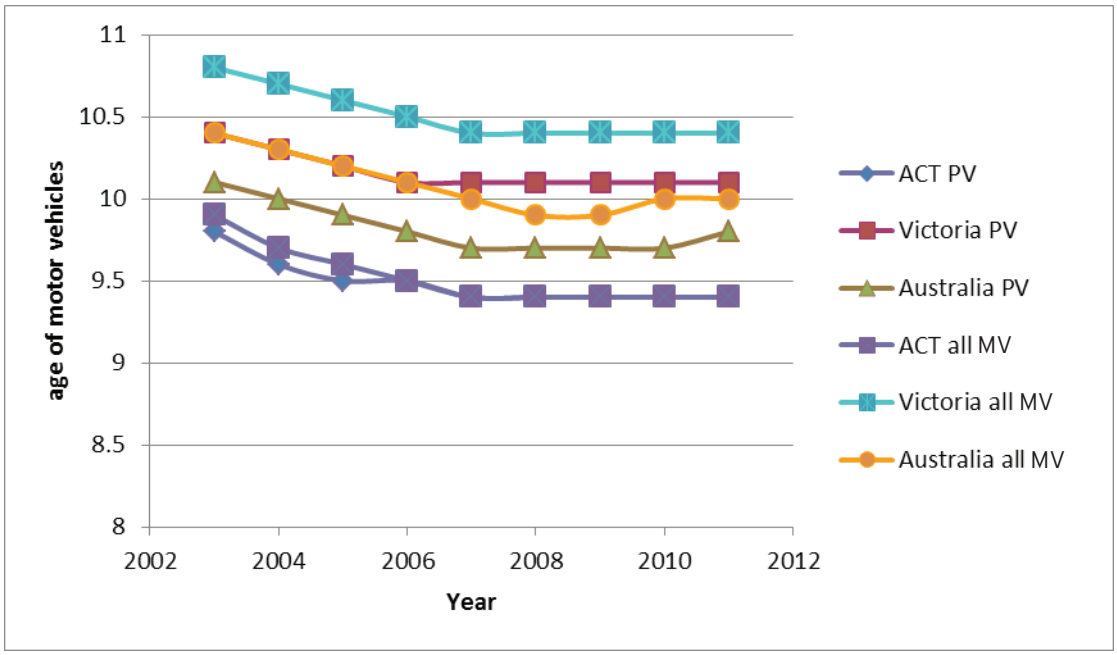
- draws attention to the impacts to the community and the environment from vehicle emissions and noise
- promotes the benefits to vehicle owners of regular maintenance, primarily fuel economy.

For the purposes of this RIS, an education campaign costing $5 million per year has been modelled and assessed. This level of funding would enable a suite of activities including direct mail, web-based campaigns and activities and mainstream media placements and promotions. Some EPA resources would also continue to be needed to monitor vehicle emissions to confirm that the campaign was having its desired impact.

By increasing the rate of vehicle turnover through use of market-based instruments, overall emissions could be reduced. This could be achieved, in theory, by removing any taxes or other barriers to new vehicle purchases, or providing direct subsidies for replacement of older vehicles. Current stamp duties discourage the purchase of new vehicles and may contribute to use of older vehicles longer than is optimal.

However, limited evidence to date suggests that such an approach would not achieve any significant benefits. In 2009, the ACT Government introduced differential stamp duty rates for new light vehicles to encourage motorists to purchase the best environmentally performing vehicle that meets their requirements. The scheme is aimed to encourage people to buy low-emission vehicles, without putting emphasis on any particular fuel or vehicle type. Similarly, since 2007 Victoria has reduced registration costs for hybrid vehicles. Neither of these changes have made significant inroads in turning over the fleet.

Figure 3.1: Average age of vehicle fleet – Australia, Victoria and ACT (2003 to 2011)




Source: ABS 2011. In this figure 'MV' means motor vehicles, 'PV' means passenger vehicles

More broadly, consideration of taxes and subsidies raises issues beyond the scope of the objectives of these Regulations. In particular, stamp duty on vehicles more generally has implications for overall state revenue and tax mix, and are therefore not considered in this RIS.

### 3.3.4 Other options not considered

The Discussion Paper noted an option to label after-market motor vehicle equipment. This was based on an assumption that some cases of illegal tampering were a result of owners being unaware that fitting certain components to their vehicle rendered it non-compliant with the standards. An initiative to include a permanent and indelible warning label on relevant after-market vehicle components may be a way to educate consumers.

Feedback from the consultation for this RIS (see Chapter 7) indicated that this option would be neither practical nor effective. EPA agrees that it is not feasible to effectively enforce such a regime across the State.

## 3.4 Costs and benefits of the options

The three options that have undergone cost-benefit assessment are:

1. specify maximum emission limits
2. implement a mandatory maintenance regime
3. a non-regulatory approach.

### 3.4.1 Specifying maximum emission limits

*Benefits*

Based on the methodology and assumptions discussed in Attachment G, EPA estimates that continuing the emission limits under the proposed Regulations will lower emissions over the next 10 years, against the base case, as follows:

Table 3.5: Avoided emissions from proposed Regulations

| Emission type | Avoided emissions 2013–2022 (tonnes) |
|---|---|
| HCs | 4,193 |
| $NO_x$ | 1,294 |
| $PM_{10}$ | 613 |

It is also estimated that the noise limits will mean that, by 2022, the cumulative impact of detecting noisy vehicles

will mean that there is a reduction of 0.26 dB on average from traffic noise.

Based on values assigned to avoided emissions discussed in Attachments E and F, the total benefits of this option are estimated at around $3.8 million in 2013 and over $122 million over 10 years (PV). This figure includes estimated savings to motorists of around $3.8 million over 10 years, as action taken to reduce HC emissions in petrol vehicles results in less fuel use by that vehicle. The break-down of benefits is shown in Table 3.6 below.

The above values are based on the estimates discussed in Attachments E and F. They reflect only those benefits that have previously been quantified in studies. Other unquantified benefits include:

- the benefit to the physical and built environment from lower emissions
- improved visibility from a reduction in smog and haze
- health benefits from reduced exposure to excessive noise (the quantified benefits reflect only the value of reduced annoyance).

### *Costs*

There are costs to motorists flowing from the proposed Regulations. Once issued with a notice from EPA, motorists must:

- undertake remedial action on the vehicle – this is a direct financial cost to motorists
- present their vehicle at a testing centre – this represents a time cost to motorists to attend the testing centre; some specific testing (smoke emission, noise and tampering) also involves payment of a testing fee, which is a direct financial cost to motorists
- provide a certificate of compliance to EPA – this is a time cost.

There are also costs to government of the proposed Regulations. These relate to the enforcement regime of detecting vehicles and following up compliance matters. Based on this experience, the cost to government of administering the proposed Regulations is $1 million per year (approximately half to each of noise and air emissions, although some tasks are shared). This includes costs to EPA, Victoria Police and other enforcement agencies.

In total, the proposed Regulations would result in costs of around $7.6 million in 2013 and around $64 million over the life of the Regulations (PV). The break-down of costs is summarised in Table 3.6 below. The methodologies and assumptions underlying the calculations are discussed in Attachment G.

### *Net benefit*

The benefits and costs of the option are shown in the table below. It is demonstrated that the quantifiable benefits outweigh the costs of this option.

Table 3.6: Costs and benefits of specifying emission limits

| | 2013 | 10-year PV |
|---|---|---|
| ***Benefits*** | | |
| *Reduced vehicle noise* | $778,075 | $24,159,321 |
| *Reduced air emissions* | $3,043,867 | $98,141,692 |
| Avoided HC emissions | $440,316 | $14,196,869 |
| Avoided $NO_x$ emissions | $32,340 | $1,042,720 |
| Avoided PM emissions | $2,452,666 | $79,079,905 |
| Savings to motorists (air) | $118,546 | $3,822,197 |
| **Total benefits** | **$3,821,943** | **$122,301,012** |
| ***Costs*** | | |
| *Reducing noise* | | |
| Rectification costs | $1,165,320 | $9,691,507 |
| Time cost of testing/compliance certificate | $615,682 | $5,120,382 |
| Test fee | $185,107 | $1,539,459 |
| Cost to government | $500,000 | $4,158,303 |
| **Total cost (noise)** | $2,466,108 | $20,509,649 |
| *Reducing air emissions* | | |
| Rectification costs | $3,903,491 | $32,463,794 |
| Time cost of testing/compliance certificate | $496,035 | $4,125,323 |
| Test fee | $273,158 | $3,205,984 |
| Cost to government | $500,000 | $4,158,303 |
| **Total cost (air)** | $5,172,684 | $43,953,404 |
| **Total costs** | **$7,638,792** | **$64,463,053** |
| ***Net benefits*** | | |
| Net benefit (noise) | -$1,688,033 | $3,649,671 |
| Net benefit (air) | -$2,128,816 | $54,188,288 |
| **Net benefit (total)** | **-$3,816,849** | **$57,837,959** |

The detailed calculations, including yearly amounts, are shown in Attachment H.

The proposed Regulations result in a net cost in the first year, but net benefits in all other years, as the benefits accumulate each year while the costs remain steady. However it is noted that these relate only to quantified benefits in this RIS. In particular, the benefits of noise reduction reflect only avoided annoyance, and do not include health impacts. The benefits of avoided air emissions reflect only health impacts on people, and not benefits to the physical and built environment.

Over the life of the Regulations, the quantified net benefit of the Regulations is estimated at $57.8 million. As noted above, there is a range of other unquantified benefits likely to flow from these measures. Therefore, EPA considers that the proposed Regulations will result in a net benefit to the Victorian community.

Within the net benefit expected from the 'air' components ($54.2 million), the net benefit attributable to avoided particulate matter and $NO_x$ from diesel vehicles is estimated to be $76.4 million over 10 years, while the contribution from avoided HCs from petrol vehicles is estimated as a net cost of $22.2 million. However, EPA stresses that this only reflects the *quantifiable* benefits. Avoided HCs from petrol vehicles will also have other benefits that have not been quantified in this RIS, including benefits to the natural and built environments. EPA has not been able to quantify the value of these benefits. Further, detection and rectification of high-emitting vehicles would also lead to reductions in other types of emissions, such as CO, for which EPA has not been able to estimate the extent of reductions.

The IGA allows jurisdictions to impose additional measures where there are good policy reasons for doing so. As discussed above, to address the gaps in the AVSRs' coverage EPA proposes to impose CO and HC limits, as well as recreational motorcycle noise limits. EPA is satisfied that these additional measures and the AVSRs represent a net benefit to Victoria. Moreover, given the presence of benefits not quantified in this RIS, a net cost (if any) from one element of the AVSRs would only be small within the context of the overall measures. The estimated costs and benefits rely on a range of estimates and assumptions outlined in this RIS.

### *Groups affected*

The proposed Regulations will affect motorists; both vehicles owners and drivers can be issued notices. However, in the absence of any private arrangements, it is often the owner of the vehicle who will undertake the necessary rectification work on the vehicle given he/she is usually the driver. In response to the enforcement of these Regulations, around 8,100 vehicles will be subjected to remedial action and further testing each year, which is about 0.2 per cent of Victoria's total vehicle fleet. This is slightly higher than the number of vehicles currently detected under the existing EPA programs (see enforcement section below) as EPA anticipates use remote sensing to increase the ability of detecting high-emitting vehicles.

The table below shows the cost impacts on motorists associated with the noise and air emissions components of the proposed Regulations.

**Table 3.7: Impacts on motorists**

| | 2013 | 10-year PV |
|---|---|---|
| Total costs to motorists (noise) | $1,966,108 | $16,351,347 |
| Total costs to motorists (air) | $4,672,684 | $39,795,101 |
| Savings to motorists (air) | $118,546 | $3,822,197 |
| Net cost to motorists | $6,520,246 | $52,324,251 |
| Vehicles affected (noise) | 4,482 | 44,820 |
| Net cost per vehicle affected | $438.67 | $364.82 |
| Vehicles affected (air) | 3,611 | 36,110 |
| Net cost per vehicle affected | $1,261 | $996 |

The savings to motorists relate to reduced fuel consumption by petrol vehicles associated with less HC emissions. It is estimated that the value of these savings to individual petrol vehicles is around $36 per year; where the vehicle is continued to be used for a further five years, the cumulative value of the savings is around $163 per vehicle (PV).

The total costs of the proposed Regulations, to both motorists and government, is around $1.82 per year per registered vehicle in Victoria.

The beneficiaries of the Regulations are the wider Victorian community, through improved overall health and amenity outcomes, and the Victorian environment. The measures benefit both current and future generations.

## 3.4.2 Mandatory maintenance program

### *Benefits*

Under the threshold for this option, around 25,000 light commercial vehicles would be required to undergo vehicle maintenance each year, for the purposes of providing evidence to EPA.

Based on the methodology and assumptions discussed in Attachment G, EPA estimates the direct impact of the maintenance program would lower emissions over the next 10 years, against the base case, as follows:

Table 3.8: Avoided emissions from maintenance program

| Emission type | Avoided emissions 2013–2022 (tonnes) |
|---|---|
| HCs | 635 |
| $NO_x$ | 2,343 |
| $PM_{10}$ | 1,111 |

It is also estimated that this approach would mean that, by 2022, the cumulative impact of better maintaining vehicles would mean an average reduction of 0.03 dB from traffic noise.

Based on values assigned to avoided emissions discussed in Attachments E and F, this option is estimated to result in benefits of around $4.7 million in 2013 and around $150 million over 10 years (PV). The break-down of benefits is summarised in table 3.9 below.

As with the emission limits option, additional maintenance to vehicles is also expected to result in better fuel efficiency for some vehicles, and hence a small saving to motorists though lower fuel costs of around $18,000 ($578,000 over 10 years) is included in the estimate of benefits.

### *Costs*

There are costs to vehicle owners flowing on from this option. These are:

- having their vehicle serviced – this is a direct financial cost to vehicle owners, as well as a time cost to drop off/pick up vehicles
- providing evidence of vehicle servicing to EPA – this is a time cost.

There are also costs the Government would also incur costs with this option. These relate to identifying vehicles subject to the program, receiving and processing evidence of servicing, coordinating with vehicle registration for non-compliant vehicles, and following up compliance matters. Importantly, EPA would also need to implement a regime to periodically test the quality of servicing and a system to regularly sample the emission of the vehicle fleet to ascertain whether the program was being effective in reducing emissions. EPA estimates the cost to government of administering this option would be $2.5 million per year.

The total cost of this option is estimated at around $13 million in 2013 and $112 million over 10 years (PV). The break-down is shown in the table in the next section.

### *Net benefit*

The table below summarises the costs and benefits of this option. It demonstrates that the quantifiable benefits outweigh the costs of this option.

Table 3.9: Costs and benefits of mandatory maintenance program

| | 2013 | 10-year PV |
|---|---|---|
| ***Benefits*** | | |
| *Reduced vehicle noise* | $78,120 | $2,425,635 |
| *Reduced air emissions* | $4,586,228 | $147,871,148 |
| Avoided HC emissions | $66,726 | $2,151,423 |
| Avoided $NO_x$ emissions | $58,583 | $1,888,866 |
| Avoided PM emissions | $4,442,954 | $143,251,634 |
| Savings to motorists (air) | $17,965 | $579,224 |
| **Total benefits** | **$4,664,348** | **$150,296,782** |
| ***Costs*** | | |
| Rectification costs | $7,500,000 | $62,374,540 |
| Time cost of testing | $3,434,191 | $28,560,809 |
| Cost to government | $2,500,000 | $20,791,513 |
| **Total costs** | **$13,434,191** | **$111,726,862** |
| **Net benefits** | **-$8,769,843** | **$38,569,920** |

The mandatory maintenance program would result in a net cost in the first year of nearly $9 million, and a further net cost of around $4 million in 2014 before the accumulated benefits of the program begin to outweigh the costs.

Over the 10-year life of the option, the quantified net benefit of the mandatory maintenance program is estimated at around $39 million.

### *Groups affected*

A mandatory maintenance regime would affect owners of light-duty vehicles. Around 25,000 light-duty vehicles would be required to provide evidence of servicing each year, which is about 0.6 per cent of Victoria's total vehicle fleet.

Table 3.10: Impacts on vehicle owners

| | 2013 | 10-year PV |
|---|---|---|
| Total costs to motorists | $10,934,191 | $90,935,348 |
| Savings to motorists (air) | $17,965 | $579,224 |
| Net cost to motorists | $10,916,226 | $90,356,125 |
| Vehicles affected | 25,000 | 250,000 |
| Net cost per vehicle affected | $437 | $361 |

The savings to motorists relate to reduced fuel consumption by petrol vehicles associated with less HC emissions. It is estimated that the value of these savings to individual petrol vehicles is around $36 per year; where the vehicle is continued to be used for a further five years, the cumulative value of the savings is around $163 per vehicle (PV).

The total cost of the maintenance program, to both motorists and government, is around $3.20 per year per registered vehicle in Victoria.

The beneficiaries of the maintenance option would be the wider Victorian community, through improved overall health and amenity outcomes, and the Victorian environment. The measures benefit both current and future generations.

### 3.4.3 Education campaign

*Benefits*

Under this option, around 1,000 vehicles would voluntarily take action on their polluting or noisy vehicles that otherwise would not have.

Based on the methodology and assumptions discussed in Attachment G, EPA estimates the direct impact of the maintenance program would lower emissions over the next 10 years, against the base case, as follows:

Table 3.11: Avoided emissions from education campaign

| Emission type | Avoided emissions 2013-2022 (tonnes) |
|---|---|
| HCs | 698 |
| $NO_x$ | 1,050 |
| $PM_{10}$ | 498 |

It is also estimated that, by 2022, the cumulative impact of better-maintained vehicles would mean an average reduction of 0.02 dB from traffic noise.

These estimates reflect the modest budget allocated to this option, and previous experience of EPA in using similar campaigns to try to change behaviour.

Based on values assigned to avoided emissions discussed in Attachments E and F, the following table summarises the quantified benefits of this option in the first year and the present value (PV) over the life of the Regulations. The detailed calculations are shown in Attachment H.

Table 3.12: Benefits of the education campaign

| Benefit type | 2013 | 10-year PV |
|---|---|---|
| Reduced vehicle noise | $62,496 | $1,940,508 |
| Reduced air emissions | $2,090,369 | $67,398,594 |
| Savings to motorists | $19,740 | $636,454 |
| **Total benefits** | **$2,172,605** | **$69,975,556** |

The value of the reduction shown in the table above is based on estimates discussed in Attachments E and F.

*Costs*

For the purpose of this RIS, there are no costs to vehicle owners included under this option. Any response to the education campaign involves voluntary actions, and as such the 'cost' of this option is limited to the cost to government.

The costs to government for this option are:

- The cost of developing and delivering the communications
- EPA staff to provide advice to the vehicle owners on actions they can take to reduce emissions
- Field staff to regularly sample the emissions of the vehicle fleet to ascertain whether the program was being effective in reducing emissions.

EPA estimates the cost to government of these activities would be $5 million per year. It is acknowledged that the amount allocated to communications is somewhat discretionary. The choice of $5 million reflects a reasonable amount that could be allocated. It should be noted that such funding would be subject to government consideration in the annual budget process, which has not occurred.

The costs are summarised in the following table.

### Table 3.13: Cost of the education campaign

| Cost type | 2013 | 10-year PV |
|---|---|---|
| **Total cost (to government)** | $5,000,000 | $41,583,027 |

Note: the annual cost is assumed to remain steady in real terms over the 10-year period.

#### *Net benefit*

Drawing from the results of the above sections, it is demonstrated that the quantifiable benefits outweigh the costs of this option, as summarised below.

### Table 3.14: Net benefit of the education campaign

| | 2013 | 10-year PV |
|---|---|---|
| Benefit of Regulations | $2,172,605 | $69,975,556 |
| Cost of Regulations | $5,000,000 | $41,583,027 |
| **Net benefit (cost)** | **-$2,827,395** | **$28,392,530** |

The education campaign would result in a net cost in the first year of nearly $3 million, before accumulated benefits of the program begin to outweigh the costs from 2015.

Over the 10-year life of the option, the program would impose costs of around $42 million, and result in quantified benefits of $70 million. The quantified net benefit of the Regulations is estimated at $28 million.

#### *Groups affected*

The total costs of the Regulations, although a cost to government, represent around $1.19 per year per registered vehicle in Victoria.

The beneficiaries of the Regulations are the wider Victorian community, through improved overall health and amenity outcomes, and the Victorian environment. The measures benefit both current and future generations.

## 3.5 Preferred outcome

The decision criterion used in this RIS is a comparison of the net present value (NPV) of the alternative options.

### Table 3.15: Comparison of options

| Option | NPV |
|---|---|
| Specify maximum emission limits | $58 million |
| Mandatory maintenance program | $39 million |
| Education campaign | $28 million |

Setting emissions limits for air emissions and noise, including those established in the AVSRs, was found to provide the greater net benefit to the community, and is therefore the preferred option for the purposes of the proposed Regulations.

It is noted that as all three options indicate a net benefit, the relative scale of net benefit may reflect the overall size of the intervention rather than its effectiveness. It is therefore useful to also look at the benefit-cost ratio of each option. This is shown in the table below.

Table 3.16: Benefit-cost ratio of options

| Option | Benefit-cost ratio |
|---|---|
| Emission limits | 1.9 |
| Mandatory maintenance program | 1.3 |
| Education campaign | 1.7 |

While all three options represent benefits outweighing costs (a ratio greater than 1), it is clear that the option to set air and noise emission limits including those established in the AVSRs provides the better approach.

**Discussion**

For example, mandating a 'younger' age at which vehicles should undergo mandatory servicing would see an increase in the number of vehicles undergoing mandatory servicing (increasing costs), but a proportionally smaller, if any, increase in benefits, as younger vehicles are less likely to be found to be high emitters. This would therefore result in a reduction in the overall benefit-cost ratio. Conversely, the benefit-cost ratio of the mandatory maintenance program could be increased by increasing the age at which mandatory servicing occurs, however this would reduce the overall number of high-emitting vehicles

rectified and therefore have an overall smaller net benefit, meaning the overall impact of the option in reducing emissions would be less.

A similar situation is likely for the education campaign; an increase in the amount of government resources dedicated to the campaign is likely to face diminishing returns, causing the benefit-cost ratio to fall as the program expands.

It is also noted that options could be combined. However, it is likely that there is overlap between the options with particular vehicles that reduce their emissions. It is therefore not possible to add the above net benefits from combining the options. While it is not possible to reliably estimate this overlap, it is noted that:

- if around 20 per cent of vehicles subject to the mandatory maintenance program would also have reduced their emissions due to enforcement of emissions limits, or
- if around 30 per cent of vehicles that reduce their emissions due to the education campaign would also have reduced their emissions due to the enforcement of emissions limits,

then the lower boundary of the NPVs for these options would become negative, creating a risk that either of these options in addition to the emissions limits would not result in a net benefit greater than enforcing the emissions limits alone. For this reason, it is proposed that only the air and noise emission limits be included in the Regulations.

However, there may be a role for targeted maintenance requirements to supplement the emission limits if these are used *outside* the proposed Regulations. In other words, the proposed Regulations would not create a requirement for mandatory maintenance based on any pre-determined category or criteria. However, for certain vehicles that are found to exceed the emissions limits, EPA could require them to undergo regular maintenance, in lieu of penalties or prosecution. This would form part of EPA's enforcement approach, which is discussed below.

While not directly reflected in the NPV assessment, adoption of the AVSRs as the emissions limits also serves a wider policy objective of remaining consistent with all other states and territories where possible.

### *Sensitivities to assumptions*

The estimated costs and benefits rely on a range of estimates and assumptions outlined in the attachments to this RIS. Some of these are parameters common to all options, and therefore while not changing the preference order of the options, will change the net benefit. As setting emission limits is the preferred option, it is useful to examine the effect of some parameter changes on the expected net benefits of the proposed Regulations.

Table 3.17: Impact on expected net benefit from changed assumptions

| Changed assumption | Impact on net benefit | Changed assumption | Impact on net benefit |
|---|---|---|---|
| Value of avoided $NO_x$ is less (see Attachment E) | -$0.2m | Value of avoided $NO_x$ is more (see Attachment E) | +$0.2m |
| Value of avoided HCs is less (see Attachment E) | -$1.3m | Value of avoided HCs is more (see Attachment E) | +$1.0m |
| Value of avoided PM is less (see Attachment E) | -$14.8m | Value of avoided PM is more (see Attachment E) | +$9.9m |
| Value of avoided noise is less (see Attachment F) | -$2.3m | Value of avoided noise is higher (see Attachment F) | +$2.3m |
| Volume of avoided emissions is 10% lower | -$9.8m | Volume of avoided emissions is 10% higher | +$9.8m |
| Detection rates are 10% lower | -$6.3m | Detection rates are 10% higher | +$6.3m |
| Rectification costs are 10% higher | -$4.2m | Rectification costs are 10% lower | +$4.2m |
| Petrol prices* decrease by 10c/L | -$0.4m | Petrol prices increase by 10c/L | +$0.4m |

* Changes in petrol prices affect the value of savings to motorists through improved fuel consumption.

The overall 'worst case' and 'best case' of the proposed exhaust emission limit Regulations, would be a net benefit in the range $19.8 million to $94.6 million over 10 years (PV). This indicates that even with reasonable uncertainties about the estimated parameters, the proposed Regulations are expected to result in an overall net benefit.

Importantly, while the estimated net benefit of the Regulations related to noise is relatively small at $3.7 million over 10 years, the above sensitivity analysis shows that even with a reasonable range of values for the benefit of avoided noise, there is still a net benefit (a 'low case' estimate of $1.4 million).

There are also option-specific assumptions that may affect which option is the preferred option. These relate primarily to the assumptions about how many vehicles will contribute to lower emissions in each option.

For the mandatory maintenance program, if the number of vehicles that make a contribution to lower emissions (i.e. that were high emitters before the mandatory service) is 15 per cent higher than assumed, the net benefit of this option would be the same as the preferred option (the proposed Regulations). However, in this situation, the benefit-cost ratio would only rise to 1.5, indicating that it would still not be the least-cost approach to achieve the net benefits. Furthermore, if the contributing number of vehicles were only 10 per cent lower than assumed, this option would result in an overall net loss if any of the 'downside' scenarios in the above table were realised. Therefore, when taking account of this sensitivity, the mandatory maintenance program is still not preferred.

In relation to the education campaign option, if the number of vehicles that reduce their emissions as a result of the campaign were 10 per cent higher than assumed, this option would result in the same benefit-cost ratio as the proposed Regulations. However, the overall net benefit would be only around $35 million over 10 years.

## 3.6 Implementation and enforcement

There are no implementation issues foreseen as the proposed Regulations generally continue the current arrangements.

**Risk-based compliance and enforcement**

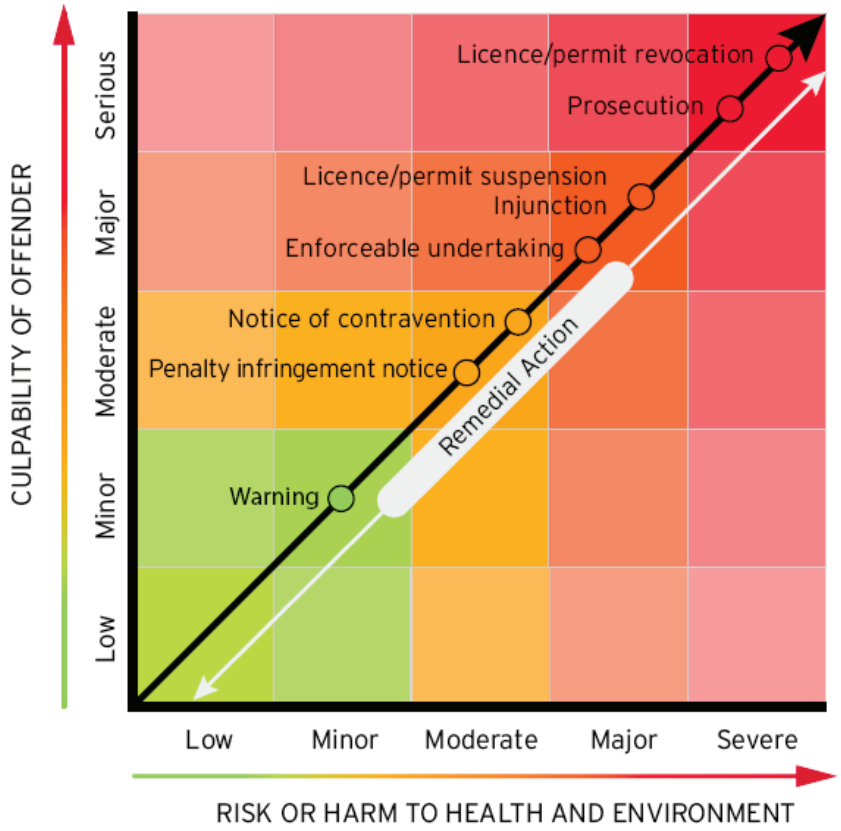
In June 2011, EPA unveiled a new way of operating that will provide more predictable compliance and enforcement, or 'policing' functions. The *Compliance and Enforcement Policy (publication number 1388)* was developed in direct response to recommendations made in the Compliance and Enforcement Review that was undertaken in late 2010. The Policy provides the framework for how EPA will exercise its discretion in its compliance and enforcement work and in practical terms ensures a consistent approach to the way EPA discharges this function.

EPA's regulatory model for compliance and enforcement is based on assessing risk and minimising harm. EPA prioritises compliance and enforcement activity, and allocate resources as appropriate to make the biggest difference to Victoria's environment by addressing the biggest risks to environment, health, safety and wellbeing. Risk is defined as a combination of both the likelihood and consequences on non-compliance.

This risk-based approach informs EPA's approach to incidents and the follow-up of compliance requirements. EPA uses a number of proactive and responsive methods including field work, desktop audits and third-party reporting.

The Act provides for penalties for non-compliance with sections 43A, 48B and 48D (see section 3.2 for details). The Act also allows EPA to take other actions as regulator. The range of options can be shown in the following figure, referred to as the Regulation response matrix.

Figure 3.3: EPA's risk-based enforcement approach




## Enforcement of proposed Regulations

EPA will use a risk-based approach in enforcing the proposed Regulations. For example, EPA will target roadside operations with other enforcement agencies in high-priority areas.

The enforcement of the proposed Regulations will be undertaken through a number of programs administered or coordinated by EPA. These include:

- Public smoky vehicles program – allows the public to confidentially report 'smoky' vehicles (10 seconds or more of visible emissions) through a 24-hour hotline. EPA sends a letter to the vehicle owner of the report indicating that the vehicle may need repairs. There is no requirement for the vehicle owner to provide evidence to EPA that the vehicle has been repaired however, if the same vehicle is subsequently detected by an EPA, VicRoads or police officer, the owner may be fined. Over time this program may be reviewed to include photos or videos as evidence for follow-up.
- Official smoky vehicle program – vehicles observed emitting 10 seconds or more of visible emissions by EPA officers, VicRoads or police officers are referred to EPA compliance team. A legal notice is issued requiring vehicles to be tested through a network of approved testers. Owners must provide a certificate of compliance to EPA.
- Noisy vehicle program – noisy vehicles are identified by police officers, VicRoads and EPA officers and referred to EPA compliance team. A legal notice is issued requiring vehicles to be tested through a network of approved noise testers across the state. Owners must provide a certificate of compliance to EPA.
- Roadside operations – EPA also conducts roadside operations in conjunction with VicRoads, police, sheriffs officers, and other enforcement agencies that identify smoky or noisy vehicles.

EPA is investigating the use of remote sensing for invisible emissions from vehicles. Remote sensing is a way to

measure pollutant levels in a vehicle's exhaust while the vehicle is travelling down the road. Unlike most equipment used to measure vehicle emissions today, remote sensing devices do not need to be physically connected to the vehicle. The concept of an efficient tool to monitor the vehicle fleet and identify excessive polluters is a complement to traditional mobile source emission control programs, and will increase EPA's ability to detect high-emitting vehicles.[80]

Infringement notices and official warnings are predominantly issued for noise offences, or repeated emission observation reports. Beyond this, suspension of vehicle registration may occur when an owner fails to comply with a legal notice reminder.

# 4 Evaporative emissions from fuel

## 4.1 Objective

Some of the proposed Regulations deal with fuel quality.

One objective of the proposed Regulations is **to provide for offences relating to the supply of petrol to minimise the release of petrol vapours into the environment.**

## 4.2 Base case

The base case is a 'do nothing' scenario, against which options for action can be assessed. It reflects the likely outcomes over the next 10 years if the current Regulations are allowed to lapse and are not replaced, and all other activities continue on a business-as-usual basis.

National legislation covers fuel quality standards. Health issues that are of concern across Australia are addressed at the national level, such as limiting the benzene content of fuel to 1 per cent.

Vapour pressure is a measure of fuel volatility, which indicates how quickly fuel evaporates. However, the *Fuel Quality Standards Act 2000* (Commonwealth) is silent on vapour pressure as it is necessarily a matter suited to a geographic area. Regulation at the state level is able to take into account regional characteristics, such as the role that the geography and meteorology play in ozone formation. Vapour pressure in petrol is therefore left to be set at the state level due to variations in regional conditions.

In the absence of Victorian Regulations, there would be higher HC emissions across the state as a result of the removal of current limits on petrol volatility during summer. In the absence of regulatory limits, it is unlikely that low-volatility petrol would be supplied during summer due to the processing cost and effort involved in reducing petrol volatility, leading to increases in HC emissions. For the purpose of this RIS, consultation with industry indicated that a base case petrol vapour pressure of 75 kiloPascals (kpa) is most likely, and higher for ethanol-blended fuels.

Without any further actions to control evaporative emissions, petrol supplied to retailers would generate around 40,000 tonnes of HC emissions each year. However, consultation with industry confirms an early EPA audit finding that around 90 per cent of metropolitan petrol stations[81] have 'Stage 1' Vapour Recovery systems in place, which can capture up to 97 per cent of evaporative emissions when tankers are filling storage tanks at petrol stations. This reduces the base case level of HC emissions associated with evaporative emissions to around 36,500 tonnes per year.

In the absence of Stage 1 Vapour Recovery systems, there are around 5,300 tonnes of HC emissions each year stemming from the filling of storage tanks at petrol stations. With the systems that EPA understands to be already in place, these emissions are reduced to around 1,800 tonnes of HC emissions.

There are also HC emissions associated with filling vehicles at petrol stations (around 5,100 tonnes per year), and use of motor vehicles (around 25,000 tonnes per year due to evaporation from vehicles). Emissions associated with filling vehicles can be reduced through 'Stage 2' Vapour Recovery systems, however this is not currently in place at any petrol station in Victoria.

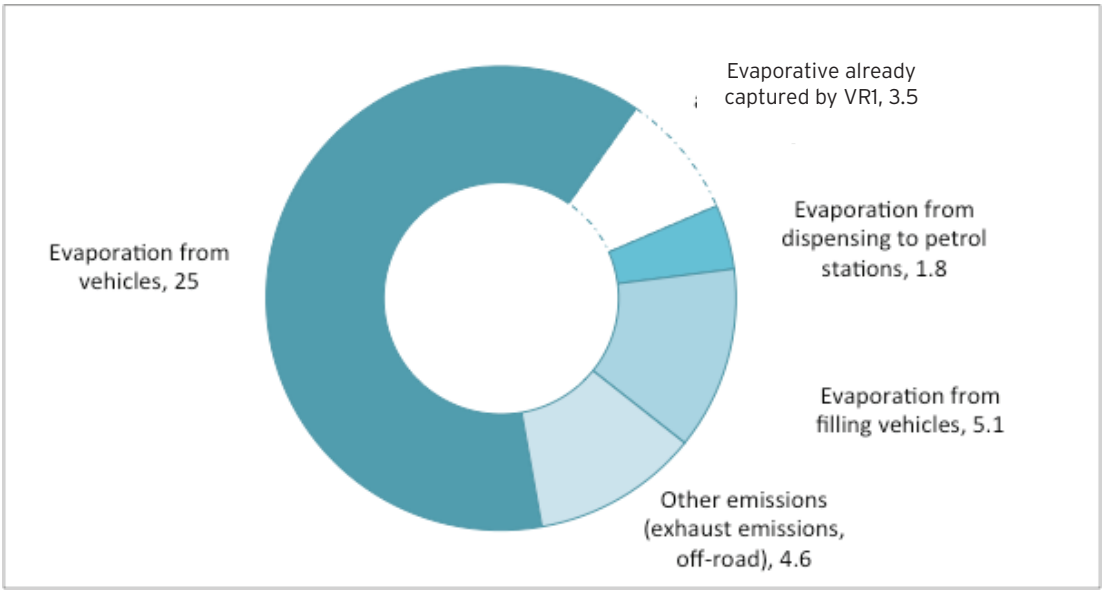
## 4.3 Options to achieve the objectives

The nature of the sources of evaporative emissions point to the potential options to reduce emissions. The following figure shows the amount of HC emissions from evaporative sources in 2012 that would have been the result if the current Regulations were not in place.

80 See for general discussion Kuhns HD et al 2004, 'Remote sensing of PM, NO, CO and HC emission factors for on-road gasoline and diesel engine vehicles in Las Vegas, NV' *Sci. Total Environ.*, Vol. 322 (1-3), pp. 123-7.

81 The audit was based on all tanks at an individual petrol station having VR1.

Figure 4.1: Sources of evaporative emissions (figures in '000 tonnes)[82]




Source: EPA calculations based on DRET petroleum data (2012) and Environment Australia emissions factors (1999).

The figure shows that, in the absence of the current Regulations, an amount of HC emissions (around 3,500 tonnes per year) is already being avoided through the voluntary use of 'Stage 1' Vapour Recovery equipment at many petrol stations, which avoids emissions at the point of dispensing fuel to petrol stations from fuel tankers. The remaining HC emissions, from all sources identified in the above figure, could be reduced by reducing the allowed vapour pressure, which slows the rate of evaporation of petrol. Controlling vapour pressure can reduce emissions by around 20 per cent. Evaporation from dispensing to petrol stations can also be reduced by further use of 'Stage 1' Vapour Recovery; while a smaller amount of overall emissions, Stage 1 recovery can capture up to 97 per cent of evaporative emissions. Evaporation from filling of vehicles can also be reduced by Stage 2 systems, which can capture up to 85 per cent of emissions.

### 4.3.1 Limits on vapour pressure during summer

Applying petrol volatility limits is the approach proposed in the Regulations. The proposed Regulations propose no change from the limits that have been in place since 2007.

Limiting the volatility of petrol reduces petrol evaporation and hence emissions of HCs. Photochemical smog (of which ozone is a principal component) occurs in summer. Because petrol evaporates more readily when it is hot, control of petrol vapour pressure is only necessary during summer months. Lowering petrol volatility over summer reduces the amount of petrol vapour lost during petrol distribution and the transfer of the petrol to a motor vehicle at a service station. The lower petrol volatility also reduces both the amount of petrol vapour that evaporates from a vehicle's petrol tank and the amount that is emitted in the vehicle's engine exhaust.[83]

Vapour pressure is a key fuel variable for evaporative emissions. In general, increasing vapour pressure above 60 kPa increases evaporative emissions.

All Australian states (apart from Tasmania) apply petrol volatility limits. Sydney and Melbourne (currently) have an average vapour pressure limit of 62 kPa. Overseas limits are often much lower than those in Australia: in the United States, for example, limits range from 48 kPa to 54 kPa.

The aim of the summer petrol volatility provisions is to reduce ozone formation by limiting the volatility of petrol supplies in summer. It does this by requiring petrol suppliers (importers and manufacturers who supply petrol to retailers for on-sale to consumers) to supply petrol that meets specified volatility limits in the summer period and to also keep records and information indicating their compliance with this.[84]

82 The figure shows that if there were no vapour pressure or Vapour Recovery actions taken, total VOC emissions from evaporative sources would be 40,000 tonnes in 2012. The figure notes that around 3,500 tonnes is however avoided by use of voluntary VR1, giving the total emissions in the absence of the current Regulations of around 36,500 tonnes.

83 As diesel fuel is inherently less volatile than petrol it does not warrant specific Regulation of its volatility.

84 Summer period 1 November to 31 March.

The proposed Regulations require that petrol supplied during the summer period must have:

- a monthly volumetric average vapour pressure of no more than 62 kPa
- a maximum vapour pressure of no more than 64 kPa.

These levels continue the requirements currently in place, which are estimated to reduce overall HCs emissions from petrol supplied for vehicle use by around 18 per cent.

Vapour pressure limits (including ethanol vapour pressure limits), frequency of sampling, exemptions and reporting requirements are discussed in the next section.

**Setting the form of limits**

A number of factors affect the capacity of local suppliers to reliably and consistently produce petrol to a specified vapour pressure limit. These include the availability and price of suitable crude stock, and options for the disposal of product removed from the petrol stream to reduce its volatility. Therefore, an averaging approach is used, which enables flexibility in production. Compliance with the 62 kPa limit is based on monthly volumetric average vapour pressure, with the allowance that the vapour pressure of any batch of petrol cannot be more than 2 kPa above this.

It is proposed that the setting of the limits will be via a monthly pool average combined with a cap set at 2 kPa higher than the average limit. The average limit provides flexibility for producers and suppliers of petrol as they can have small fluctuations in the RVP levels of different batches, while the maximum limit prevents against large deviations. The average and cap approach also has benefits for the environment as it guarantees that all batches of petrol will have an RVP within a specific range. If the limit was set as an average only, the possibility exists that there may be batches with an RVP much greater than the average. If one of these high RVP batches coincided with a very hot day, the benefits of limiting summer time RVP would be negated. In addition, a cap allows effective random spot checking to be undertaken by EPA.

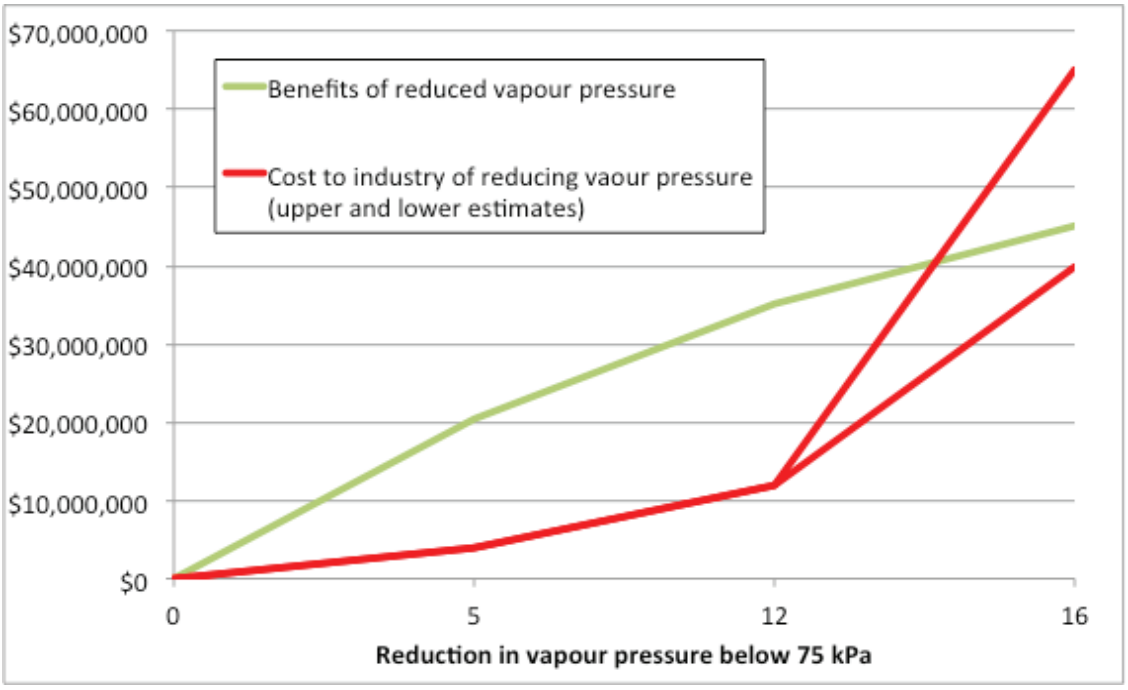
However, allowing actual volatility to vary above the desired average limit (up to a maximum) will require higher levels of sampling than otherwise. A low level of sampling has a risk of indicating a supplier exceeds the required average pressure when in fact it may not. EPA considers the current arrangements, which involve taking four samples each month (during the summer period), provides a minimum number of samples to give a reliable average. Samples are required to be taken on different days, with at least six days between each sample.

While some states have both average and maximum limits, two states do not, instead setting an average limit only. Consultation with petrol suppliers suggests that the current maximum provides sufficient flexibility, and does not of itself lead to additional costs above those involved in meeting the average volatility limits. EPA therefore proposes to continue with the current average and maximum arrangements, although welcomes feedback on whether removing the maximum limit would reduce costs without leading to unwanted outcomes.

**Discussion**

In the development of this RIS, EPA considered the merits of further reducing the vapour pressure limits, as small reductions to vapour pressure appear to be a direct way to make significant reductions in overall HC emissions. An average limit of 59 kPa, with maximum of 61 kPa, was discussed with fuel suppliers. Where vapour pressure is further reduced, there are diminishing benefits in terms of the volume of avoided emissions. However, the costs associated with further reductions increase in an exponential-like manner.

Figure 4.2: Indicative benefits and costs from reducing petrol vapour pressure




The above figure includes savings to motorist as benefits, but does not reflect other administration costs such as testing, reporting and compliance audits.

Through consultation with industry, it was not possible to determine a cost of reducing the required vapour pressure to 59 kPa with precision. This is because the mechanisms available to further reduce vapour pressure are likely to be different from the steps taken to achieve 62 kPa, many of which have not been done before.

The profile of costs in the above figure reflects the methods available to reduce vapour pressure. Pressure reductions are largely achieved by removing the amount of butane in petrol. For small reductions, butane is able to be removed and used for other uses, which can generate a return to suppliers partially offsetting the costs of removal and the loss of value from its inclusion in fuel. As more butane is required to be removed, the opportunities for other uses of butane reduces, and represent increasingly lower value opportunities. Consultation with petrol suppliers in the development of this RIS suggested that any further reductions in vapour pressure will result in increased flaring of waste butane (which creates its own emissions) that cannot be used for any other purposes, or lead to fundamental shifts in the overall composition of petrol to a more expensive mixture.

In response to the Discussion Paper, Review of the Environment Protection (Vehicle Emissions) Regulations 2003, EPA publication 1415, industry argued that there is a preference for consistency between jurisdictions. Industry indicated that this not only assists the manufacturing process, but also assists with surety of supply as, if Victoria had a lower limit, NSW would be unable to supply Victorian grade fuel on an ongoing basis or in the case of Victorian supply disruptions.

From this analysis, EPA considers that further reductions to the required vapour pressure beyond the current levels are not practical, and are not further assessed in this RIS.

**Exemptions**

The current Regulations include a process for exemptions from this requirement, dependent on an application and payment of a prescribed fee (10.4 fee units; currently around $130). Under the current Regulations, all requests for exemption have related to ethanol fuel. Although ethanol blends produce lower particle emissions, the ethanol content increases volatility by 7 kPa for those with a 5–10 per cent ethanol blend. However, HC emissions from ethanol petrol blends, while higher, are less reactive compared to standard petrol. It is therefore proposed to include separate limits in the Regulations for ethanol fuel, dispensing with the need for application for an exemption and payment of a fee. Similar vapour pressure limit provisions apply in New South Wales, Queensland and in the United States. The proposed limit for ethanol fuel is a maximum vapour pressure of no more than 71 kPa.[85]

The proposed Regulations also regulate all alcohol petrol blended fuels. These fuels will need to comply with the petrol limit or apply for an exemption to the Regulations. This approach will deal with new petrol blends coming onto the market where there is uncertainty relating to the impact on vapour pressure, for example, methanol petrol blends.

Petrol suppliers will also be required to take four samples of vapour pressure per month (during the summer period), retaining these records for two years. A compliance report is required to be provided to EPA by 30 April each year (differing from the current arrangements, which are to report monthly).

The proposed Regulations require that the ASTM D4953-06 *Standard Test Method for Vapor Pressure of Gasoline and Gasoline-Oxygenate Blends (Dry Method)* be used to measure vapour pressure. The ASTM D4953-06 Standard Test Method is a recognised test method for petrol and petrol blends with a vapour pressure range between 35–100 kPa.

The proposed vapour pressure limits are authorised under section 71(e) of the Act, which allows for the making of Regulations for or with respect to regulating the use of any specified chemical substance or fuel.

### 4.3.2 Vapour Recovery (Stage 1)

Vapour Recovery at petrol service stations provides immediate health protection benefits by reducing personal exposure to toxic substances in petrol vapours. Emissions occur because as a storage tank is filled by a fuel tanker, the incoming petrol (as a liquid) fills the space and forces out any petrol vapour that was present in the tank, having evaporated from the petrol in the tank.

The installation of technology known as Stage 1 Vapour Recovery (VR1) captures the vapour displaced from underground storage tanks as the tanks are filled by road tankers.

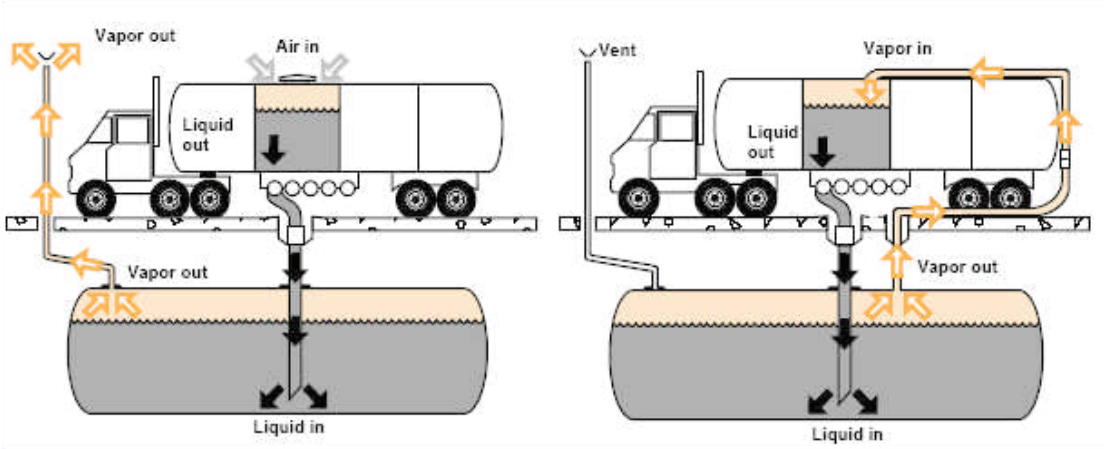
Up until 1994, VR1 was required by Regulation in the Port Phillip Air Quality Control Region (PPAQCR); these Regulations no longer exist.

VR1 involves the collection of the vapour occupying the empty space in the underground petrol storage tank while the tank is being filled by the road tanker. The vapour displaced by the rising liquid level is fed into the vapour space of the tanker as the liquid level in the tanker falls. This provides a closed loop of liquid and vapour transfer between the tank and tanker, and avoids harmful vapours escaping into the environment. When the tanker returns to the terminal for refilling, the vapour displaced from the tanker is collected through the gantry and returned to the terminal tank storage via a Vapour Recovery unit that condenses the vapour into a liquid.

The following diagram illustrates the escape of vapour without VR1 and the capture of vapour with the appropriate equipment installed on both the fuel tankers and the petrol storage tanks.

85 NSW Regulatory Impact Statement, Proposed Protection of the Environment Operations (Clean Air) Regulation 2010

Figure 4.3: Stage 1 Vapour Recovery




Source: Wolf H Koch, *Petroleum Equipment & Technology*, July 1998.

The equipment modifications required consist of additional piping for the vapour transfer. For VR1, this involves underground excavation to install pipework to the storage tank, and additional pipework and connections on the road tanker.

EPA understands that all road tankers that operate out of the major distribution terminals have VR1 installed. Further, an audit of all petrol stations conducted in 2003 found that nine out of 10 metropolitan petrol stations had VR1 installed. Only one regional petrol station had VR1 in place at that time.

In this RIS it is assumed that the 90 per cent of PPAQCR petrol stations (920 petrol stations) that already use Stage 1 systems are the higher-volume petrol stations in the above figure. This means they account for around 97 per cent of the petrol sold within the PPAQCR and about 72 per cent of petrol sold across the State.

Owners/operators of both new and existing underground petroleum storage systems are required to comply with the SEPP AQM and any relevant protocol for environmental management. Under guidelines, owners/operators of sites with Vapour Recovery equipment in place should operate the system so that vapours are effectively recovered upon delivery of fuel to the system.[86]

It is therefore a feasible and practical option to consider re-introduction of VR1.

**VR1 option assessed**

Existing petrol stations would have two years to retrofit VR1 to their sites. New petrol stations would be required to include VR1 at the time of construction.

Under such an option, the requirement would only apply to the PPAQCR petrol stations, as this is where there are already high concentrations of HCs from other sources, and where there is concern about ozone levels. While petrol stations outside this area are nonetheless a source of a large amount of HC emissions, the generally better air quality in these airsheds, combined with much lower population density, mean that benefits from reduced emissions will be small outside the PPAQCR.

The requirement would also only apply to petrol stations that dispense over 0.5 million litres per year. This threshold aims to maximise emissions reduction whilst minimising the impacts on very small petrol stations.

Using the methodology for the assessment of costs and benefits below, as described in the attachments to this RIS, there is a relevant threshold at which the benefits of installing VR1 equipment do not outweigh the costs for that particular petrol station. The analysis reveals that, allowing for sensitivities of assumptions:

- for a petrol station dispensing 0.3 million litres of petrol per year, the net benefit (over 10 years) is in the order of -$6,200 to -$3,800 (PV)
- for a petrol station dispensing 0.4 million litres of petrol per year, the net benefit (over 10 years) is in the order of -$500 to $2,600 (PV)
- for a petrol station dispensing 0.5 million litres of petrol per year, the net benefit (over 10 years) is in the order of $5,100 to $9,100 (PV).

86 EPA Victoria, *Guidelines on the Design, Installation and Management Requirements for Underground Petroleum Storage Systems (UPSSs)*, January 2009.

These estimates relate to retrofitting existing petrol stations, which represent the majority of costs for this option. EPA estimates that there are only a small number (around five) of existing petrol stations within the PPAQCR (all of which are assumed to not already have VR1) that would fall below this threshold.

This is the same threshold used in New South Wales Regulation for VR1, and also in the United Kingdom.

Road tankers transport the captured vapours to a terminal or distribution facility. The framework for managing VR1 at these facilities relies on these premises being scheduled and licensed. Therefore, the option did not look at regulating these facilities.

To enable enforcement of these requirements through audits and inspections, petrol stations and road tankers would be required to regularly (every six months) test the performance of their system and keep records on performance.

**Authorising provisions**

Vapour Recovery requirements are authorised under section 71(e) and (eb) of the Act, which allows for the making of Regulations for, or with respect to, respectively:

- regulating the use of any specified chemical substance or fuel
- regulating the construction, installation and operation of equipment and fittings used for or in connection with the dispensing of petrol, including prohibiting or regulating modifications to such equipment.

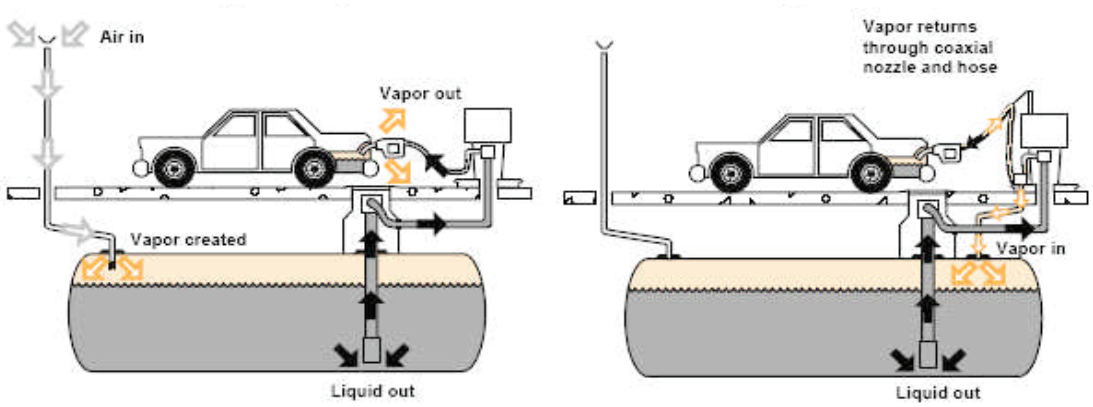
### 4.3.3 Vapour Recovery (Stage 2)

Evaporative emissions also occur when a vehicle is refilling at a petrol station. As a car is refilling, the incoming petrol forces petrol vapour (which had evaporated inside the car) out of the car's petrol tank and into the atmosphere.

The installation of Stage 2 Vapour Recovery (VR2) controls the emissions from filling vehicle tanks at petrol stations. VR2 captures petrol vapours at the petrol pump when motor vehicles refuel. It involves the capture of the vapour in the vehicle's fuel tank and the transfer of these vapours to the underground storage tank, preventing their release into the atmosphere.

When installing VR2, in addition to the vapour piping system, a vacuum pump is required to create suction to return the vapour from the vehicle's petrol tank to the underground tank, ensuring that no vapour escapes from the space around the nozzle. The figure below shows the flow of vapour without and with recovery equipment in place.

Figure 4.4: Stage 2 Vapour Recovery




Source: Wolf H Koch, *Petroleum Equipment & Technology*, July 1998.

VR2 technology was introduced in Europe and the United States in the early 1990s and is required in numerous countries where petrol vapour emissions are also the cause of local and regional air pollution. The use of VR1 and VR2 technology is considered best practice for management of petrol vapour at petrol stations. Best practice (under SEPP AQM) is defined by EPA around 'practicability' taking into account technical, logistical and financial criteria.

VR2 is currently being introduced to new and modified service stations over 0.5 million litres in selected regions in New South Wales, and will be required in all large (over 12 million litres) New South Wales metropolitan petrol stations from 2014 and smaller petrol stations (3.5–12 million litres) from 2017.

EPA understands that the latest available equipment for VR2 can capture up to 85 per cent of vapour emissions during refilling, however the cost of VR2 equipment is significant.

**Existing petrol stations**

Consultation with industry indicated that the basic cost to install VR2 equipment at an existing site is around $400,000. This excludes potential costs consequential on disturbing ground that is subject to other Regulations, such as dealing with contaminated material. There are other factors that suggest that installing VR2 may not be feasible or practical in Victoria at the present time.

- Advice from representatives of petrol station equipment suppliers suggests that there is currently limited capacity to deliver and install VR2 to existing petrol stations (for example, number of suppliers and provision of equipment), with at most only a small number likely to be achieved within the life of the Regulations.
- The cost to existing petrol stations represents a large upfront cost, which could have significant unintended consequences. This includes potential closure of some petrol stations that could also have implications for local communities.
- The option of linking the installation of VR2 to refurbishment activities could have the unintended consequence of delaying upgrades of equipment, which may lead to other environmental impacts (e.g., pollution of land and groundwater) associated with continued use of degraded equipment. These impacts have not yet been assessed.

EPA therefore considers that installation of VR2 at existing petrol stations would require significant further development and is not pursued in this RIS.

**VR2 option assessed – new petrol stations**

A feasible option to consider in this RIS is to only require VR2 equipment at new petrol stations, starting from 2015 to allow current construction plans to include the necessary equipment. As with the VR1 option, the VR2 option would only apply to petrol stations within the PPAQCR, as this is where ozone levels are highest and there is a denser population.

Preliminary data provided to EPA by one industry stakeholder indicates that the incremental cost of installing VR2 as part of constructing a new petrol station is around $50,000, while another indicated a cost of $200,000 per site. Given this variation in estimates and associated uncertainty, the benefits and costs of various scenarios are presented in the next section.

To enable enforcement of these requirements through audits and inspections, petrol stations would be required to regularly (every six months) test the performance of their system and keep records on performance.

**Authorising provisions**

Vapour Recovery requirements are authorised under section 71(e) and (eb) of the Act, which allows for the making of Regulations for or with respect to, respectively:

- regulating the use of any specified chemical substance or fuel
- regulating the construction, installation and operation of equipment and fittings used for or in connection with the dispensing of petrol, including prohibiting or regulating modifications to such equipment.

### 4.3.4 Non-regulatory options

The following table considers whether common types of non-regulatory approaches are suitable or feasible in relation to the defined objective.

Table 4.1: Non-regulatory options

| Non-regulatory option | Assessment |
|---|---|
| Self-Regulation, quasi-Regulation or co-Regulation | See comment below table. |
| Increased enforcement of existing provisions | None available. |
| Extending the coverage of existing legislation | Use of other sections of the Act would require additional Regulations to set standards and offences. |
| Removing other legislative impediments | None identified. |
| Rewarding good behaviour | Not applicable. |
| Negative licensing | The proposed Regulations do not establish any licensing. Victoria does not license petrol suppliers or petrol stations. |
| Public information and education campaigns | In most cases, the primary target of action is petrol suppliers, not the public. Action could be taken (e.g. promoting awareness of not spilling petrol while filling vehicles) although this is considered to have only marginal impact and therefore not feasible. |
| Information disclosure | Not applicable. |
| Market-based instruments (e.g. taxes, subsidies, user charges, tradeable permits) | Not applicable. |

**Discussion**

Given petrol distribution is largely centralised, self-Regulation or co-Regulation is prima facie feasible. However, it is noted that in the past New South Wales had set limits on petrol volatility via a memorandum of understanding with local oil companies. New South Wales since abandoned that approach in favour of more certain requirements through Regulations.

At the time of making the current Victorian Regulations in 2002, there was strong support from the Australian Institute of Petroleum, individual oil companies and independent importers on the setting of vapour pressure limits in Victoria via Regulation. In part, this reflects that lowering vapour pressure is costly to suppliers, who want certainty that there will be no free-riders in any approach. In this regard, putting limits in Regulation is an advantage to industry. Feedback from industry during development of this RIS indicated an unwillingness to pursue a self-regulatory approach, largely due to problems of coordination, accountability, and liability for failure to meet requirements.

New South Wales had proposed a negotiated agreement based on industry achieving an 85 to 90 per cent reduction in refuelling emissions in the greater metropolitan region within a specified timeframe. Such an approach would have enabled industry to install VR2 at locations of its choosing where it would be most cost effective, and offer flexibility in meeting required HC reductions. Such an agreement potentially offers scope for reducing the cost of the measures. However, New South Wales found that given market competition, fragmentation and a multitude of business ownership structures it was difficult to envisage how a consistent industry-wide agreement could be executed. It cited the UK experience with self-Regulation as being unsuccessful, and not lending support to a negotiated approach to the implementation of VR2 in NSW EPA. DECCW has also had poor experience with the oil industry in executing and honouring voluntary agreements in relation to meeting fuel quality specifications.

In New South Wales, stakeholders argued that if Vapour Recovery was to be expanded, it required an efficient regulatory approach that could provide for consistency of application and certainty of environmental outcome. A voluntary industry agreement was not deemed a robust or credible mechanism to implement VR2 that could offer consistency of application and certainty of environmental outcome, within a very competitive business environment.

Petrol retail sites in Australia can be separated into four broad categories on the basis of ownership and wholesale supply arrangements. These are:

- refiner-marketer owned sites
- refiner-marketer branded independent and distributor-owned sites
- supermarket operated sites
- independent operator sites selling their own brands.

Retail sites within these categories are operated in one of the following ways:

- Owner operated – the owner of the site is free to choose its wholesale supplier and determine its retail price. An independent owner-operator may choose to align its site with the brand of fuel sold by a particular wholesaler, by receiving branding (signage identifying that site as sourcing its fuel from a particular wholesale supplier).
- Commission agent – an individual manages a site (owned by a refiner-marketer or independent chain), and compensation is generally in the form of a commission based on the quantity of product sold.
- Franchise operated – an individual rents a site or a number of sites, (generally owned by a refiner–marketer) and operates under a franchise agreement. At these sites, fuel is sourced from the owner of the site and branded accordingly. Franchise operated sites may receive price support from their wholesaler. Price support enables the wholesaler to influence the retail prices set by the operator of the site.[87]

This complex structure makes it difficult to coordinate activities across the sector on an agreement basis.

Therefore co-Regulation or self-Regulation is not considered feasible.

## 4.4 Cost and benefits of the options

### 4.4.1 Vapour pressure limits during summer

**Benefits**

EPA estimates that the proposed limits on summer petrol volatility (monthly volumetric average vapour pressure of no more than 62 kPa; and a maximum vapour pressure of no more than 64 kPa) will lead to a reduction (compared to the base case pressure of 75 kPa) of around 6,800 tonnes of HCs each year.[88]

Table 4.2: Avoided HC emissions

| Source | Avoided HC emissions (tonnes/year) |
|---|---|
| Evaporative emissions from vehicles | 5,824 |
| Emissions during distribution | 412 |
| Exhaust emissions | 519 |
| **Total** | **6,773** |

Regulating to reduce vapour pressure results in a reduction of HCs emissions from vehicle-related evaporative sources by around 18 per cent.

Based on the methodology and assumptions detailed in Attachment G, this gives quantifiable health benefits of $28.4 million per year ($237 million PV over 10 years).

Lower volatility also means less fuel is lost to the atmosphere at service stations and terminals and directly from motor vehicles. This means there is more petrol that can be used. Petrol stations avoid evaporation of some petrol that they could sell; motorists avoid evaporation of some petrol that they use (reducing the need for additional purchases). These additional benefits are shown in the table below.

87 ACCC (2007), *Petrol prices and Australian consumers:* Report of the ACCC inquiry into the price of unleaded petrol, Chapter 5.

88 These estimates are based on the assumptions used in the NSW Regulatory Impact Statement: Proposed Protection of the Environment Operations (Clean Air) Regulations 2010, adjusted for the different proportion of petrol sales in Victoria. However, the NSW assessment assumed a base case of 70 kPa; this RIS uses a base case of 75 kPa based on feedback from petrol suppliers, and therefore the scale of reductions has been adjusted.

### Table 4.3: Benefits of vapour pressure limits

| Benefit | 2013 | 10-year |
|---|---|---|
| Health benefits from reduced emissions | $28.4m | $236.6m |
| Savings to motorists | $6.6m | $54.9m |
| Savings to distributors (petrol stations)* | $0.1m | $0.9m |
| **Total Benefits** | **$35.2m** | **$292.5m** |

*Of the 412 tonnes of HCs each year avoided during distribution, only 109 tonnes would be for petrol in the control of petrol stations. Other avoided emissions relate to filling of vehicles, which are currently unable to be recovered, and therefore reduced emissions have no additional value.

There are other unquantified benefits expected, including to the environment and amenity (for example, improved visibility).

**Costs**

Petrol refiners are readily able to reformulate petrol to meet the current petrol volatility limits without additional capital costs because the requisite management systems have already been developed. This reformulation results in more of the lighter HC, like butane, being separated out during the refining of oil to petrol. The cost to industry represents forgone profit from redirecting butane away from its highest value end-product (petrol) and instead, selling it as fuel gas.

Consultation with industry indicates that meeting the current vapour pressure requirements, relative to a 75 kPa level, cost around $12 million per annum (an average of $3 million per year for each supplier). This appears consistent with estimates in other jurisdictions (see Attachment G).

Additional costs are imposed by the recording and reporting requirements. Each supplier is required to sample test their fuels four times per month for five months of the year. Consultation with industry indicates that this costs the petrol suppliers around 1,200 hours in total each year, with a further 24 hours for reporting. Valuing this time as per Attachment G gives a compliance cost to industry of $0.1 million per year, and $0.7 million over 10 years (present value).

Records are required to be kept for two years, although this is expected to be kept electronically with no material cost burden to suppliers.

Under this option, the costs to government are limited to monitoring compliance (reviewing industry reporting and checking compliance) and follow up enforcement actions. Based on current practices, these costs are estimated to be $50,000 per annum.

### Table 4.4: Costs of vapour pressure limits

| Cost | 2013 $m | 10-year PV |
|---|---|---|
| Financial cost to petrol suppliers | $12.0m | $99.8m |
| Compliance cost to petrol suppliers | $0.1m | $0.7m |
| Cost to government | $0.05m | $0.4m |
| **Total Costs** | **$12.1m** | **$100.9m** |

The total cost represents $2.89 per vehicle per year.

**Net benefit**

The vapour pressure option is estimated to provide a net benefit of $23.0 million in 2013, and $191.5 million over 10 years (PV). This net benefit reflects a financial and compliance cost to industry (petrol suppliers), offset by a small saving to petrol stations and motorists through reduced fuel evaporation.

While not modelled for the purpose of this RIS, it is likely that the cost to petrol suppliers associated with reducing vapour pressure are passed through to petrol stations and then further to motorists. If all of the costs were passed on through to petrol prices charged to motorists, the incremental cost of the proposed vapour pressure requirements is equivalent to higher petrol prices in the order of 0.31 cents per litre.[89]

89 This is a relatively small amount given the benefits achieved, and compares to the estimate by one petrol supplier that a further reduction in vapour pressure from 62 kPa to 59 kPa would cost a further 0.41 cents/litre.

### 4.4.2 Vapour Recovery (Stage 1)

**Benefits**

With the latest available technology, VR1 can capture 97 per cent of petrol vapour from escaping into the atmosphere. Emissions would be avoided at this rate by:

- Existing petrol stations within the PPAQCR, with throughput petrol sales greater than 0.5 million litres per year, that do not currently have VR1 equipment. This is estimated to avoid emissions of around 130 tonnes of HCs each year, although this rate would not be reached until 2015.
- New petrol stations within the PPAQCR, with throughput petrol sales greater than 0.5 million litres per year. This was estimated to avoid 13.4 tonnes of HCs emissions each year, which accumulates as additional new petrol stations come online each year. This estimate takes account of an assumed 50 per cent of new petrol stations within the PPAQCR installing VR1 regardless of any new regulatory requirements.[90]
- Existing petrol stations within the PPAQCR, with throughput petrol sales greater than 0.5 million litres per year, that undergo refurbishment. This was estimated to avoid 13.4 tonnes of HCs emissions each year, which accumulates as additional new petrol stations come online each year. This estimate takes account of an assumed 50 per cent of new petrol stations within the PPAQCR installing VR1 regardless of any new regulatory requirements.[91]

In total, this option is estimated to avoid 2,592 tonnes of HCs emissions from evaporation over the life of the Regulations. While avoided emissions are small in the early years, the impact of this option would be to reduce the current evaporative emissions associated with dispensing petrol to petrol stations by around 46 per cent in 2022.

The health benefits of the reduced HCs over this period are estimated to be around $220,000 in 2013 and $8.7 million over 10 years (PV).

As with vapour pressure, capturing vapour as liquid fuel also provides a benefit to industry by reducing waste; the captured vapour can be returned to liquid form and used as petrol. The value of this re-captured fuel is about $59,000 in 2013 and $2.3 million over 10 years.

#### Table 4.5: Benefits of Stage 1 Vapour Recovery

| Benefit | 2013 | 10-year PV |
|---|---|---|
| Health benefits from reduced emissions | $219,660 | $8.7m |
| Savings to industry (petrol suppliers) | $59,139 | $2.3m |
| **Total Benefits** | **$278,799** | **$11.0m** |

**Costs**

Direct financial costs to petrol stations are estimated at $6,000 per tank per site to retrofit VR1 at 97 petrol stations in the PPAQCR. This is assumed to be spread equally over 2013 and 2014 in preparation for 1 January 2015.

There would also be 10 petrol stations each year that would be either new or being refurbished, that would not have otherwise installed VR1 systems and would need to comply with the new VR1 requirements. For these sites, the cost is assumed to be $2,000 per tank per site and although the requirement would commence from 1 January 2015, it is assumed that any new petrol stations being constructed from January 2013 would install the necessary equipment to be ready for the 2015 compliance date and hence incur additional costs from 2013.

Petrol stations have on average four tanks per site. This gives a total cost to industry of this option of $1.2 million in the first year and $2.9 million over 10 years (PV). The cost to industry is not smooth, with a spike in costs at the beginning, reflecting the need for existing petrol stations to comply. After the retrofits are completed, total costs to industry would be around $80,000 per year.

90 The 50 per cent of new petrol stations with the higher volume sales have been modelled to account for 64 per cent of total petrol sold by new PPAQCR petrol stations. The same proportion applied to refurbished petrol stations within the PPAQCR.

91 These petrol stations are included in the benefits (and the costs) as refurbishment presents an opportunity to not replace VR1 equipment during a refurbishment if it is not mandated.

While an existing petrol station is having VR1 equipment installed, there may be a 'disruption cost' to the individual petrol station associated with downtime and lost business. Such a cost has not been included in this cost-benefit analysis as:

- EPA understands the downtime in relation to VR1 would be quite small (days to a week), as compared to disruption associated with VR2, which EPA understands would be in the order of 6–8 weeks
- there would be no net impact as motorists would transfer any purchases during this period to another petrol station (the small loss to one petrol station is offset by a gain to other petrol stations in the same area)
- by limiting new VR1 requirements to petrol stations in the metropolitan areas, there is assumed to be no additional travel cost associated with motorists travelling to another petrol station.

There would also be compliance costs associated with monitoring and recording of equipment performance. This would be required to be conducted every six months for all petrol stations and road tankers. In total, this cost is around $138,000 per year, and is in addition to the costs to the industry noted above.[92]

There would also be an additional cost to government associated with this option. EPA would need to inspect and monitor compliance with the VR1 requirements and additional resources to test the ongoing effectiveness of the measure. This would be expected to cost EPA around $100,000 per year.

### Table 4.6: Costs of Stage 1 Vapour Recovery

| Cost | 2013 | 10-year PV |
|---|---|---|
| Cost to petrol stations – equipment | $1.2m | $2.9m |
| Cost to petrol stations/fuel tankers - compliance | $0.1m | $1.2m |
| Cost to government | $0.1m | $0.8m |
| **Total Costs** | **$1.5m** | $4.9m |

**Net benefit**

This option has a net cost of $1.2 million in 2013, although an overall net benefit of $6.2 million over 10 years (NPV). It is therefore considered to be a cost-effective approach to reducing evaporative emissions, although the overall quantum of the reduction is small.

The total costs represent about 35 cents per vehicle in the first year, decreasing over the life of the Regulations. If the (net) costs to industry were fully passed through to motorists through petrol prices, the incremental impact of this option would be 0.04 cents/litre in 2013, although after around four years the accumulated savings to the industry are likely to outweigh the ongoing costs, resulting is a very small negative impact on petrol prices by 2022 (around 0.003 cents per litre).[93]

### 4.4.3 Vapour Recovery (Stage 2)

Given the uncertainties in the cost of VR2 installation, and therefore identifying an appropriate threshold for what size petrol stations could be required to install VR2, the analysis of costs and benefits in this section is presented differently to the options above. As outlined in Section 4.3.3, the analysis is undertaken for VR2 installation at new petrol stations only.

**Benefits**

With the latest technology, VR2 can capture 85 per cent of petrol vapour from escaping into the atmosphere during vehicle refuelling. The amount of emissions recovered depends on the annual throughput of petrol at each petrol station. The health benefits of the reduced HCs are derived from these estimates based on the values discussed in Attachment E.

As with VR1, capturing vapour and converting it back to liquid fuel also provides a benefit to petrol stations by reducing waste. This is linked directly to the amount of petrol vapour captured.

92 Petrol stations within the PPAQCR and over 0.5 million litres per year.

93 The costs of installing VR1 fall on petrol station owner-operators, while the savings from captured vapours accrue to petrol suppliers who collect the vapour and return it to liquid form. Both impacts could potentially affect overall petrol prices. It is likely any VR1 costs would be passed through to motorists.

**Costs**

The costs of implementing VR2 are the equipment and installation costs, and costs associated with monitoring and recording of equipment performance required every six months.

There is an additional cost to government associated with this option. EPA would need to inspect and monitor compliance with the VR2 requirements and additional resources to test the ongoing effectiveness of the measure. This would be expected to cost EPA around $2,000 per year per petrol station (commencing from 2015).

**Net benefits**

The net benefit was calculated for a number of different cost scenarios, with each scenario also sensitive to the estimated value of the avoided emissions.

The following table shows the net benefit to the community of installing VR2 at a single petrol station, being in the PPAQCR with annual petrol throughout of 3.1 million litres.[94]

### Table 4.7: Net benefits of VR2 (average petrol station)

| Cost of installing VR2 | Net Benefit (10-year NPV) | | |
|---|---|---|---|
| | **Value of reducing emissions** | | |
| | **Low** | **Medium** | **High** |
| $50,000 | $51,000 | $60,000 | $67,000 |
| $100,000 | $4,000 | $13,000 | $20,000 |
| $150,000 | -$42,000 | -$33,000 | -$27,000 |
| $200,000 | -$89,000 | -$80,000 | -$73,000 |

Taking the best estimate of the health benefits of reduced HC emissions used in this RIS (the 'medium' scenario – third column of the above table), this analysis indicates that, for an average petrol station in the PPAQCR, a VR2 cost of $114,000 presents a break-even point. The break-even point associated with the 'low' estimate (the second column of the above table) of health benefits is $104,000.

If VR2 was required for all new petrol stations from 2015 with sales over 0.5 million litres per year within the PPAQCR, and taking a mid-point of potential equipment costs of $150,000 per petrol station, this would result in total costs over 10 years of $11 million (PV) and a total benefit of $5.2 million (PV). This would impose a net cost on the community of around $5.9 million over 10 years (PV). This would affect 80 new petrol stations over the life of the Regulations (10 new petrol stations within the PPAQCR each year, commencing from 2015).

Alternatively, the modelling can determine what annual volume of petrol is required by an individual petrol station in order to reach the break-even point. This is shown in the table below.

### Table 4.8: Break-even petrol station size for VR2

| Cost of installing VR2 | Annual petrol throughput (ML) | | |
|---|---|---|---|
| | **Value of reducing emissions** | | |
| | **Low** | **Medium** | **High** |
| $50,000 | 1.6 | 1.5 | 1.4 |
| $100,000 | 2.9 | 2.7 | 2.5 |
| $150,000 | 4.1 | 3.8 | 3.6 |
| $200,000 | 5.4 | 5.0 | 4.7 |

The above break-even points are calculated on an NPV basis over the life of the Regulations, assuming a commencement for VR2 requirements from 2015.

This suggests that even at the lower estimate of $50,000 for installing VR2, the requirement should only apply to petrol stations selling more than 1.6 million litres of petrol per year. If the actual cost of VR2 were closer to $200,000 per site, benefits would only be achieved for sites with annual throughput of over 5 million litres.

94 This is the average petrol volume throughput over all petrol stations in the PPAQCR with throughput greater than 0.5 million litres.

**Further investigation into VR2**

EPA cannot confirm the most likely cost of VR2 at this time, and given the sensitivity of the net benefit to VR2 installation costs, VR2 is not able to be recommended at this stage.

However, EPA considers that this option warrants further analysis. If new petrol stations within the PPAQCR installed VR2 over the next 10 years, the total avoided HC emissions over that period would be around 1,260 tonnes, which has a health benefit to the community of around $5.3 million. EPA therefore seeks to gather further information through this RIS process to provide better precision on VR2 costs.

In particular, preliminary discussions with industry suggested that the desired outcomes of VR2 (capture of evaporative emissions during vehicle refilling) could be achieved other than by installing the equipment currently used elsewhere. EPA welcomes any views on possible approaches that would reduce the installation costs.

Feedback on theEPA discussion paper (publication 1415) also indicated that 85 per cent capture rate may be too optimistic, or may have implications for costs of installation. Views are sought through this RIS process on whether requiring 85 per cent capture rate would be feasible.

## 4.5 Preferred outcome

The decision criterion used in this RIS is net present value (NPV).

On this basis, the assessed vapour pressure limits (monthly volumetric average vapour pressure of no more than 62 kPa; and a maximum vapour pressure of no more than 64 kPa) are expected to lead to a clear and significant net benefit, and are therefore proposed to be included in the Regulations (continuing the current arrangements for vapour pressure, although reducing the reporting burden from monthly to annual).

EPA considers that any benefit offered by introducing VR1 is marginal, and is not proposed at this time. Unless greater overall benefits can be demonstrated, VR1 will not be regulated at this time.

Given that VR2 would only result in a net benefit under certain conditions, for which there is a lack of accurate data, EPA cannot conclude at this stage that VR2 would represent a net benefit to the community. It is therefore not presently proposed to be included in the Regulations, although EPA will be pursuing further information on its costs and benefits, and whether there are implementation issues if it were to proceed, through this RIS process. Unless greater overall benefits can be demonstrated, VR2 will not be regulated at this time.

**Stakeholders affected by the preferred outcomes**

The vapour pressure limits are expected to result in a net benefit to the State and is therefore the preferred outcome. The following groups will be affected by the proposed approach:

- The community as a whole will benefit from lower health impacts from HC emissions, and improved amenity by improved visibility. Motorists will also benefit from lower fuel requirements as evaporative emissions from vehicles will be reduced. These benefits will be largely to metropolitan areas.
- Industry will bear the costs of the proposed measures—petrol suppliers will bear the cost of meeting vapour pressure limits, and associated testing and reporting. It is likely that at least some of this cost will flow through to higher petrol prices, although this impact is expected to be negligible in terms of current petrol prices.
- There are also benefits to the wider community through better environmental outcomes, such as reduced ozone, which is a greenhouse gas. However, these benefits have not been quantified in this RIS.

**Sensitivity analysis**

While VR1 is estimated to generate an overall net benefit ($6.2 million over 10 years), this is much smaller than the impact of the vapour pressure requirements. It is therefore useful to consider the robustness of this estimate to different parameters. In particular:

- if a lower value for the health benefits of avoided HCs was used (see Attachment E), the net benefit of VR1 would be reduced by $800,000
- if equipment costs were 10 per cent higher than expected, the net benefit of VR1 would be reduced by $290,000
- if 95 per cent of existing petrol stations already have VR1 installed (as opposed to the assumed 90 per cent), the net benefit of VR1 would be reduced by $600,000
- if the rate of new and refurbished petrol stations (or new petrol stations that do not otherwise install VR1) is half of that expected, the net benefit of VR1 is reduced by $3.1 million.

The benefit included in the VR1 estimates assumes the measure is implemented in isolation. However, where the proposed vapour pressure limits are in place, this will already serve to reduce some emissions. Setting vapour pressure limits avoids 412 tonnes of HC emissions per annum during distribution. This represents an 8 per cent reduction in emissions from distribution activities. Therefore, with vapour pressure limits in place, VR1 equipment would be expected to recover 8 per cent less HC emissions than if vapour pressure was at a higher 75 kPa. Therefore, the benefits (in terms of health benefits and reduced waste of fuel) of 207 tonnes of HC emissions need to be deducted if both options were implemented. This reduced the incremental net benefit of implementing VR1 by around $900,000 over 10 years.

Some other costs have not been included in the above analysis. Following consultation with industry representatives, EPA is aware that while many petrol stations have VR1 systems in place, there may be a low level awareness of how its performance can be readily measured. This could lead to low levels of compliance in the early years, and/or additional costs to EPA to provide information to petrol stations to assist them.

Also, disruption to individual petrol stations has not been included. While this does not represent a net cost to the community (temporarily reduced sales from one petrol stations would be offset by increased sales elsewhere), it does have a material impact on the petrol station needing to install VR1 equipment. EPA has not been provided specific feedback on the extent of this disruption to petrol stations, although estimates that it would only involve closure of a couple of days, possibly up to a week.

This RIS has assumed nine out of 10 petrol stations in the PPAQCR have VR1 (and 97 per cent of fuel by volume in metroplitan Melbourne comes from service stations with VR1). This is consistent with EPA pollution report data for the last 10 years, which indicates minimal reports in relation to odour from a petrol station during refuelling (one report per annum for tank refuelling) and less that 0.1 per cent of total EPA odour and air reports for the PPAQCR related to refuelling from petrol stations.

Also, it is industry practice to install VR1 on road tankers. Once VR1 is installed on tankers, they need to comply with the Dangerous Goods Act requirements.

EPA will be pursuing further feedback on the costs, benefits and assumptions used for VR1, and whether there are implementation issues if it were to proceed during the RIS consultation. Unless greater overall benefits can be demonstrated, VR1 will not be regulated at this time.

## 4.6 Implementation and enforcement

There are no implementation issues for the vapour pressure limits as these continue the current arrangements.

The proposed Regulations include penalties for non-compliance. However, as detailed in Chapter 3.6, EPA uses both proactive and responsive approaches to monitoring compliance, including a range of other tools to encourage compliance.

The proposed Regulations include a process for the making and granting of exemptions from the vapour pressure requirements. These are discussed in the next chapter.

# 5 Exemptions from Regulations

## 5.1 Background

The proposed Regulations recognise that the requirements for vapour pressure may need to be waived or varied in unforseen and special circumstances, and therefore include a process for EPA granting exemptions from those parts of the Regulations.

The current Regulations allow for exemptions to be granted in relation to the vapour pressure requirements. Since 2002, there have been six exemptions applied for. All of these related to ethanol-blended fuel. The proposed Regulations will now include a special provision for ethanol-blended fuel, removing the need for these exemptions to be sought. EPA therefore expects that applications for exemptions will be very infrequent. For example, the exemptions process allows for consideration of other alcohol blended petrol where there is current uncertainty regarding the impact on vapour pressure levels.

Therefore, in framing the proposed Regulations, EPA does not expect any particular exemptions to be sought and there is no assumption as to a particular level of exemption application. However, the need to include this flexibility is recognised, and the inability to grant exemptions in special cases poses a risk to be able to vary the requirements for vapour pressure.

## 5.2 Objective

The objective in relation to the exemptions is to facilitate the efficient consideration and granting of exemptions.

## 5.3 Base case

In the absence of any Regulations, there would be no need for a process to apply for exemptions. Therefore, a more meaningful approach is to consider a situation where the proposed Regulations are in place but without a process for exemptions.

## 5.4 Options

Given the nature of this matter, the options are relatively limited to:

- giving EPA the ability to grant exemptions, without specifying what information must be provided with an application; or
- giving EPA the ability to grant exemptions, including specifying the information that must be provided in writing with an application. The proposed Regulations include only the minimum information that EPA considers necessary to determine whether an exemption should be granted, and includes:
  - reason for the application
  - assessment of the environmental impact of the proposed exemption
  - volume and grade of petrol covered by the application
  - likely geographic location where the petrol will be sold for retail
  - vapour pressure of the petrol to be supplied
  - period for which the exemption is requested.

Under both options EPA would have the ability to request further information if warranted in order to properly assess the application.

In both circumstances, the Regulations would also need to include provision to support the implementation and enforcement of any exemption granted.

## 5.5 Costs and benefits of the options

It is not possible to meaningfully quantify the costs or benefits of the exemptions to the proposed Regulations. As noted above, EPA does not expect exemptions to be made other than in unforseen and exceptional circumstances, and therefore the value in being able to grant exemptions is unknown. However, EPA considers that provision for exemptions is better than not having that ability.

Providing for the granting of exemption imposes no burden.

In relation to the information to be provided with an application, this does create an administrative burden on applicants in making their application and responding to further requests from EPA about the application if needed. Again, it is not possible to quantify the impacts of the two options, as the amount of time applicants would be required to expend on making an application would depend on the particular exemptions being sought. EPA cannot anticipate these in advance. EPA can ensure that the application process and information requirements are clearly and consistently communicated to potential exemption applicants. The amount of information expected in an application would be proportional to the nature and scope of the exemption being sought. The criteria for exemptions will be guided by environmental protection principle 1B Principle of integration of economic, social and environmental considerations. In considering an exemption application the Authority will have regard to the following:

(a) the protection of the environment
(b) the protection of occupational and public health and safety
(c) the interests of consumers
(d) the impact on economic and regional development
(e) any other matters the Authority considers relevant.[95]

EPA considers that specifying the minimum information to be included in an application saves time for both EPA and the applicant, and therefore assists in a more efficient exemptions process.

The preferred option is therefore to include the list of requirements to be included with an application. The groups affected by these arrangements are only those seeking exemption (fuel suppliers).

## 5.6 Application fees

The proposed Regulations require that in making an application for an exemption, that a fee be paid.

Cost recovery may be defined as the recuperation of the costs of government-provided or funded products, services or activities that, at least in part, provide private benefits to individuals, entities or groups, or reflect the costs imposed by their actions.

The Victorian Government's *Cost Recovery Guidelines* set out principles underpinning cost recovery arrangements. The Guidelines establish a whole-of-government framework thereby ensuring that cost recovery arrangements in Victoria are transparent, efficient, effective and consistent with legislative requirements and government policy. These guidelines are based on the principle that properly designed cost-recovery arrangements can deliver both equity and efficiency benefits to the community.

The Government's policy is that, in the absence of other policy objectives, fees should be set to fully recover an agency's additional costs in undertaking the task. As the setting of a fee in this instance is unlikely to have any impact on other policy objectives, the proposed fee amount has been set to fully recover the costs to EPA of considering and making a decision on an application.

The *Cost Recovery Guidelines* set out 10 steps to consider when setting fees. These are set out below, together with a summary of EPA's consideration of each step in accordance with the guidelines.



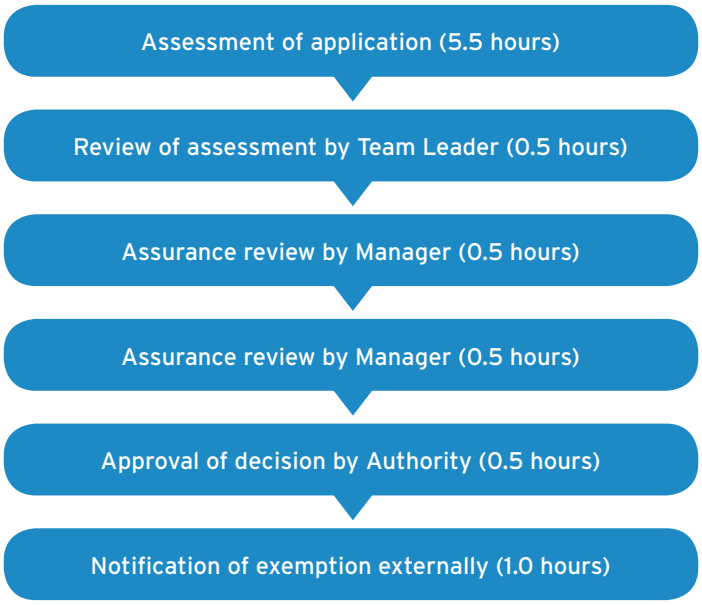
95

Table 5.1: Cost recovery guidelines

| Step | Issues to be addressed | EPA consideration |
|---|---|---|
| **Appropriateness of cost recovery** | | |
| 1 | Is provision of the output or level of Regulation appropriate? | EPA considers it appropriate that parties may apply for exemptions to the Regulations and have them considered by EPA. |
| 2 | What is the nature of the output or Regulation? | The Regulation to which the fee applies is an exemption from other Regulations. |
| 3 | Who could be charged? | As it is applicants that will benefit from the granting of an exemption, it is appropriate that the applicant bears the cost of processing that application. It is not practical for other parties to be charged. |
| 4 | Is charging feasible, practical and legal? | Charging of fees is feasible and practical as it can be administered as part of the application processes. This also minimises transaction costs. The Act provides that fees may be prescribed. |
| 5 | Is full cost recovery appropriate? | Yes. There are no factors that indicate that full cost recovery is not appropriate. |
| **Cost structures and nature of charges** | | |
| 6 | Which costs should be recovered? | The cost base for the purposes of assessing recovery is based on the incremental costs associated with EPA receiving and dealing with the exemption application. Direct and indirect costs are included on a marginal cost basis. An activity-based costing method was used to determine the fee. |
| 7 | How should charges be structured? | EPA does not consider it necessary to spread payment of fees over a longer period to support cash flow, investment, innovation or competition considerations. No cross-subsidisation is proposed. The fees are structured as a single fee, and are therefore the simplest structure. |
| 8 | Are cost recovery charges based on efficient costs? | By specifying certain information to be included with an application, EPA has endeavoured to make the consideration of exemptions as efficient as possible by reducing the likelihood of requests for further information. The application will be assessed according to EPA's existing processes. |
| **Implementation features** | | |
| 9 | What is the importance of consultation? | Consultation of fees is occurring via this RIS process. |
| 10 | How should cost recovery arrangements be monitored and reviewed? | EPA will monitor the impact of the proposed fees. |

**The cost base for the purposes of assessing cost recovery is based on the incremental costs associated with EPA processing applications and other information provided by applicants. Direct and indirect costs are included on a marginal cost basis. An activity-based costing method was used to determine the fee.**

The proposed process for handling applications for exemption is shown in the following process map:




EPA estimates that the total time spent by EPA staff is eight hours (expressed in VPS5 equivalent terms).

The estimate of hours is based on EPA's expectation of performance under the proposed Regulations that set out the information to be provided with each application.

The time and costs of notifying the public about the exemption in the government gazette and on EPA's website have also been included. Only costs associated with the consideration of applications was included in the cost base. There are additional costs to EPA associated with the exemptions, such as auditing compliance with any exemption conditions and prosecuting breaches of exemption condition. However these are not directly related to the processing of the application, and are undertaken to benefit the community not the applicant.

The hourly cost a VPS5 is taken as an hourly rate of $102.27 ($58.44 salary plus $43.83 on-costs and overheads). The total cost of processing an application for exemption is therefore estimated at $818.16. This involves assessing whether the application complies with the requirements of the Regulations, as well as determining whether the environmental impacts of the proposed exemptions are acceptable. An hour of EPA staff time is also required to prepare a notification of exemption, seek approval for that notification and coordinate its publication in the Government gazette and EPA's website. The cost of notifying the public in the government gazette is $80. Therefore the total cost is $898.16. The value of a fee unit under the *Monetary Units Act 2004* for 2013–14 is $12.84, which gives an equivalent cost of processing exemptions as 69.9 fee units (fee units must be rounded to 1 decimal place).

For administrative simplicity, the costs associating with notifying the public about a successful exemption will be borne by both successful and unsuccessful exemption applicants.

EPA anticipates receiving less than one exemption application every two years.

This represents an increase from the current application fee of 10.4 fee units. The increase is 573 per cent.

# 6 Impacts on competition

This section of this RIS discusses the impact of the proposed Regulations on competition. A measure is likely to have an impact on competition if any of the following questions can be answered in the affirmative:

Table 6.1: Competition test

| Test question | Assessment |
|---|---|
| Is the proposed measure likely to affect the market structure of the affected sector(s) – i.e. will it reduce the number of participants in the market, or increase the size of incumbent firms? | NO |
| Will it be more difficult for new firms or individuals to enter the industry after the imposition of the proposed measure? | NO |
| Will the costs/benefits associated with the proposed measure affect some firms or individuals substantially more than others (e.g. small firms, part-time participants in occupations etc)? | NO |
| Will the proposed measure restrict the ability of businesses to choose the price, quality, range or location of their products? | NO |
| Will the proposed measure lead to higher ongoing costs for new entrants that existing firms do not have to meet? | NO |
| Is the ability or incentive to innovate or develop new products or services likely to be affected by the proposed measure? | NO |

The proposed Regulations are not expected to have any impact on competition.

It is however, worthwhile to note that if either Stage 1 or Stage 2 Vapour Recovery options were proposed, these would have an impact on competition.

The option relating to Stage 1 Vapour Recovery (VR1) would affect competition among petrol retailers. This is because a large number of petrol stations (around 90 per cent) already have VR1 systems in place. The requirement to have VR1 means that the costs of a new petrol station entering the market will be higher. However, the impact would not be significant.[96]

If implemented, Stage 2 Vapour Recovery (VR2) would have a more significant impact on competition. This is because it would only apply to new petrol stations, and therefore is a direct barrier to entry into the petrol retail market. The impact is also significant – while a cost of around $200,000 is only a small component of the total cost of constructing and operating a petrol station (less than 2 per cent), spread over 30 years, it would amount to 1.5 cents per litre for a petrol station that just exceeds the threshold of 0.5 million litres per year.

96 A new petrol station would incur incremental costs of as little as $2,000 per tank in meeting VR1 requirements. This compares to the total capital costs of establishing a new petrol station of well over $10 million. The requirement for VR1 would only apply to petrol stations that dispense more than 0.5 million litres per year spread over 10 years, then this cost would reflect at most an addition of 0.15 cents per litre of petrol sold by that petrol station. This is below the increments at which petrol stations compete, and negligible when compared to daily fluctuations in retail petrol prices.

# 7 Stakeholder consultation

In November 2011, EPA released a Discussion Paper – Review of the Environment Protection (Vehicle Emissions) Regulations 2003, EPA publication 1415 as part of the review of the current Regulations, and invited feedback on their effectiveness and opportunities for change. The discussion paper set out the current arrangements and specifically outlined possible new options for addressing the existing problems, including Stage 1 and 2 Vapour Recovery, mandatory vehicle maintenance, and labelling of after-market motor vehicle equipment.

Written submissions were invited, in parallel to an online forum and survey. EPA also held four workshops to explore issues identified in the discussion paper and assist people making submissions.

There were 13 written submissions from four members of the public and the following organisations:

- ExxonMobil Australia
- Exhaust Systems Professional Association
- Caltex Australia
- Shell Australia
- Australian Institute of Petroleum
- Maribyrnong Truck Action Group
- BP Australia
- Victoria Police.

Those who provided feedback on the discussion paper generally supported a continuation of the Regulations. Motor vehicle noise and emissions were seen as an important issue amongst community members, many of whom called for harsher penalties. The fuel industry highlighted the importance of establishing the case for Regulation and its benefits. They submitted that Regulations should be outcome-based and should not adversely impact competition.

While there was support for the introduction of Stage 1 Vapour Recovery as a cost-effective means of reducing HC emissions, there was general opposition from industry to the introduction of Stage 2 Vapour Recovery, based on the costs of implementation.

Fourteen people attended the workshops.

The online forum was held by EPA in December 2011 for interested parties to exchange and discuss views on the issues included in the discussion paper. The forum attracted around 600 visits, although there was only a small number of comments made under each of the prompt questions.

EPA also conducted an online survey open to the general public in December 2011. There were 42 responses to the survey. These responses indicated that:

- Sixty per cent of respondents thought air and pollution and noise from motor vehicles were a significant issue for Victoria
- Fifty-two per cent of respondents had been affected by vehicle noise at their home in the past three months; the median level of annoyance was 7 (scale 1–10)
- Sixty-five per cent of respondents thought that vehicle inspections or maintenance should be mandatory for 'some vehicles'.

EPA held an 'Open House' Discussion in November 2011. The discussion was facilitated between a community member, an approved emission and noise tester, and a fuel industry representative.

The preparation of this RIS has taken account of the information collected from the feedback on the discussion paper and workshops.

In addition, EPA met with the following organisations in June 2012 to discuss options in relation to reducing evaporative emissions from petrol, to test the assumptions used in this RIS and to discuss the feasibility of implementation and enforcement:

- Australian Institute of Petroleum
- Caltex Australia
- Exxon Mobil Australia
- Shell Australia
- Victorian Automotive Chamber of Commerce
- Australasian Convenience and Petroleum Marketers Association
- Australian Petroleum Industry Contractors and Suppliers Association
- Two independent petrol station proprietors (one each from metro/non-metro area).

The organisations provided additional data to EPA, which has been incorporated into the modelling of this RIS.

EPA consulted with all Australian states and territories regarding the policy option to set emission limits for CO and HC for spark ignition vehicles. All jurisdictions have no objections to this approach being used in Victoria.

*The Subordinate Legislation Act 1994* requires that the public be given at least 28 days to provide comments or submissions regarding the proposed Regulations. Written comments on this RIS are required by no later than 5.00pm, 23 September 2013.

# 8 Evaluation Strategy

EPA will measure the performance of the proposed Regulations as part of reporting against EPA's 5 Year Plan.

Key metrics to evaluate performance of the proposed Regulations will include:

- number of notices issued for smoky and noisy vehicles
- number of public smoky vehicle reports
- number of infringement notices and official warnings issued
- number of vehicles inspected
- number of roadside activities
- estimation of the volume of avoided emissions from regulated sources
- review of vapour pressure annual compliance reports.

A number of these metrics will be reported as part of EPA's annual reporting.

Many of these metrics can be used as a proxy to determine the effectiveness of the proposed Regulations in reducing air pollution and noise and can help inform any future broader plans (for example EPA's 5 Year Plan).

It is acknowledged that the most recent estimates of the costs of some of the emissions, in an Australian context, are from 2002. Commissioning, producing or identifying more recent estimates in Australia are likely to occur nationally over time as part of development of a National Plan for Clean Air (NPCA).

Annual review of this data will help inform the effectiveness of these proposed Regulations and their contribution to EPA's broader environmental quality objectives. Frequent review will determine if there is a need for specific consultation, for example with industry.

If further consultation reveals issues that can only be solved through Regulation, there is the potential to amend the proposed Regulations within their 10-year lifespan.

## *Attachment A: Description of proposed regulations*

| Regulation number | Description | Nature of Regulation |
|---|---|---|
| **PART 1 – Preliminary** | | |
| 1 | States that the objectives of these Regulations are to:<br>prescribe air emission standards and standards of maximum permissible concentration for emissions from motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment<br>prescribe noise emission standards for motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment<br>provide for offences relating to the supply of petrol to minimise the release of petrol vapours into the environment<br>prescribe various matters necessary to be prescribed for the purposes of the *Environment Protection Act 1970* | Machinery provision |
| 2 | These Regulations are made under sections 53P and 71 of the *Environment Protection Act 1970* | Machinery provision |
| 3 | States the commencement date for the Regulations | Machinery provision |
| 4 | Revokes previous Regulations | Machinery provision |
| 5 | Defines certain terms used in the Regulations | Machinery provision |
| 6 | Defines application of Regulations | Machinery provision |
| **PART 2 – Vehicle air emission standards** | | |
| 7 | Sets a limit for visible emissions from vehicles | Imposes financial cost. Costs and benefits assessed in this RIS |
| 8 | Sets maximum permissible concentrations from spark ignition vehicles | Imposes financial cost. Costs and benefits assessed in this RIS |
| 9 | Sets limits for emissions from diesel vehicles | Imposes financial cost. Costs and benefits assessed in this RIS |
| **PART 3 – Vehicle noise emission standards** | | |
| 10 | Sets noise limits for vehicles certified to ADR 83/00 | Imposes financial cost. Costs and benefits assessed in this RIS |
| 11 | Sets noise limits for passenger vehicles not certified to ADR 83/00 | Imposes financial cost. Costs and benefits assessed in this RIS |
| 12 | Sets noise limits for goods vehicles and buses not certified to ADR 83/00 | Imposes financial cost. Costs and benefits assessed in this RIS |
| 13 | Sets noise limits for motor cycles and motor trikes not certified to ADR 83/00 | Imposes financial cost. Costs and benefits assessed in this RIS |
| 14 | Prescribes the method for determining motor vehicle noise emissions | Machinery provision |
| **PART 4 – Vehicle noise labelling standards** | | |
| 15 | Prohibits removal and defacement of noise labels on motor cycles and trikes and use of vehicles without intact noise label | Enforcement provision |

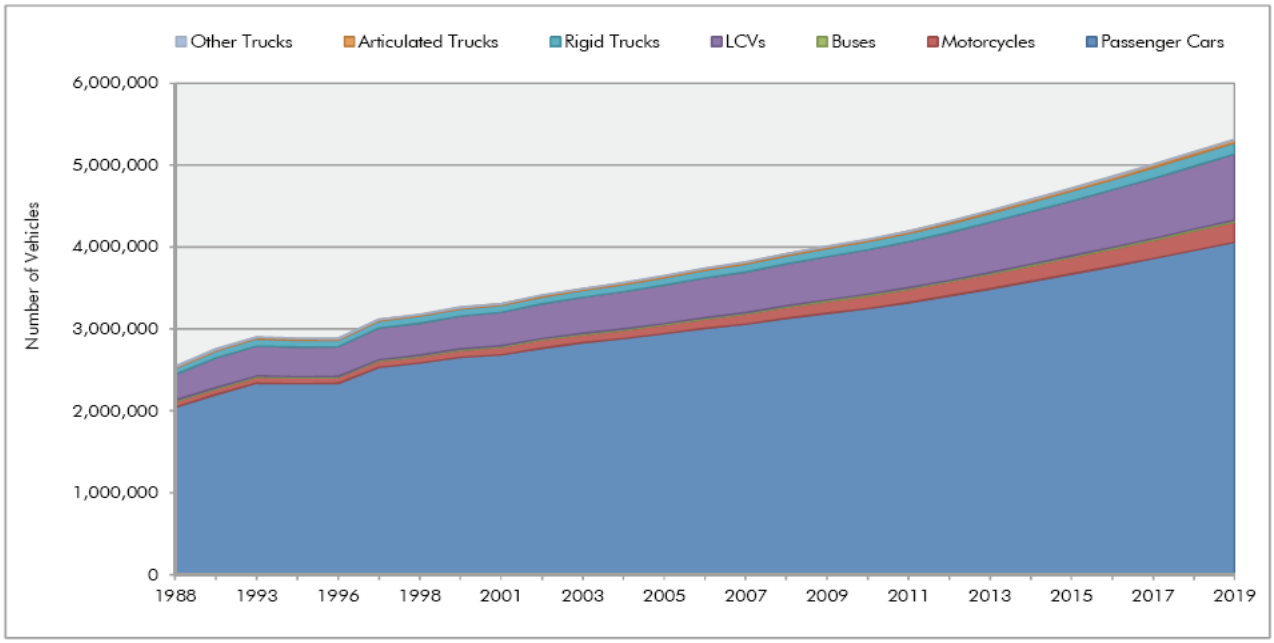
*Attachment A: Description of proposed regulations (continued)*

| Regulation number | Description | Nature of Regulation |
|---|---|---|
| **PART 5 – general vehicle offences** | | |
| 16 | Prohibits the sale of a vehicle exceeding a prescribed noise standard | Enforcement provision |
| 17 | Prohibits use of temporary noise defeat devices | Enforcement provision |
| **PART 6 – petrol vapour pressure** | | |
| 18 | Specifies the calculation of the average volumetric vapour pressure | Machinery provision |
| 19 | Specifies the permitted vapour pressure for petrol supplied | Imposes financial cost. Costs and benefits assessed in this RIS |
| 20 | Sets out the process for exemptions | Imposes financial and time cost. Costs and benefits assessed in this RIS |
| 21 | Specifies records to be kept for vapour pressure testing | Compliance cost assessed in this RIS |
| 22 | Specifies annual compliance reporting of vapour pressure | Compliance cost assessed in this RIS |

## *Attachment B: Trends and projections in use of vehicles*

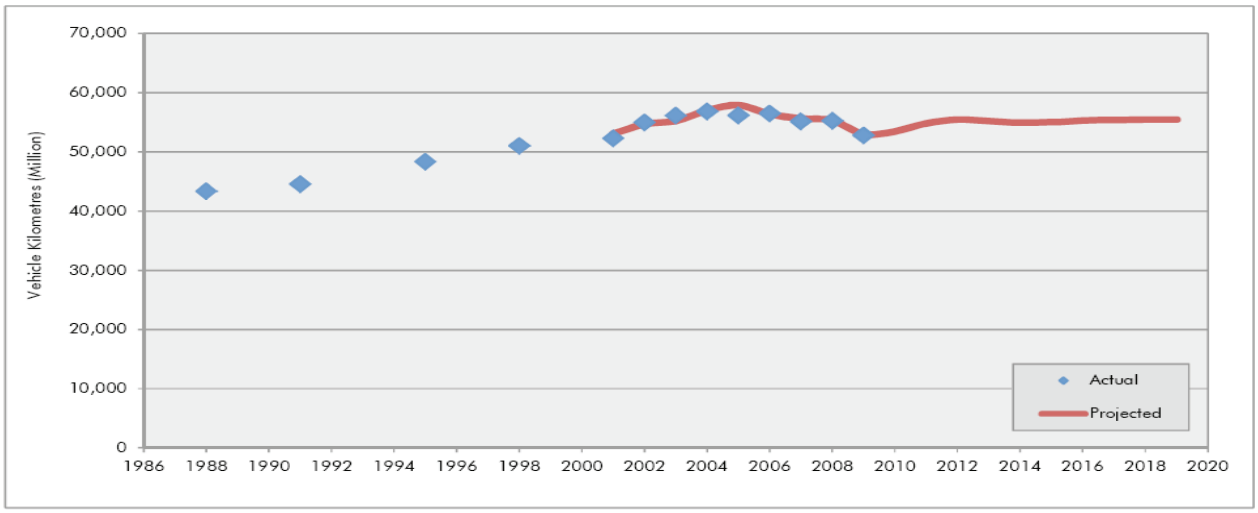
Victoria has a total vehicle fleet of over 4 million vehicles. These are largely passenger vehicles: in 2012 around 79 per cent of total vehicles. Light commercial vehicles comprise around 13 per cent of all vehicles. The total vehicle fleet is projected to increase to over 5 million by 2020.

### Figure B1: Victoria's vehicle fleet by type, 1988–2019



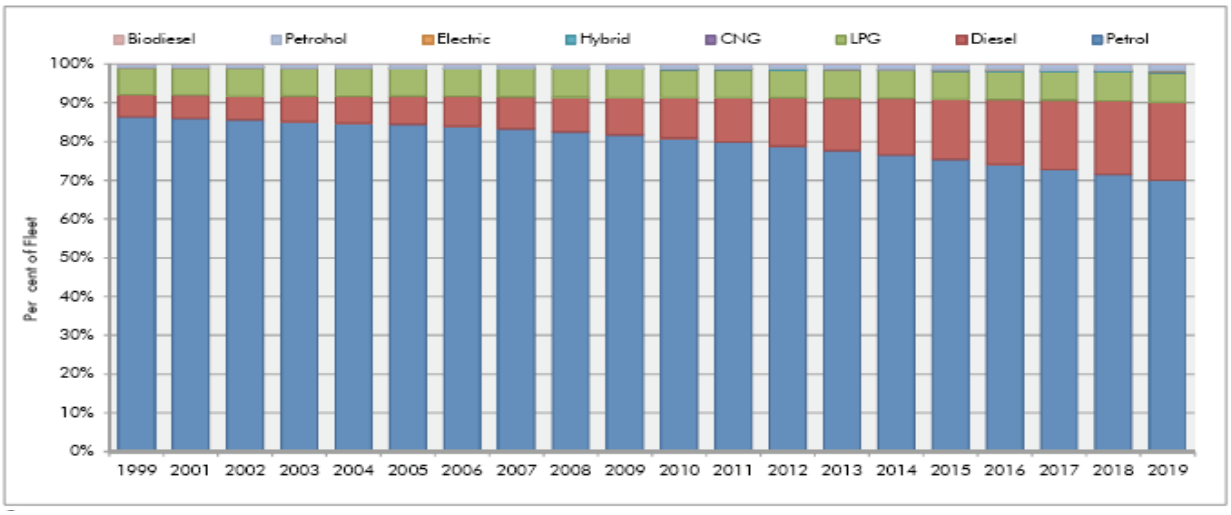

Source: CTEE (2011) *Victorian Transport Facts*, prepared for State Government of Victoria.

### Figure B2: Total vehicle kilometres travelled, 1988–2019



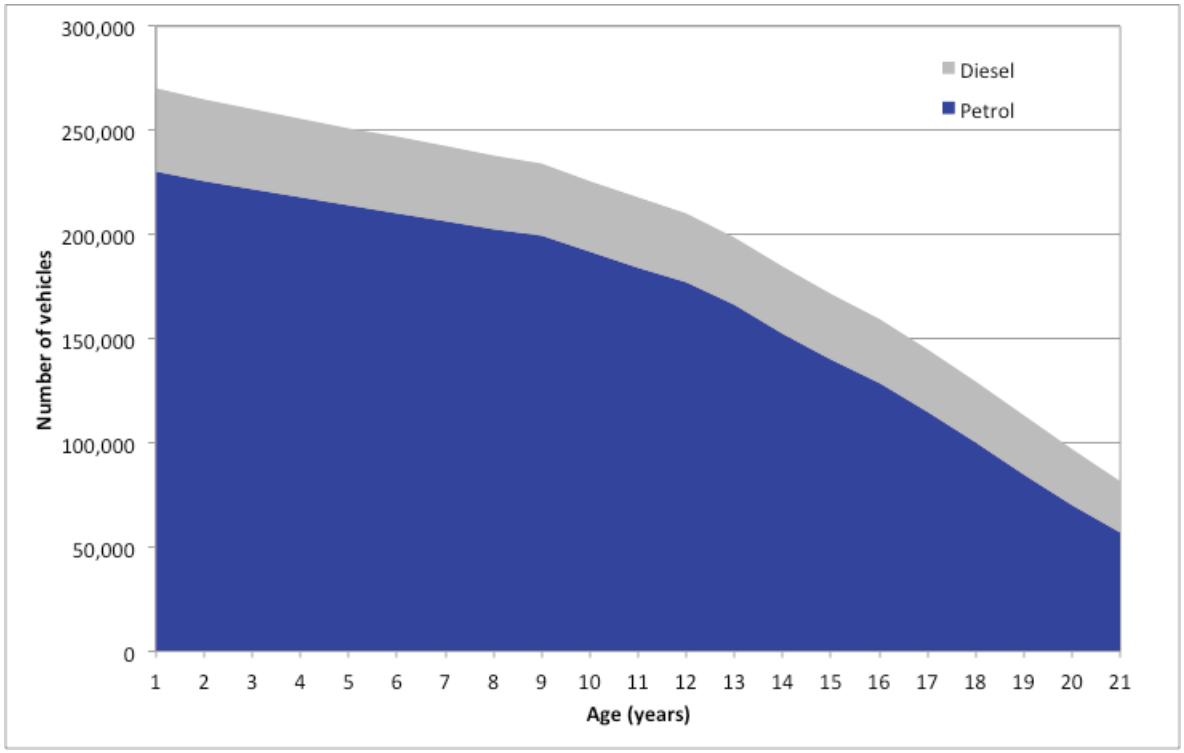

Source: CTEE (2011) Victorian Transport Facts, prepared for State Government of Victoria

Figure B3: Fuel type profile of Victoria's vehicle fleet, 1999–2019




Source: CTEE (2011) *Victorian Transport Facts*, prepared for State Government of Victoria.

Figure B4: Age profile of Victoria's vehicle fleet, 2010

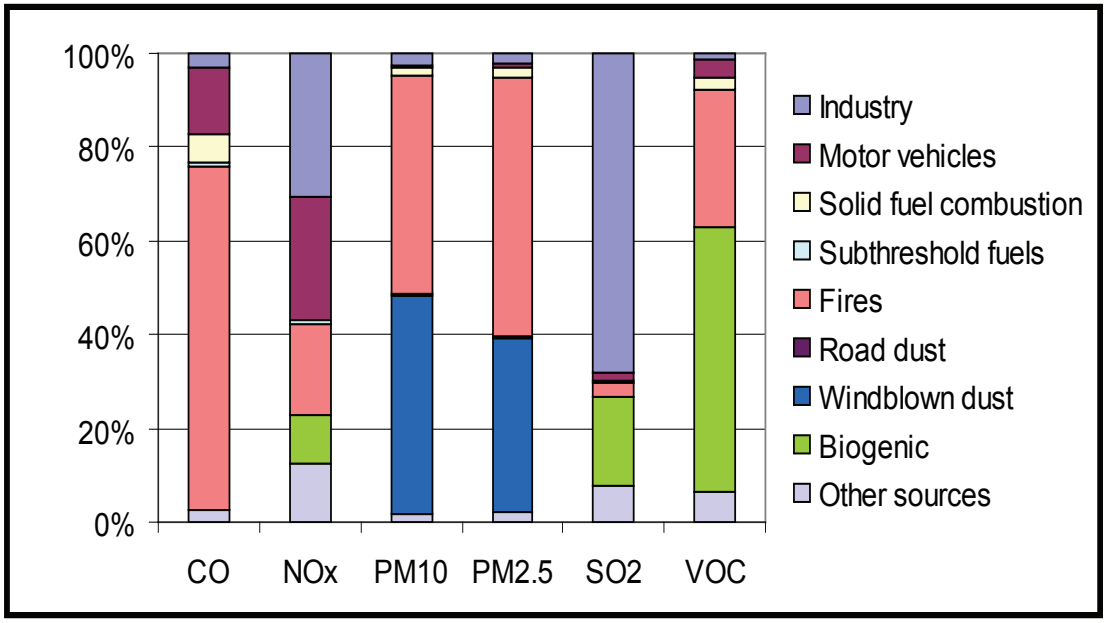



Source: Regulatory Impact Solutions; ABS

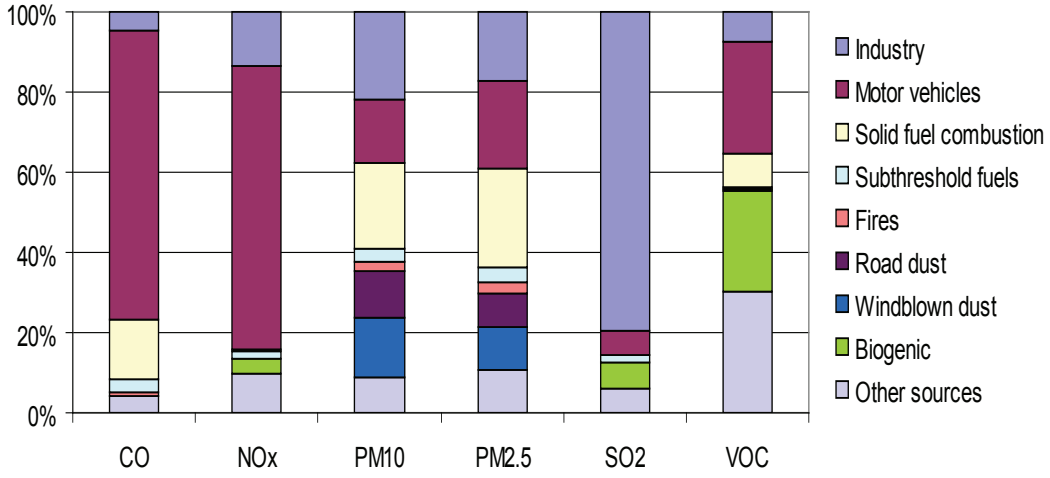
## *Attachment C: Air quality In Victoria*

Common air pollutants are pollutants that have many sources and are widely spread in the air environment. The following figures show the contributors of different sources of air pollution in Victoria and the Port Phillip Region (Melbourne and Geelong), taken from the 2006 Air Emissions Inventory.

### Figure C1: Sources of air pollution in Victoria




### Figure C2: Sources of air pollution in the Port Phillip Region



The following table shows the percentage of common air pollutants attributable to motor vehicles in the Port Phillip Region (Greater Metropolitan Melbourne including Geelong). It shows results from the most recent emission inventory and EPA projections of the contributions from motor vehicles in 2022 (the end of the period of proposed Regulations).[97]

### Table C1: Percentage contribution to total air pollutants from motor vehicles

| Pollutant | 2006 Emission Inventory | 2022 Projection |
|---|---|---|
| CO | 72 | 52 |
| $NO_x$ | 71 | 45 |
| $PM_{10}$ | 16 | 10 |
| $PM_{2.5}$ | 22 | 16 |
| HCs | 28 | 22 |

The projections are based on continuation of emissions standards through the current Regulations, or equivalent strategies that ensure that emissions from in-service vehicles remain at the level intended through the ADRs. They include the planned introduction of Euro 5/6, but do not include the introduction of Euro 6 for heavy vehicles or reflect any impact of the carbon pricing mechanism.

Air toxics are compounds that are commonly found at low levels in the atmosphere and are of concern because due to their toxicity. In relation to air toxics in the Port Phillip Region motor vehicles contribute:

- 65 per cent of benzene emissions
- 50 per cent of toluene emissions
- 48 per cent of xylene emissions
- 43 per cent of formaldehyde emissions.[98]

97 EPA 2006, Air Emissions Inventory.
98 EPA 2006, Air Emissions Inventory.

## *Attachment D: Arrangements in other jurisdictions*

All other Australian states and territories have adopted the AVSRs into their own Regulations.

Table D1: Adoption of AVSRs in Australian states and territories

| Emission type | |
|---|---|
| **Visible emissions** | **New South Wales**<br>Protection of the Environment Operations (Clean Air) Regulation 2010 (Reg 16) prohibits a motor vehicle (propelled by a spark ignition or diesel engine) emitting excessive air impurities (when in operation, it emits air impurities in excess of such a standard of concentration that air impurities are visible for a continuous period of more than 10 seconds when determined in accordance with TM-31)<br>**Queensland**<br>Replicates AVSR – Transport Operations (Road Use Management – Vehicle Standards and Safety) Regulations 2010 (Reg 129)<br>**Western Australia**<br>Replicates AVSR – Rule 141 of the Road Traffic (Vehicle Standards) Rules 2002<br>**South Australia**<br>Replicates AVSR – Road Traffic (Vehicle Standards) Rules 1999 (Reg 147)<br>**Tasmania**<br>Replicates AVSR – Vehicle And Traffic (Vehicle Standards) Regulations 2001 – Reg 135<br>**ACT**<br>Road Transport (Vehicle Registration) Regulation 2000 – Schedule 1 (item 1.155): Replicates AVSR except prohibition applies to excessive visible emissions (excessive means any concentration of smoke more than a colouration that results in a just perceptible colouration of the exhaust)<br>**Northern Territory**<br>Incorporates AVSR - Motor Vehicles (Standards) Regulations Schedule 4 of the *Motor Vehicles Act* requires that registration of vehicles is subject to, inter alia, the lubrication of the engine and the carburation of the working mixture controlled so that smoke is not projected with the exhaust, or from any other part |
| **$NO_x$ emissions (Diesel vehicles)** | **ACT**<br>Road Transport (Vehicle Registration) Regulation 2000 – Replicates AVSR, except post-1996, GMV >25 has limit of 1.2<br>**Northern Territory**<br>Incorporates AVSR – Motor Vehicles (Standards) Regulations |
| **PM emissions (Diesel vehicles)** | **ACT**<br>Road Transport (Vehicle Registration) Regulation 2000 – Replicates AVSR, except post-1996, GMV 12-25 has limit of 0.05<br>**Northern Territory**<br>Incorporates AVSR - Motor Vehicles (Standards) Regulations |

Table D1: Adoption of AVSRs in Australian states and territories (continued)

| | |
|---|---|
| **Noise** | **New South Wales**<br>Protection of the Environment Operations (Noise Control) Regulation 2008 – clause 4 and Schedule 1: Replicates AVSR (including ADR 83/00 from September 2011) for sale of vehicles<br>**Queensland**<br>Transport Operations (Road Use Management – Vehicle Standards and Safety) Regulation 2010: Replicates AVSR<br>**Western Australia**<br>Road Traffic (Vehicle Standards) Rules 2002: Replicates AVSR except no reference to ADR83/00 vehicles<br>**South Australia**<br>Road Traffic (Vehicle Standards) Rules 1999: Replicates AVSR except no reference to ADR83/00 vehicles<br>**Tasmania**<br>Vehicle And Traffic (Vehicle Standards) Regulations 2001: Replicates AVSR<br>**ACT**<br>Road Transport (Vehicle Registration) Regulation 2000 - Schedule 1: Replicates AVSR<br>**Northern Territory**<br>Incorporates AVSR – Motor Vehicles (Standards) Regulations |

Experiences from overseas highlights:

- In Europe, applying emission limits only at point of manufacture/sale results in lower than projected improvements in air quality. This appears to be due to a combination of regulatory gaming by manufacturers and unrestrained behaviour of motorists. A key conclusion is that in-service standards are also necessary.
- In the United States, while the regulators have the authority to control emissions, this is often not done through setting limits, but through a combination of inspections/rectification orders and other programs to support initiatives. The US agencies in particular take a multi-faceted approach, with the central aim of helping vehicle operators to reduce emissions and making incremental reductions to the aggregate level of emissions, rather than aiming for results across all vehicles.
- Neither the United States nor Europe appear to rigorously test the effectiveness of the vehicle emission standards. While overall air quality is measured and reported, there are few studies that can attribute quantitative improvements in air quality to particular emission standards. This is because: (a) there is poor data on non-compliance, (b) there are simultaneously other initiatives also aimed at improving air quality, and (c) there is often more than one contributing factor even for vehicles (for example, the benefit of in-service emission limits is dwarfed by the introduction of catalytic converters, which was driven by design rules). As any changes to standards are generally phased in over a long period, it is not unexpected that a direct measurement of standard effectiveness is absent.
- There is limited use of financial incentives (other than fines for non-compliance) to reduce emissions. An exception is the 'low-emission zones' in some European cities, which require vehicles with emissions above certain levels to pay a fee to enter the area. Such arrangements are relatively new (since around 2008) and there is limited data on effectiveness to date.

In relation to evaporative emissions, the following arrangements are in place in other Australian jurisdictions:

### Table D2: Adoption of vapour pressure limits in Australian states and territories

| State | Approach |
|---|---|
| **New South Wales** | Summer petrol volatility limits: 62 kPa summer monthly average and a maximum limit of 64 kPa (Sydney only) (stricter standards under consideration).<br>VR1 and VR2 will be required in NSW by 2017. The primary drivers for this initiative are to reduce risks to human health and prevent degradation of the environment by reducing HC emissions from motor vehicles and petrol service stations. |
| **Queensland** | 69 RVP (Reid Vapour Pressure) in summer months in low-volatility zone (67 kPa monthly average) (South East only) *Environmental Protection Act 1994* – Sect 440ZS. |
| **Western Australia** | RVP summer months October to April; 67 kPa summer monthly average in Perth. |
| **South Australia** | 67 KPa summer monthly average. |

Internationally, other jurisdictions tend to rely on more than one approach. For example, in relation to fuel vapour, the United States and Europe employ both vapour pressure limits and Vapour Recovery requirements.

The US Federal requirement of 7.8 pounds per square inch (54 kPa) during the 'high ozone' season is made under Regulations to the Clean Air Act. Most US states also require Stage 1 and Stage 2 Vapour Recovery system.

Also, Onboard Refuelling Vapour Recovery (ORVR) has been mandated on all passenger cars in the United States since 2000. (ORVR is a vehicle emission control system that captures fuel vapours from the vehicle fuel tank during refuelling. When refuelling the vehicle, fuel vapours in the fuel tank travel to an activated carbon-packed canister, which adsorbs the vapour. When the engine is in operation, it draws the vapours into the engine intake manifold to be used as fuel.) The use of onboard Vapour Recovery is intended to make Vapour Recovery at petrol stations obsolete.[99]

Each European country applies one or more volatility classes depending on its climate and on the season, and all gasoline, including petrol ethanol blends, must comply with the relevant DVPE (Dry Vapour Pressure Equivalent) limits.

There are laws requiring Stage 2 Vapour Recovery in Sweden, Switzerland, Germany, Denmark, Holland, Luxembourg, Austria, the Netherlands, United Kingdom, Italy and France with retrospective programs in place to convert existing stations. Some of the eastern European countries such as Poland, the Slovac Republic, Hungary and parts of Russia have followed suit and made laws regulating Stage 2; or they offer fiscal incentives for the installation of Stage 2. Fiscal incentives are also granted in Denmark. The EC Petrol Vapour Recovery Stage 1 and Stage 2 Directives (94/63/EC + 2009/126/EC) regulate the storage of petrol and dispensing of petrol in order to reduce the emissions of HCs by recovering the vapour. PVRSII takes effect for all EC countries on 1 January 2012 and will require all petrol stations to provide Stage 2 systems in place by the end of 2018.

99 See *US Environmental Protection Agency Office of Air and Radiation Office of Transportation and Air Quality*, http://www.epa.gov/otaq/regs/ld-hwy/onboard/orvrq-a.txt.

## *Attachment E: Health and environmental impacts of pollutants*

The material in this attachment includes a survey of the health and environmental impacts of $NO_x$, particulate matter, HCs, and ozone. For the purpose of this RIS, the estimated impacts have been drawn from studies considered broadly compatible with Victoria.

The following is adapted from the NEPM, *National Environment Protection (Ambient Air Quality) Measure Review Report 2011* and the NSW DECCW, *Regulatory Impact Statement: Proposed Protection of the Environment Operations (Clean Air) Regulation 2010.*

### Oxides of nitrogen

Oxides of nitrogen ($NO_x$) are a group of highly reactive gases that include nitric oxide (NO) and nitrogen dioxide ($NO_2$). These gases are produced mainly by combustion processes. Combustion of fossil fuels converts atmospheric nitrogen and any nitrogen in the fuel into its oxides, mainly to nitric oxide, which slowly oxidises to $NO_2$ in the atmosphere. This reaction occurs more rapidly in the presence of ozone. $NO_x$ are precursors to ozone formation.

Ozone is a respiratory irritant and exposure to high levels can affect healthy adults and children. Some people, such as asthmatics, are sensitive to ozone at low concentrations so there appears to be no safe level of exposure. During the periods of high ozone concentration, hospital admissions for asthma and other respiratory conditions increase. It is not possible to detect a distinct threshold for ozone, below which no individual would experience a given adverse health effect, especially given some members of a population are sensitive even at very low concentrations.[100]

The review of the Ambient Air Quality NEPM included updated health outcomes for ozone. The health reviews found that short-term exposures are linked to increases in mortality, hospital admissions and emergency department attendances, mainly for respiratory causes. The effects are greatest in the warm season and in elderly people. Studies show increases in emergency department attendances for asthma linked to both one-hour and eight-hour exposures to zone.

Ground-level ozone damages plants, ecosystems and buildings. These effects include:

- interfering with the ability of sensitive plants to produce and store food, making them more susceptible to certain diseases, insects, other pollutants, competition and harsh weather
- damaging the leaves of trees and other plants
- reducing forest growth and crop yields, potentially affecting species diversity in ecosystems
- corrosion of building materials and monuments.

While $NO_x$ is significant as a precursor to ground-level ozone formation as well as the formation of secondary fine particle pollution, it is itself a significant pollutant with impacts on health and the environment.

$NO_2$ is a pungent acidic gas that is corrosive and strongly oxidising. Recent studies have presented evidence to find a likely causal link between $NO_x$ and respiratory illness.

At low levels of exposure, $NO_x$ can irritate eyes, nose, throat and lungs, leading to coughing, shortness of breath, tiredness and nausea. Exposure can cause a build-up of fluid in the lungs for 1 to 2 days after exposure. Longer-term exposure can lead to the destruction of lung tissue, leading to chronic inflammatory lung disease.

At high levels of exposure, $NO_x$ can cause rapid burning, spasms and swelling of tissues in the throat and upper respiratory tract, reduced oxygenation of tissues, a build-up of fluid in the lungs, and death in some cases. Asthmatics and children are particularly susceptible.

The review of the Ambient Air Quality NEPM included updated health outcomes for $NO_2$. The review found that epidemiological studies worldwide show consistent associations between short-term and long-term exposure to $NO_2$ and hospital admissions and emergency department attendances, particularly for children with asthma. New studies have also shown increases in asthma symptoms and medication usage linked to short-term exposures to $NO_2$. Clinical studies show that people with asthma are more susceptible to exposure to $NO_2$, and that short-term exposure to $NO_2$ is associated with airway reactivity and enhanced inflammatory response in people with asthma.

Australian multi-city studies have shown that ambient $NO_2$ is associated with increases in mortality and hospital admission for all cause, respiratory and cardiovascular causes.

In 2012, the Standing Council on Environment and Water released the findings of a study into the effects of air pollution on children's respiratory health. The Australian Child Health and Air Pollution Study found that $NO_2$ had the strongest association with adverse respiratory effects in children. The major source of $NO_2$ emissions in Australian cities are motor vehicles.[101, 102]

100 United States Environmental Protection Agency 2006,. Air quality criteria for ozone and related photochemical oxidants, Volume I, United States Environmental Protection Agency.

101 http://www.scew.gov.au/resource/australian-child-health-and-air-pollution-study-achaps-final-report

102 In 2006 motor vehicles in Melbourne contributed 70 per cent of all nitrogen oxide emissions. Sourced from EPA's 2006 Air Emissions Inventory.

Table E1 summarises the estimates of health impacts from $NO_x$. The ranges reflect different impacts in different areas, such that lower estimates generally correspond to the impacts of pollution in low-population density areas and the upper estimates correspond to metropolitan areas. The true 'average' impact is therefore likely to be skewed towards the upper estimate.

### Table E1: Value of avoided $NO_x$ emissions

| Jurisdiction[103] | A$/tonne | |
|---|---|---|
| | Lower | Upper |
| United States (2006) | $2,052 | $21,651 |
| European Union (2005) | $8,767 | $23,901 |
| United Kingdom (2009) | $1,593 | $4,646 |
| Australia (NSW) (2010) | $162 | $1,108 |

Note: international studies have been converted from their original units, and currencies using OECD purchasing power indices for the year of the study. Figures have also been inflated by 2.5 per cent per annum to provide comparable estimates in 2012 dollars.

Excessive levels of $NO_x$, particularly $NO_2$, can reduce the growth rate of plants, damage the leaves of crops and cause death in plants and roots. It lowers the pH of rain, thus increasing its acidity, resulting in lowered pH levels in surface and ground waters and soil. The lowered pH can have harmful effects on a variety of biological systems, possibly even death. $NO_x$ can also deteriorate fabrics, corrode dyes and reduce visibility. These impacts are not reflected in the above estimates.

The Air NEPM review report found that the effects of $NO_2$ on mortality and hospital admissions for respiratory and cardiovascular causes are greater in Australian multi-city studies than in Europe and the United States, although the current levels of $NO_x$ are overall less. Therefore, for the purposes of this RIS, the health impacts from $NO_x$ are taken as $1,000 per tonne. This is towards the upper end of the NSW estimate range, noting that the NSW estimates are expected to be most relevant to the Victorian context, and noting that a higher estimate within this range reflects a tendency of a more urbanised area of impact. For sensitivity purposes, upper and lower estimates of $800 and $1,200 per tonne are used.

## Volatile organic compounds

Volatile organic compounds (VOCs or hydrocarbons, HCs) are a broad grouping of carbon-based compounds that vaporise at normal temperatures.

HCs as a group are significant as a precursor to the formation of ground-level ozone (see above). In addition, HCs from petrol are individually significant for health and the environment as air toxics.

In the Melbourne metropolitan area, exhaust and evaporative emissions of petrol from vehicles account for the largest proportion of HC emissions: around 38 per cent (EPA 2006 Emissions Inventory).

General effects of exposure to HCs include: irritation to the eyes, nose and throat; headaches; loss of coordination; nausea; and damage to the liver, kidney and central nervous system. Some HCs are known or suspected to cause cancer in humans.

Benzene is an aromatic HC found in petrol and vehicle exhausts and is used for a range of industrial purposes. The World Health Organization classifies benzene as a human carcinogen. Long-term exposure to benzene has been linked with increased incidence of leukaemia.

Table E2 summarises the estimates of health impacts from HCs. The ranges reflect different impacts in different areas, such that lower estimates generally correspond to the impacts of pollution in low-population density areas and the upper estimates correspond to metropolitan areas. The true 'average' impact is therefore likely to be skewed towards the upper estimate.

103 The studies for this table and other valuation tables in this Attachment are: US Government 2006, *Report to Congress on the Costs and Benefits of Federal Regulations: Appendix B, Office of Management and Budget*, available at www.whitehouse.gov/omb/ inforeg/2006_cb/2006_cb_final_report.pdf; Holland M, Pye S, Watkiss P, Droste-Franke B and Bickel P 2005, *Damages per tonne emission of $PM_{2.5}$, NH3, SO2, $NO_x$ and VOCs from each EU25 Member State (excluding Cyprus) and surrounding seas: A cost-benefit analysis of air quality related issues, in particular in the clean air for Europe (CAFE) programme*, prepared for the European Commission DG Environment, available at www.cafe-cba.org/assets/marginal_damage_03-05.pdf; DEFRA 2009, *Interdepartmental Group on Costs and Benefits: Air quality damage costs per tonne, 2008 prices*, UK Department for Environment, Food and Rural Affairs, London, available at www.defra.gov.uk/environment/quality/air/airquality/panels/ igcb/guidance/damagecosts.htm, and DECCW (NSW) 2010, *Regulatory Impact Statement: Proposed Protection of the Environment Operations (Clean Air) Regulation 2010.*

### Table E2: Value of avoided HC emissions

| Jurisdiction | A$/tonne | |
|---|---|---|
| | Lower | Upper |
| United States (2006) | $1,119 | $5,039 |
| European Union (2005) | $1,890 | $5,578 |
| United Kingdom (2009) | - | - |
| Australia (NSW) (2010) | $4,200 | |

Note: International studies have been converted from their original units, and currencies using OECD purchasing power indices for the year of the study. Figures have also been inflated by 2.5 per cent per annum to provide comparable estimates in 2012 dollars.

The NSW estimate is consistent with the international estimates, and as the NSW estimate is relevant to the Victorian context, the value of $4,200 per tonne has been used in the estimate of health benefits in this RIS. The NSW study did not include a range for the purposes of sensitivity analysis, however in this RIS lower and upper estimates of $3,800 and $4,500 have been used.

## Particulate matter

Particulate matter (or particles) is a term used to describe liquid or solid particles suspended in the air. It can be a primary pollutant (from emissions) or a secondary pollutant (resulting from atmospheric reactions on primary pollutants).

Particles are measured using their aerodynamic diameter and range in size from 0.001 to 500 micrometres (↔m) in diameter but particles larger than 10 ↔m do not usually enter the human respiratory system. Particles are categorised according to size because different sizes behave differently both in the atmosphere and the human respiratory system: for example, smaller particles are more easily inhaled with a potentially stronger impact on human health. Table E3 sets out the categories of particulate matter by size, principal human sources and differences in mobility. Motor vehicles are a source of all three categories.

Particles are easily inhaled and can be retained in, or absorbed through, a person's lungs. The health effects of particle exposure include increased mortality rates, cardiopulmonary disease and reduced lung function. The health reviews found that there is substantial new evidence from time series studies and cohort studies on both short-term and long-term effects for particles. $PM_{10}$ and $PM_{2.5}$ are associated with increases in mortality and morbidity, with much stronger evidence now for cardiovascular outcomes. Larger particles are generally filtered in the nose and throat via cilia and mucus, but $PM_{10}$, can settle in the bronchi and lungs and cause health problems. Similarly, $PM_{2.5}$, tend to penetrate into the gas exchange regions of the lung, and very small particles (< 100 nanometers) may pass through the lungs to affect other organs.

### Table E3: Categorisation of particulate matter

| Category | | | Principal human sources | Mobility |
|---|---|---|---|---|
| $PM_{10}$<br>0-10.0 ↔m<br>Fine particles | | | Mechanical activity, such as roads, farming, mining | Settles relatively quickly (within minutes to hours) |
| | $PM_{2.5}$<br>0-2.5↔m<br>Very fine particles | | Combustion processes, used in industry, power generation, and vehicles; transformations of primary pollutants ($SO_X$, $NO_X$ and HCs) | $PM_{2.5}$ can normally remain airborne for several hours to several weeks and may be transported thousands of kilometres from the original source |
| | | PM0.1<br><0.1 ↔m<br>Ultra-fine particles | Vehicle emissions and atmospheric photo-chemical reactions | Can accumulate into $PM_{2.5}$; removed through rain |

The review of the Ambient Air Quality NEPM included updated health outcomes for particulate matter. The health review found that there is substantial new evidence from time series studies and cohort studies on both short-term and long-term effects for particles. $PM_{10}$ and $PM_{2.5}$ are associated with increases in mortality and morbidity, with much stronger evidence now for cardiovascular outcomes. Associations have also been shown between particles and increases in respiratory symptoms and medication use in children with asthma; linked to a reduction in lung function and increased lung inflammation.[104]

Epidemiological studies worldwide have shown that increases in particle pollution are associated with a range of health outcomes, including increases in daily mortality, hospital admissions and attendances at emergency rooms. Problems from short-term exposures include: respiratory symptoms, such as irritation of the airways, coughing and difficulty breathing; aggravated asthma; irregular heartbeat; heart attacks; and premature death in people with heart or lung disease. Long-term exposures may result in decreased lung function; development of chronic bronchitis; and increased cardiovascular risk.

Significantly, there is no safe concentration threshold for exposure to $PM_{10}$ or $PM_{2.5}$ where adverse health effects have not been observed. This means that even low levels may have an adverse impact on human health.

Depending on the concentration and length of exposure, healthy people can experience symptoms from exposure to particle pollution. However, some groups are particularly susceptible: children, older people, asthmatics, people with existing cardio-respiratory conditions and those who are exercising.

The Air NEPM levels were set by reference to a number of studies, both in Australia and overseas, that consistently showed a 1 per cent increase in daily mortality (from all causes) per 10 ↔g/m$^3$ increment in $PM_{10}$. For respiratory and cardiovascular mortality, the observed increases are higher, with values of 3.4 per cent and 1.4 per cent per 10 mg/m$^3$ increase in $PM_{10}$, respectively.

In a 2009 study covering 51 cities in the United States, using data from the late 1970s to the early 2000s, a decrease of 10 ↔g/m$^3$ of $PM_{2.5}$ was associated with an estimated increase in mean life expectancy of between 0.61 and 0.20 years.[105]

Previous studies have focused almost entirely on short-term links between exposure and hospitalisation. A study published in April 2012 showed an association between long-term exposure to fine air particles for all hospital admissions examined. The study found that for every 10-↔g/m$^3$ increase in long-term $PM_{2.5}$ exposure, the researchers found a 4.22 per cent increase in respiratory admissions, a 3.12 per cent increase in cardiovascular disease admissions, a 3.49 per cent increase in stroke admissions, and a 6.33 per cent increase in diabetes admissions.[106]

Table E4 summarises the estimates of health impacts from particular matter. The ranges reflect different impacts in different areas, such that lower estimates generally correspond to the impacts of pollution in low-population density areas and the upper estimates correspond to metropolitan areas. The true 'average' impact is therefore likely to be skewed towards the upper estimate.

### Table E4: Value of avoided PM emissions

| Jurisdiction | A$/tonne | |
|---|---|---|
| | Lower | Upper |
| United States (2006) | $18,500 | $187,000 |
| European Union (2005) ($PM_{2.5}$ only) | $52,000 | $150,000 |
| United Kingdom (2009) ($PM_{2.5}$ only) | $42,000 | $170,000 |
| Australia (NSW) (2010) ($PM_{10}$ only) | $58,500 | $247,000 |

Note: International studies have been converted from their original units, and currencies using OECD purchasing power indices for the year of the study. Figures have also been inflated by 2.5 per cent per annum to provide comparable estimates in 2012 dollars.

104 For a wider discussion of the recent evidence, the Air NEPM review report can be found at www.ephc.gov.au.

105 Pope CA, Ezzat M and Dockery DW 2009, 'Fine-particulate air pollution and life expectancy in the United States', *The New England Journal of Medicine*, p.360: pp.376-86, available at www.content.nejm.org/cgi/content/short/360/4/376.

106 Kloog I, Coull BA, Zanobetti A, Koutrakis P and Schwartz JD 2012, 'Acute and Chronic Effects of Particles on Hospital Admissions in New England', *PLoS ONE*,April 2012.

These estimates are calculated from studies to the impacts on the health of human beings. Therefore the following impacts are not reflected in the above estimates and are considered to be unquantified impacts for the purposes of this RIS.

- Vegetation and ecosystems: Particles can be carried over long distances and settle on the ground or in water. The effects of this settling has the potential to change the nutrient balance in aquatic environments; deplete nutrients in soil; damage sensitive forests and farm crops; and affect the diversity of ecosystems.
- Visibility: Particles scatter and absorb light and are responsible for brown haze. Poor visibility caused by particle pollution has a direct impact on the attractiveness of a location for living, tourism and investment as well as reducing residents' sense of wellbeing.
- Building materials: Particle pollution can stain and damage stone and other building materials, including heritage buildings.
- Global warming: Black carbon, the main component of soot particles, is also considered to be a powerful global warming agent.

The Air NEPM review report finds that Australian studies of the health effects of particulate matter appear to be greater than in the United States and Europe. Therefore, for the purposes of this RIS, EPA considers the NSW estimates are the most relevant to the Victorian context. This RIS therefore uses a central estimate of $160,000 per tonne. The range of estimates in the NSW report represent upper and lower estimates based on a completely rural through to a completely urban air shed, and therefore overstate the actual range of likely impact. For sensitivity analysis in this RIS, upper and lower estimates of $130,000 and $180,000 per tonne are used.

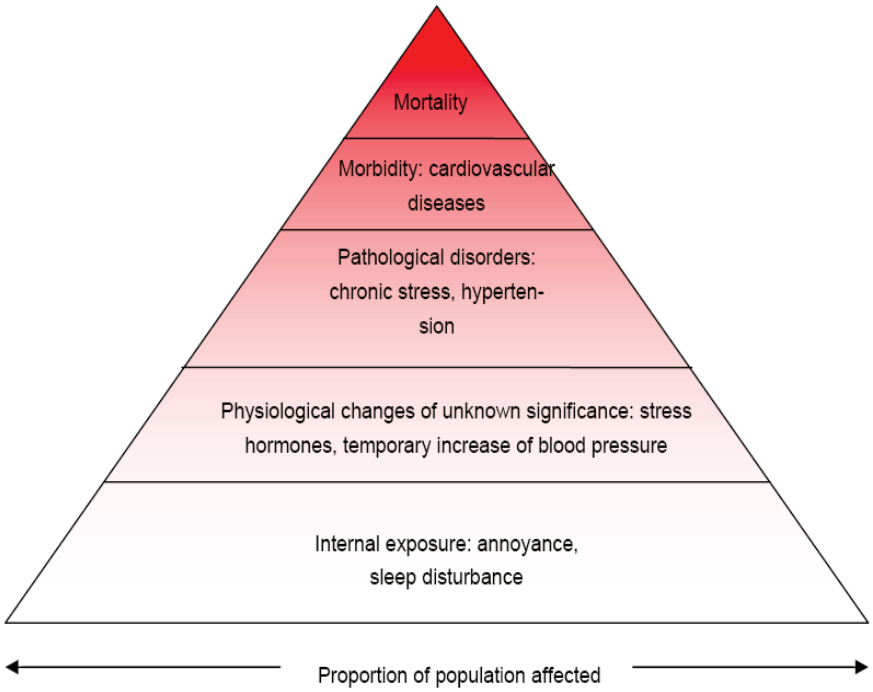
## *Attachment F: The economic value of noise reduction*

The majority of sounds detected by human hearing are within the range of 0 to 140 decibels (dB). The noise created by traffic normally resides in the range of 50 to 95 dB.

High noise levels can contribute to cardiovascular effects and exposure to moderately high levels during a single eight-hour period causes a statistical rise in blood pressure of five to 10 points and an increase in stress and vasoconstriction leading to the increased blood pressure noted above as well as to increased incidence of coronary artery disease.[107]

Not all people exposed to excessive noise will suffer the known problems. The following figure illustrates the relationship between exposure to excessive traffic noise and health impacts.

### Figure F1: Impacts of excessive noise on humans




Source: RIVM (2001)

Noise can also have a detrimental effect on animals, increasing the risk of death by changing the delicate balance in predator or prey detection and avoidance, and interfering with the use of the sounds in communication especially in relation to reproduction and in navigation. An impact of noise on animal life is the reduction of usable habitat that noisy areas may cause, which in the case of endangered species may be part of the path to extinction.[108]

Road traffic noise, neighbour noise, audible alarms and construction noise are the four sources of noise most annoying to Victorians. Noise from motor vehicles (in-service) can be linked to lack of maintenance, ignorance of noise levels or impacts, tampering, consumer expectations (marketing of vehicles), culture, vehicle use (for example, engine brakes from heavy vehicles, 'hooning'), and the ready availability of aftermarket equipment and service providers.

The effects of transportation noise are routinely measured using an A-weighted decibel scale (designated dB(A)), which is useful for measuring the noise impact of a single occurrence, but not the impact of continuous noise. A frequently used measurement for continuous noise is the equivalent sound level ($L_{eq}$), known also as the energy mean sound level. $L_{eq}$ includes both the intensity and length of all sounds occurring during a given period; it indicates 'the average acoustic intensity over time and is the equivalent noise energy level of a steady, unvarying tone.'

The United States Environmental Protection Agency has developed a measurement for a community's exposure to noise (the average energy sound level) for a 24-hour period from midnight to midnight. The measure of this

107 Rosen S and Olin P 1965, 'Hearing Loss and Coronary Heart Disease', *Archives of Otolaryngology*, pp.82:236.

108 Southall B, Berkson J, Bowen D, Brake R, Eckman J, Field J, Gisiner R, Gregerson S, Lang W, Lewandoski J, Wilson J and Winokur R 2009, *Addressing the Effects of Human-Generated Sound on Marine Life: An Integrated Research Plan for U.S. federal agencies*, Interagency Task Force on Anthropogenic Sound and the Marine Environment of the Joint Subcommittee on Ocean Science and Technology, Washington, DC.

day-night sound level, designated DNL or $L_{dn}$, is commonly used to evaluate noise impacts on communities and residential areas.

Studies in the 1970s estimated that background noise in a typical urban neighbourhood was roughly 55 $L_{dn}$.

It is difficult to determine the monetary impact of noise, and noise abatement. Two valuation methods common to cost-benefit analyses are stated or revealed willingness to pay (WTP) and hedonic pricing. WTP involves asking a series of questions in order to impute the value someone is willing to pay for less noise. Hedonic pricing commonly looks at measures such as the impact on property prices due to location near a source of local externality.

Both of these methods have shortcomings. The main shortcoming is that it tends to reflect only perceptions of the externality, not its actual impacts. For noise, this means that both methods may tend to:

- only capture the annoyance cost of noise, and not actual health impact or impacts on the physical or built environment
- distort the overall social cost of a given noise level, as routinely people report being more disturbed by noises at night despite the source being much quieter.

The first factor has generally not been addressed in studies; beyond acknowledging that value estimates do not capture all impacts. The second factor has been addressed by a number of measurement techniques that smooth out time of day effects, and enable an estimate of the value based on marginal changes in this 'smoothed' noise level, recorded as $L_{den}$ (day-evening-night measure).

Valuations also recognise a minimum threshold in noise exposure, to be regarded as 'excessive' noise, against which people would benefit from reduction. This is generally taken as 55 dB ($L_{den}$).

Hedonic pricing approaches in the United States have found that housing prices decreased by 0.2 to 0.6 per cent for every one unit increase in Lden. This appears to be consistent with European studies, however, such an approach is not readily applicable to analysis of traffic noise reduction as the valuation does not have a useful time component. It also presumes that traffic noise is only experienced by people at home (or at least within their local neighbourhood).

A 2005 Spanish study found that in urban areas households are willing to pay approximately €4 per decibel per year for noise reduction.[109] Against this, the social cost estimates for the Euro countries indicates a social cost per capita of €60 per year from vehicle noise, or around €190 per year for those actually exposed to excessive noise. Averaged over the number of vehicles, the social costs amount to around €235 per vehicle.[110]

The European Commission recommends use of the benefit of noise reduction of €25 per household per decibel per year.[111] This figure has been used in this RIS – converted to AUD equivalent of $31. For costing sensitivities, a range of $28 to $34 was used.

However, when applying the valuation it is important to recognise that reducing noise from a single source will only lead to an observed reduction in the overall background noise for people in the immediate vicinity, and then only in those areas where the background noise level is above the 55 dB threshold. Reducing the number of noise disturbances from individual motor vehicles will improve sleep quality, reduce awakenings and minimise subsequent lost productivity.

109 Barreiro J, Sánchez M, t Viladrich-Grau M 2005, 'How much are people willing to pay for silence? A contingent valuation study', *Applied Economics*, vol 37 (11). This value does not include associated health and other social costs.

110 Regulatory Impact Solutions calculations based on United Nations Economic Commission for Europe statistical database.

111 European Commission 2002, *The state-of-the-art on economic valuation of noise,* prepared by Navrud S, for the European Commission, DG Environment, Brussels.

## *Attachment G: Methodologies and assumptions*

The real discount rate used in this RIS is 3.5 per cent. This adopts the rate published in the *Victorian Guide to Regulation* (Appendix C, p. 19). The discount rate of 3.5 per cent was used over a 10-year period (i.e. the life of Regulations in Victoria). Cash flows are discounted to a 'Year 0', being the year before the commencement of the proposed Regulations in January 2014.

As a proxy for valuing an hour of a person's time, $HR_x$, the following formula is given in the *Victorian Guide to Regulation*:

$$\mathbf{HR_x = (AE_x \times OO_x)/(AW_x \times AH_x)}$$

where:

$AE_x$ = average weekly earnings (trend full time, adult, total earnings in Victoria) multiplied by 52 weeks

$AW_x$ = number of weeks worked per annum (44 weeks)

$AH_x$ = average weekly hours for full-time workers (41 hours)

$OO_x$ = multiplier for on-costs and overhead costs (1.75)

See *Victorian Guide to Regulation* (Appendix C, pp. 12–15). Using data from February 2012 in ABS Cat 6302.0 – Average Weekly Earnings, Australia (released 17 May 2012), the trend full time, adult, total earnings in Victoria of $1,361.60 per week gives an hourly rate of $68.68.

In relation to the modelling of emissions, there is limited data available to calculate precisely how much of each emission type will be avoided by the continuation of the Regulations. Therefore, it has been necessary to make a number of simplifyied working assumptions for the purpose of estimating benefits and costs.

Sources identified below are from:

- NSW DECCW – the NSW Department of Environment, Climate Change and Water provided a number of data sources in its *Regulatory Impact Statement for the Proposed Protection of the Environment Operations (Clean Air) Regulations* 2010
- EPA Victoria – EPA has estimated detection and compliance rates based on past activities
- ABS – some data is taken from various publications by the Australian Bureau of Statistics – 6302.0 Average Weekly Earnings; 9309.0 Motor Vehicle Census; 9208.0 Survey of Motor Vehicle Use
- Survey of websites – where possible for market prices, a range of prices were sourced from Victoria suppliers to identify an average price
- ACCC – Monitoring the Australian Petroleum Industry – summary 2011
- Industry consultation – during the development of this RIS, EPA has met with representatives of the fuel industry, representing fuel suppliers, retailers, and equipment suppliers/installers
- NISE – National In-Service Emissions Studies 1 and 2
- DRET – Commonwealth Department of Resources, Energy and Tourism, Australian petroleum statistics, published monthly at www.ret.gov.au.

Calculation of volume of emissions are derived from emission factors published in *Emission Estimation Technique Manual for Aggregated Emissions from Service Stations* published by Environment Australia, November 1999.

Other sources are indicated below where relevant.

### Compliance with AVSRs

The following assumptions are made about the impact of the proposed Regulations:

- Remedial action is taken on 4,482 vehicles each year in order to comply with the noise limits. This reflects the average number of notices issued by EPA over recent years. The value of the avoided noise is $31 per dB per household (see Attachment F). While the reduced noise resulting from detection of vehicles is assumed to spread evenly over all households, the benefit is only included for the 20 per cent of households (420,000 in 2013) that report to being affected by excessive noise (EPA community noise survey). This avoids counting a benefit where the reduced noise would have negligible noticeable impact. The costs to the vehicle owner are:
  - $260 for works on the vehicle, which would generally involve replacement of exhaust muffler (survey of various websites in March 2012)
  - 2 hours' time cost to attending testing and to provide certificate to EPA (EPA estimate)
  - $41.30 cost of the test (fee is indexed annually).
- Remedial action is taken on 3,303 spark ignition-engined vehicles each year in order to comply with the emissions limits and tampering provisions. This reflects the average number of vehicles EPA expects to be detected under the smoky vehicles program and remote sensing.
  - Once rectified to comply with the Regulations, a spark ignition-engined vehicle will avoid, on average, 2.3 grams of HCs per kilometre travelled (estimate from NSW DECCW, 2010). Petrol vehicles travel an average of 13,800 kilometres per year (ABS 9208.0). This gives 31.7 kg of avoided HCs per vehicle per year. The value of the avoided emissions is $4,200 per tonne (see Attachment E).
  - The costs to the motorist are the direct costs of rectification ($1,065 on average for re-tuning, head gasket replacement or possibly engine reconditioning or rebuilding, based on survey of websites in March 2012), a time cost (two hours, EPA estimate) and for tampering notices a test fee of $82.70.
- Remedial action is taken on 308 diesel vehicles each year in order to comply with the emissions limits (EPA expectation based on historical trends and remote sensing).
  - Once rectified to comply with the Regulations, a diesel vehicle will avoid, on average, 2.37 grams of $PM_{10}$ per kilometre travelled (NSW DECCW estimate). Diesel vehicles travel an average of 21,000 kilometres per year (ABS 9208.0). This gives 50 kg of avoided $PM_{10}$ per vehicle per year. The value of the avoided PM emissions is $160,000 per tonne (see Attachment E).
  - Once rectified, a diesel vehicle is also estimated to avoid $NO_x$ emissions of 5 grams per kilometre (NSW DECCW estimate). This gives an average of 105 kg per vehicle. The value of the avoided $NO_x$ emissions is $1,000 per tonne (see Attachment E).
  - The costs to the vehicle owner are the direct costs of rectification ($1,150 on average for tuning, filter replacements, new injectors and possibly engine reconditioning, based on survey of websites in March 2012), a time cost (two hours, EPA estimate) and a test fee of $550. Until 1 January 2016, an agreement between EPA and Vipac means that the costs of the testing are reimbursed, and there is effectively no fee charged to the vehicle owner. This RIS assumes that from 1 January 2016 the fee will be paid by the vehicle owner as there has been no agreement to extend the current reimbursement arrangements.
- Benefits in terms of reduced ozone have not been estimated due to the complexities in how ozone is produced. Therefore, benefit is based on reduction in the primary pollutants.
- There are also benefits to motorists – the NISE1 found that tuning of vehicles delivered fuel consumption benefits, reducing the cost to motorists of operating their vehicles.
  - Savings have been calculated on the basis that one tonne of emissions is equivalent to 1,518 litres of fuel. This has been derived from averaging the densities of petrol and butane. The density of petrol is 0.73 tonnes/cubic metre (m⌖) and the density of butane is 0.6 t/m⌖, which translates into 1,369.9 litres per tonne of petrol and 1,666.7 (L/t) of butane (Perry and Green 1984).
  - Petrol savings were estimated using the wholesale petrol price of 74.49 cents per litre. The wholesale petrol price equals the retail petrol price of $1.32 per litre, less 10 per cent GST, fuel excise of 38.14 cents per litre, and gross margin of 9 per cent of the retail petrol price. These subtracted amounts represent only transfers, and thus not aggregate costs or savings associated with changes in volume of fuel consumed. Costings are based on a general assumption that the price of oil will remain on average steady over the period of the Regulations. It is noted that these assumptions in relation to petrol prices are considered conservative – actual increases in prices will result in greater benefits of the options than those reflected in this RIS. The $1.32 retail price was found to be the average retail price over 2010–11 by the ACCC, which also provided estimates of the margin. While retail prices have been slightly higher than this during 2011–12, for June 2012 the retail price in Victoria has averaged around $1.32 (RACV website). Note that the same approach to valuing savings to motorists is also used for the other options.

All figures are in 2012 dollars. For the purposes of calculating the present value of benefits and costs over the life of the Regulations, the following assumptions are relevant:

- All monetary values are projected on the basis of remaining steady in real terms over the life of the Regulations.
- The incidence of detection and rectification is also projected on the basis of remaining at the same level each year.
- The age of the vehicle fleet is assumed to remain stable over the life of the Regulations.
- The average kilometres travelled each year is assumed to remain steady. This is consistent with the pattern over the past five years.
- Once a non-compliant vehicle has been detected and rectified, it is assumed that the annual benefit in reduced noise/emissions continues for the remainder of the life of the vehicle. This is assumed to be five years on average for the vehicles rectified (estimate provided by DEPI for the purposes of this RIS).

### Compulsory maintenance regime

Based on the definition of vehicles subject to the program and the current age profile of the Victorian vehicle fleet, there would be 25,000 vehicles each year required to undergo the compulsory servicing (EPA calculation based on ABS data). Consistent with the current profile, 48 per cent are estimated to be petrol engine and 52 per cent diesel engine. The benefits in terms of avoided emissions follows the same methodology as for the proposed Regulations, with the following additional assumptions based on EPA data:

- sixty per cent of light commercial vehicles will have already voluntarily undertaken regular servicing during the first 12 years of operation. For these vehicles, the mandatory servicing at age 12 is expected to result in no material reduction in emissions or noise
- of those vehicles that have not had recent servicing before age 12, historical EPA compliance data indicates that about 45 per cent will high emitters
- undergoing servicing may not necessarily improve the emissions performance of vehicles. NISE2 tested approximately 350 light commercial petrol vehicles manufactured from 1994 to 2007 and found that among the group identified as gross polluting vehicles 37 per cent were perceived to suffer from lack of or poor maintenance. Therefore, only 37 per cent of polluting vehicles will be improved under the maintenance program
- for the vehicles which lead to a reduction in emissions under the program, it is assumed that 33 per cent contribute to lower HC emission (petrol vehicles), 37 per cent contribute to lower $NO_x$ and PM emissions, and 30 per cent contribute to lower local traffic noise (estimated based on current detection rates)
- the age profile of the light commercial fleet is assumed to remain steady over the next 10 years.

The cost to vehicle owners has been assumed at a rate of $300 per vehicle service. This is a weighted average of a base service cost of $250 per vehicle, with an average cost of $1,100 for those vehicles that require additional work, including replacement of parts, related to emissions or noise (based on survey of prices on websites). Two hours of time (EPA estimate) has been included to reflect the time required to drop-off/pick-up a vehicle from a servicing location, and to provide relevant evidence of service to EPA.

### Vehicles emissions education campaign

This RIS assumes a relatively low response to an education campaign, at around just over 10 per cent of the effectiveness of detecting vehicles against set limits. EPA has undertaken a range of campaigns in recent years aimed at changing behaviours—'Witness a Drive By' (radio/outdoor/experiential event); 'Your Call Could Stop a Litterer' (radio/outdoor/local press); 'You'll Get Stung' (TV/radio/outdoor). Effective campaigns are those that align to pre-existing beliefs or can effectively change beliefs.

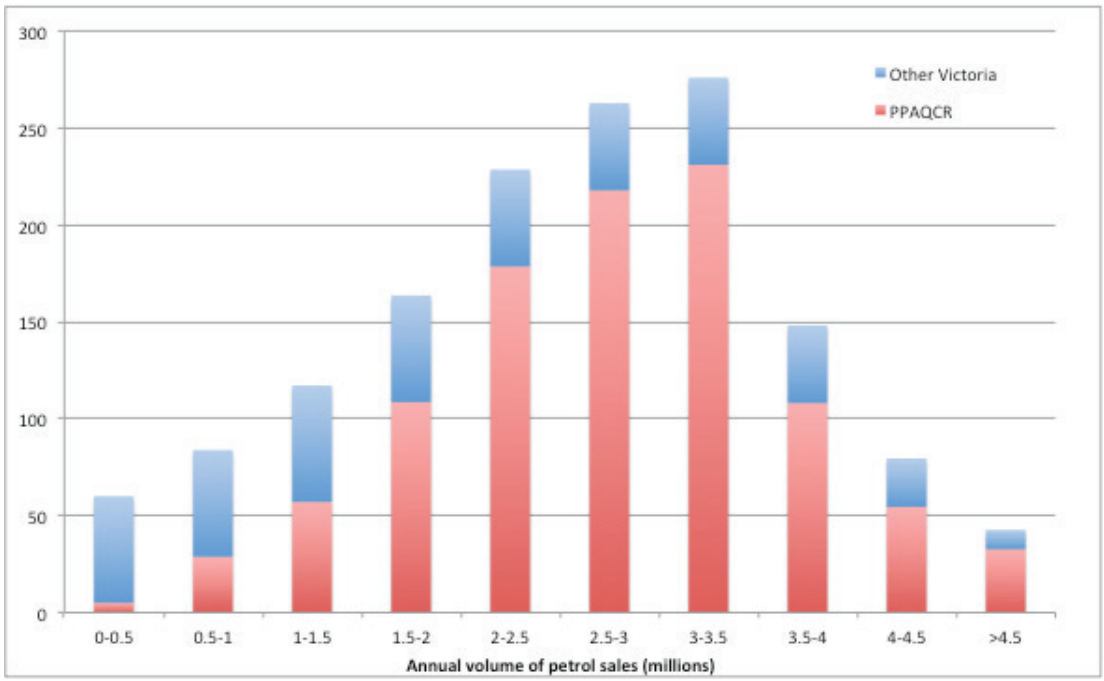
- While programs generally have a moderate level of impact on the general population, for vehicle emissions a campaign is likely to be effective more effective with people who are already have their car regularly serviced, or is likely to prompt people to take action even though their vehicles are not high emitters.
- To be effective, a campaign would need to motivate high emitters to change. Vehicles are high emitters generally due to apathy about their environmental impacts, lack of awareness that they are high emitters, or cost constraints that are a barrier to regular maintenance. It would be difficult to change these behaviours solely through a campaign. In relation to vehicle emissions, most people would not be well positioned to determine their level of emissions.
- Successful programs in the past have relied on demonstrating the benefits to individuals (for example, previous campaigns on energy use ('Black Balloons' ads) and water use incorporated emphasis on savings to consumers), or by linking the message to a regulatory compliance regime (for example, 'dobbing in' or 'don't get caught' messages backed up by regulatory penalties).

The expected response rate used in this RIS assumes that, despite potentially leading to a higher number of people taking some action, there will 180 vehicles each year that actually reduce their noise level, 550 petrol vehicles that reduce their HC emissions, and 250 diesel vehicles that reduce their PM/$NO_x$ emissions. As these are only assumptions, sensitivities are also assessed in this RIS.

### Vapour pressure and recovery

There are 1,462 petrol stations in Victoria (ACAPMA estimate) that sold 3,868 million litres of petrol in 2010–11 (DERT). The figure below shows the number of petrol stations in Victoria by annual petrol sales and location.

### Figure G.1: Petrol stations in Victoria




EPA does not have data on the petrol sales or equipment at individual petrol stations. The above figure is therefore constructed from limited available data on locations of petrol stations, total petrol sales, and a survey of a sample of petrol stations undertaken by industry.

An audit by EPA in 2003 found that 90 per cent of petrol stations in metropolitan areas had Stage 1 Vapour Recovery systems in place. Consultation with industry in development of this RIS indicated that Stage 1 systems are in 'virtually all' inner Melbourne petrol stations. EPA understands that petrol suppliers require Stage 1 to be used where it is in place as a condition of supply, based on the high volume of petrol distributed to these sites. Therefore, it is assumed that the 90 per cent of PPAQCR petrol stations (920 petrol stations) that already use Stage 1 systems are the higher volume petrol stations in the above figure. These petrol stations together account for 72 per cent of all petrol volume sold by retailers in Victoria and 97 per cent of all petrol volume sold within the PPAQCR. (24 per cent of petrol sales are through retailers outside the PPAQCR area, while the remaining 3 per cent is sold through smaller PPAQCR petrol stations).

For the period of the proposed Regulations, it was assumed the number of petrol stations remain steady. Savings from evaporative emissions have been calculated on the basis that 1 tonne of emissions is equivalent to 1,518 litres of fuel. This has been derived from averaging the densities of petrol and butane (noted above).

Petrol savings were estimated using the wholesale petrol price of 74.49 cents per litre. The wholesale petrol price equals the retail petrol price of $1.32 per litre, less 10 per cent GST, fuel excise of 38.14 cents per litre, and gross margin of 9 per cent of the retail petrol price. These amounts represent only transfers, and thus not aggregate costs or savings associated with changes in volume of fuel consumed. Costings are based on a general assumption that the price of oil will remain on average steady over the period of the Regulations. It is noted that these assumptions in relation to petrol prices are considered conservative – actual increases in prices will result in greater benefits of the options that reflected in this RIS.

For vapour pressure sampling and reporting (these assumptions were made following consultation with industry in the drafting of this RIS):

- sampling and recording data is assumed to take 15 hours per week, per supplier, during the summer period
- producing summary reports to EPA is estimated to take six hours per supplier per report (three hours for standard petrol, three hours for ethanol)
- retaining records for two years is assumed to add no material cost to suppliers
- based on the four fuel suppliers in Victoria.

The cost to industry of vapour pressure was reported at a total of $12 million. This was provided by petrol suppliers as an estimate. EPA has aggregated information provided by each supplier (Caltex, Shell and ExxonMobil). This cost relates to a reduction from 75 kPa to 62 kPa, which is different from other estimates. Notwithstanding, it is useful to compare the estimate of $12 million against other estimates:

- Data provided to EPA from an industry peak body in response to the discussion paper indicated that the cost to industry of reducing vapour pressure from 67 kPa to 62 kPa would be $6 million per annum, and the cost of reducing vapour pressure from 75 kPa to 62 kPa would be around $12 million per annum.
- In similar analysis undertaken for identical limits under New South Wales Regulations, the cost of compliance with petrol volatility limits at 62 kPa (from a base case of 70 kPa) was estimated to be $11.82 million per year (2010 dollars), based on information provided to the New South Wales Government by Caltex, Shell, BP and Mobil. Allowing for less overall fuel supplied in Victoria, an equivalent cost would be around $8.8 million per annum. This is within the range indicated through preliminary consultation with industry for this RIS.

It is noted that these costs are sensitive to the prevailing oil prices and exchange rates, and therefore subject to some sensitivity that is assessed in this RIS.

With separate limits now to be included in the Regulations for ethanol-blended fuel, EPA does not anticipate any particular exemptions to be sought. The facility for applying for, and granting of, exemptions remains as a precaution for unforeseen circumstances. However, for the purpose of analysis, no exemptions have been factored into this RIS analysis.

For Vapour Recovery:

- There are 1,022 petrol stations in the PPAQCR area. Based on the constructed figure above, it is estimated that 1,017 of these dispense more than 0.5 million litres of petrol per annum. This number is expected to remain steady over the life of the Regulations. This is based on EPA estimates from the 2006 Emissions Inventory, however is supported by views of industry, citing ACCC, that consolidation of retail sites has slowed significantly over the past few years.
- Ten per cent of existing PPAQCR petrol stations (102 stations) were assumed to not have VR1 in place, based on a survey by EPA in 2003; and confirmed by industry as an accepted assumption for the current status. These petrol stations sell around 119 million litres of petrol per year. Five of these 102 petrol stations are modelled to sell less than 0.5 million litres of petrol per year. No non-PPAQCR petrol stations have VR1 systems.
- It is estimated there are 1,000 road tankers in Victoria that transport petrol. This is based on a global estimate of 1,400 tankers registered in Victoria (WorkSafe) and EPA assumptions of the maximum number of these likely to be used for transporting petrol based on consultation with petroleum suppliers. Based on feedback from preliminary consultation, these all have VR1 installed already in accordance with the relevant standards.
- Feedback from industry representatives indicates that over the next 10 years there will be around 10 new petrol stations open in the PPAQCR area each year. These are assumed to be all larger than 0.5 million litres per annum in petrol sales. It is assumed that five new petrol stations each year (being the higher volume new petrol stations) will install Vapour Recovery equipment regardless of whether there are Regulations mandating VR1. Although a requirement for VR1 would come into force from 2015, costs are likely to be incurred for any new petrol stations being constructed from the time the new requirement would come into effect (January 2013).
- Refurbishments of petrol stations occurs at different times depending on type (those operated by major brands tend to refurbish more frequently than smaller and independent petrol stations). Refurbishment is also variable within an individual petrol station, with equipment such as bowsers being replaced generally more frequently than underground piping or storage tanks. For the purposes of analysis in this RIS, EPA has assumed that existing sites are being re-tanked (relevant for the introduction of VR1) at a rate of 1 per cent per annum (implying 10 per year in the PPAQCR). Similar to new petrol stations, it is assumed that five per year (being the higher volume petrol stations) would install VR1 regardless of any new regulatory requirements. While introduction of VR2 would generally be linked to replacement of bowsers, which are

replaced on average every 15 years, VR2 would also necessitate groundwork for associated piping and storage. Due to risks of contamination and the overlap with other safety standards on works at petrol stations, this type of work is very infrequent.

- The costs of implementing VR1 were assumed to be $2,000 per tank when installed at a new petrol station or during refurbishment and $6,000 per tank for retrofitting an existing petrol station. This is based on NSW estimates in Better Regulation Statement, *Expansion of Vapour Recovery at Petrol Service Stations in the NSW Greater Metropolitan Region*. EPA has confirmed with industry representatives that these estimates are still considered reasonable. A typical petrol station has four tanks for different petrol grades that would need to be modified for VR1.
- Existing petrol stations would have two years to comply with VR1 requirements. The modelling in this RIS therefore assumes that in the first two years there will only small reductions in emissions from existing stations – 20 per cent in 2013 and 40 per cent in 2014.
- While an existing petrol station is having VR1 equipment installed, there may be a 'disruption cost' to the individual petrol station associated with downtime and lost business. Such a cost has not been included in this cost-benefit analysis as: EPA understands the downtime in relation to VR1 would be quite small; there would be no net impact as motorists would transfer any purchases during this period to another petrol station (the small loss to one petrol station is offset by a gain to other petrol stations in the same area); by limiting new VR1 requirements to petrol stations in the metropolitan areas, there is assumed to be no additional travel cost associated with motorists travelling to another petrol station.
- It is assumed there is no additional cost in relation to fuel tankers transporting captured vapour from VR1 systems back to the supplier. This is based on discussions with industry that indicates that, as currently occurs with Vapour Recovery already undertaken at 90 per cent of metropolitan petrol stations, that captured vapour is returned to suppliers when a tanker returns to be refilled with another load of fuel for delivery.
- The costs for VR2 are less certain. The discussion paper indicated costs of between $20,000 and $450,000 per petrol station to implement VR2, based on NSW estimates. However submissions made by petrol suppliers in response to the discussion paper indicated that the costs could be much higher, with a minimum cost of around $200,000 per site and indicated that many sites in the early roll-out in New South Wales were costing in the order of $500,000. In response, during the development of this RIS, EPA conducted further consultation with representatives from petrol stations and suppliers of petrol station equipment. This revealed that for existing petrol stations, the costs were at a minimum around $400,000 for an average-sized petrol station for the basic installation of equipment, but could be higher if there were additional groundwork costs consequential on undertaking work at the site. The cost of installation at a new site were estimated to be $200,000 per average site, as all works could be factored into the initial construction.
- For each of VR1 and VR2 options, all monitoring and recording has been costed on the basis that it would represent a time cost of 0.5 hours per entity (petrol stations and road tankers) per occurrence (required to occur every six months). As noted above, time is valued at $68.68 per hour. Costs of retaining records take 24 over to live with months has been ignored as records would not exceed more than a few pages and have no material storage cost (or may be stored electronically). Enforcement of requirements would be through regular EPA audits. These would be conducted under existing provisions of the *Environment Protection Act* and are not a new cost on petrol stations imposed by these Regulations. In any case, audits related to Vapour Recovery would involve EPA officers or agents conducting tests at a site and/or reviewing records of tests, which is unlikely to impose any material time burden on operators.

## *Attachment H: Benefits and costs*

### H1: Benefits and costs of emission limits

| | YEAR | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BENEFITS | | | | | | | | | | | | |
| NOISE | | | | | | | | | | | | |
| Average reduction in noise | dB | 0.0598 | 0.1195 | 0.1613 | 0.2105 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | |
| **Total benefit of noise reduction** | **$** | **778,075** | **1,579,493** | **2,163,474** | **2,866,272** | **3,631,910** | **3,686,388** | **3,741,684** | **3,797,809** | **3,854,777** | **3,912,598** | $30,012,480 |
| **PV** | | **751,763** | **1,474,473** | **1,951,330** | **2,497,790** | **3,057,971** | **2,998,879** | **2,940,930** | **2,884,100** | **2,828,369** | **2,773,714** | $24,159,321 |
| AIR EMISSIONS | | | | | | | | | | | | |
| Petrol vehicles | | | | | | | | | | | | |
| Avoided VOCs | (tonnes) | 105 | 210 | 315 | 419 | 524 | 524 | 524 | 524 | 524 | 524 | 4193 |
| Savings to motorists | $ | 118,546 | 237,091 | 355,637 | 474,182 | 592,728 | 592,728 | 592,728 | 592,728 | 592,728 | 592,728 | |
| **Total benefit from petrol vehicles** | **$** | **558,862** | **1,117,724** | **1,676,586** | **2,235,447** | **2,794,309** | **2,794,309** | **2,794,309** | **2,794,309** | **2,794,309** | **2,794,309** | |
| Diesel vehicles | | | | | | | | | | | | |
| Avoided PM | tonnes | 15 | 31 | 46 | 61 | 77 | 77 | 77 | 77 | 77 | 77 | 613 |
| Avoided Nox | tonnes | 32 | 65 | 97 | 129 | 162 | 162 | 162 | 162 | 162 | 162 | 1294 |
| **Total benefit from diesel vehicles** | **$** | **2,485,006** | **4,970,011** | **7,455,017** | **9,940,022** | **12,425,028** | **12,425,028** | **12,425,028** | **12,425,028** | **12,425,028** | **12,425,028** | |
| **TOTAL BENEFITS (AIR)** | | **3,043,867** | **6,087,735** | **9,131,602** | **12,175,470** | **15,219,337** | **15,219,337** | **15,219,337** | **15,219,337** | **15,219,337** | **15,219,337** | $121,754,699 |
| **PV** | | **2,940,935** | **5,682,966** | **8,236,182** | **10,610,219** | **12,814,274** | **12,380,941** | **11,962,262** | **11,557,741** | **11,166,899** | **10,789,275** | $98,141,692 |
| TOTAL BENEFITS | | **3,821,943** | **7,667,228** | **11,295,077** | **15,041,742** | **18,851,247** | **18,905,726** | **18,961,022** | **19,017,147** | **19,074,114** | **19,131,936** | |
| PV | | | | | | | | | | | | $122,301,012 |
| COSTS | | | | | | | | | | | | |
| NOISE | | | | | | | | | | | | |
| Financial cost of rectification | | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | 1,165,320 | |
| Time cost | | 615,682 | 615,682 | 615,682 | 615,682 | 615,682 | 615,682 | 615,682 | 615,682 | 615,682 | 615,682 | |
| Noise test fee | | 185,107 | 185,107 | 185,107 | 185,107 | 185,107 | 185,107 | 185,107 | 185,107 | 185,107 | 185,107 | |
| Cost to Government | | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | |
| **Total cost of noise regulations** | | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | **2,466,108** | $24,661,083 |
| **Present value** | | **2,382,713** | **2,302,138** | **2,224,288** | **2,149,071** | **2,076,397** | **2,006,181** | **1,938,339** | **1,872,791** | **1,809,460** | **1,748,271** | $20,509,649 |
| AIR EMISSIONS | | | | | | | | | | | | |
| Financial cost of rectification | | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | 3,903,491 | |
| Time cost | | 496,035 | 496,035 | 496,035 | 496,035 | 496,035 | 496,035 | 496,035 | 496,035 | 496,035 | 496,035 | |
| Inspection fees | | 273,158 | 273,158 | 273,158 | 442,558 | 442,558 | 442,558 | 442,558 | 442,558 | 442,558 | 442,558 | |
| Cost to Government | | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | |
| **Total cost of air regulations** | | **5,172,684** | **5,172,684** | **5,172,684** | **5,342,084** | **5,342,084** | **5,342,084** | **5,342,084** | **5,342,084** | **5,342,084** | **5,342,084** | $52,912,636 |
| **Present value** | | **4,997,762** | **4,828,755** | **4,665,464** | **4,655,317** | **4,497,891** | **4,345,788** | **4,198,829** | **4,056,840** | **3,919,652** | **3,787,104** | $43,953,404 |
| TOTAL COSTS | | **7,638,792** | **7,638,792** | **7,638,792** | **7,808,192** | **7,808,192** | **7,808,192** | **7,808,192** | **7,808,192** | **7,808,192** | **7,808,192** | |
| Total PV | | | | | | | | | | | | $64,463,053 |
| **NET BENEFITS** | - | **3,816,849** | **28,435.7** | **3,656,285** | **7,233,550** | **11,043,055** | **11,097,534** | **11,152,830** | **11,208,955** | **11,265,922** | **11,323,744** | |
| **NET PRESENT VALUE** | | | | | | | | | | | | **$57,837,959** |

## H2: Benefits and costs of mandatory maintenance regime

| | YEAR | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BENEFITS | | | | | | | | | | | | |
| NOISE | | | | | | | | | | | | |
| Average reduction in noise | dB | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | |
| **Total benefit of noise reduction** | **$** | **78,120** | **158,584** | **217,216** | **287,778** | **364,650** | **370,119** | **375,671** | **381,306** | **387,026** | **392,831** | $3,013,301 |
| **PV** | | **75,478** | **148,039** | **195,917** | **250,782** | **307,025** | **301,092** | **295,274** | **289,568** | **283,973** | **278,485** | $2,425,635 |
| AIR EMISSIONS | | | | | | | | | | | | |
| Petrol vehicles | | | | | | | | | | | | |
| Avoided VOCs | tonnes | 16 | 32 | 48 | 64 | 79 | 79 | 79 | 79 | 79 | 79 | 635 |
| Savings to motorists | $ | 17,965 | 35,929 | 53,894 | 71,859 | 89,823 | 89,823 | 89,823 | 89,823 | 89,823 | 89,823 | |
| **Total benefit from petrol vehicles** | **$** | **84,691** | **169,382** | **254,073** | **338,764** | **423,455** | **423,455** | **423,455** | **423,455** | **423,455** | **423,455** | |
| Diesel vehicles | | | | | | | | | | | | |
| Avoided PM | tonnes | 28 | 56 | 83 | 111 | 139 | 139 | 139 | 139 | 139 | 139 | 1111 |
| Avoided NOx | tonnes | 59 | 117 | 176 | 234 | 293 | 293 | 293 | 293 | 293 | 293 | 2343 |
| **Total benefit from diesel vehicles** | **$** | **4,501,537** | **9,003,074** | **13,504,611** | **18,006,148** | **22,507,685** | **22,507,685** | **22,507,685** | **22,507,685** | **22,507,685** | **22,507,685** | |
| **TOTAL BENEFITS (AIR)** | | **4,586,228** | **9,172,456** | **13,758,684** | **18,344,912** | **22,931,140** | **22,931,140** | **22,931,140** | **22,931,140** | **22,931,140** | **22,931,140** | $183,449,121 |
| **PV** | | **4,431,138** | **8,562,586** | **12,409,545** | **15,986,531** | **19,307,405** | **18,654,497** | **18,023,669** | **17,414,173** | **16,825,288** | **16,256,317** | $147,871,148 |
| TOTAL BENEFITS | | **4,664,348** | **9,331,040** | **13,975,900** | **18,632,690** | **23,295,790** | **23,301,259** | **23,306,811** | **23,312,446** | **23,318,166** | **23,323,971** | |
| PV | | | | | | | | | | | | $150,296,782 |
| COSTS | | | | | | | | | | | | |
| Time cost of servicing vehicle | | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | 3,434,191 | |
| Financial cost of rectification | | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | 7,500,000 | |
| Cost to Government | | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | 2,500,000 | |
| **Total cost of regulations** | | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | $134,341,907 |
| **Present value** | | **12,979,894** | **12,540,961** | **12,116,870** | **11,707,121** | **11,311,228** | **10,928,723** | **10,559,152** | **10,202,080** | **9,857,082** | **9,523,751** | $111,726,862 |
| TOTAL COSTS | | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | **13,434,191** | |
| Total PV | | | | | | | | | | | | $111,726,862 |
| **NET BENEFITS** | - | **8,769,843** | - **4,103,151** | **541,710** | **5,198,500** | **9,861,599** | **9,867,069** | **9,872,621** | **9,878,256** | **9,883,975** | **9,889,781** | |
| **NET PRESENT VALUE** | | | | | | | | | | | | **$38,569,920** |

## H3: Benefits and costs of education campaign

| | YEAR | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BENEFITS | | | | | | | | | | | | |
| NOISE | | | | | | | | | | | | |
| Average reduction in noise | dB | 0.0048 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | |
| **Total benefit of noise reduction** | **$** | **62,496** | **126,867** | **173,773** | **230,223** | **291,720** | **296,095** | **300,537** | **305,045** | **309,621** | **314,265** | $2,410,641 |
| **PV** | | **60,383** | **118,432** | **156,733** | **200,626** | **245,620** | **240,874** | **236,219** | **231,655** | **227,178** | **222,788** | $1,940,508 |
| AIR EMISSIONS | | | | | | | | | | | | |
| Petrol vehicles | | | | | | | | | | | | |
| Avoided VOCs | tonnes | 17 | 35 | 52 | 70 | 87 | 87 | 87 | 87 | 87 | 87 | 698 |
| Savings to motorists | $ | 19,740 | 39,479 | 59,219 | 78,959 | 98,698 | 98,698 | 98,698 | 98,698 | 98,698 | 98,698 | |
| **Total benefit from petrol vehicles** | **$** | **93,059** | **186,118** | **279,177** | **372,236** | **465,295** | **465,295** | **465,295** | **465,295** | **465,295** | **465,295** | |
| Diesel vehicles | | | | | | | | | | | | |
| Avoided PM | tonnes | 12 | 25 | 37 | 50 | 62 | 62 | 62 | 62 | 62 | 62 | 498 |
| Avoided NOx | tonnes | 26 | 53 | 79 | 105 | 131 | 131 | 131 | 131 | 131 | 131 | 1050 |
| **Total benefit from diesel vehicles** | **$** | **2,017,050** | **4,034,100** | **6,051,150** | **8,068,200** | **10,085,250** | **10,085,250** | **10,085,250** | **10,085,250** | **10,085,250** | **10,085,250** | |
| **TOTAL BENEFITS (AIR)** | | **2,110,109** | **4,220,218** | **6,330,327** | **8,440,436** | **10,550,545** | **10,550,545** | **10,550,545** | **10,550,545** | **10,550,545** | **10,550,545** | $84,404,362 |
| **PV** | | **2,038,753** | **3,939,619** | **5,709,592** | **7,355,353** | **8,883,276** | **8,582,875** | **8,292,633** | **8,012,206** | **7,741,262** | **7,479,480** | $68,035,049 |
| TOTAL BENEFITS | | **2,172,605** | **4,347,085** | **6,504,100** | **8,670,659** | **10,842,265** | **10,846,641** | **10,851,082** | **10,855,590** | **10,860,166** | **10,864,810** | |
| PV | | | | | | | | | | | | $69,975,556 |
| COSTS | | | | | | | | | | | | |
| Time cost of servicing vehicle | | - | - | - | - | - | - | - | - | - | - | |
| Financial cost of rectification | | - | - | - | - | - | - | - | - | - | - | |
| Cost to Government | | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | |
| **Total cost of regulations** | | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | $50,000,000 |
| **Present value** | | **4,830,918** | **4,667,554** | **4,509,714** | **4,357,211** | **4,209,866** | **4,067,503** | **3,929,955** | **3,797,058** | **3,668,655** | **3,544,594** | $41,583,027 |
| TOTAL COSTS | | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | **5,000,000** | |
| Total PV | | | | | | | | | | | | $41,583,027 |
| **NET BENEFITS** | **-** | **2,827,395** | **-** | **652,915** | **1,504,100** | **3,670,659** | **5,842,265** | **5,846,641** | **5,851,082** | **5,855,590** | **5,860,166** | **5,864,810** | |
| **NET PRESENT VALUE** | | | | | | | | | | | | **$28,392,530** |

## H4: Benefits and costs of vapour pressure limits

| | YEAR | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BENEFITS | | | | | | | | | | | | |
| Health benefits | | | | | | | | | | | | |
| Total health benefit of avoided VOCs | $ | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | 28,446,873 | |
| PV | | 27,484,902 | 26,555,461 | 25,657,450 | 24,789,807 | 23,951,504 | 23,141,550 | 22,358,985 | 21,602,884 | 20,872,352 | 20,166,524 | |
| TOTAL PV | | | | | | | | | | | | 236,581,418 |
| Savings to motorists | | | | | | | | | | | | |
| Savings to motorists | $ | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | 6,605,408 | |
| PV | | 6,382,037 | 6,166,219 | 5,957,699 | 5,756,231 | 5,561,576 | 5,373,504 | 5,191,791 | 5,016,223 | 4,846,592 | 4,682,698 | |
| TOTAL PV | | | | | | | | | | | | 54,934,570 |
| Savings to suppliers | | | | | | | | | | | | |
| Savings to industry | $ | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | |
| | | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | 113,294 | |
| PV | | 109,463 | 105,762 | 102,185 | 98,730 | 95,391 | 92,165 | 89,048 | 86,037 | 83,128 | 80,317 | 942,225 |
| TOTAL PV | | | | | | | | | | | | |
| TOTAL BENEFITS | | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | 35,165,576 | |
| | | | | | | | | | | | | 292,458,214 |
| COSTS | | | | | | | | | | | | |
| Cost to industry | | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | |
| Total | | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | 12,000,000 | |
| Present value | | 11,594,203 | 11,202,128 | 10,823,312 | 10,457,307 | 10,103,678 | 9,762,008 | 9,431,892 | 9,112,939 | 8,804,772 | 8,507,026 | |
| Total present value | | | | | | | | | | | | 99,799,264 |
| Cost to government | | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | |
| Total | | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | |
| Present value | | 48,309 | 46,676 | 45,097 | 43,572 | 42,099 | 40,675 | 39,300 | 37,971 | 36,687 | 35,446 | |
| Total present value | | | | | | | | | | | | 415,830 |
| Compliance testing/reporting | | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | |
| Total | | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | 84,069 | |
| Present value | | 81,226 | 78,479 | 75,825 | 73,261 | 70,784 | 68,390 | 66,077 | 63,843 | 61,684 | 59,598 | |
| Total present value | | | | | | | | | | | | 699,169 |
| TOTAL COSTS | | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | **12,134,069** | |
| Total PV | | | | | | | | | | | | **100,914,263** |
| **NET BENEFITS** | | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | **23,031,507** | |
| **NET PRESENT VALUE** | | | | | | | | | | | | **191,543,951** |

## H5: Benefits and costs of Stage 1 Vapour Recovery

| | YEAR | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BENEFITS | | | | | | | | | | | | |
| Health benefits | | | | | | | | | | | | |
| Reduced emissions from existing stations | | 25.5 | 51 | 130.2 | 130.2 | 130.2 | 130.2 | 130.2 | 130.2 | 130.2 | 130.2 | |
| New petrol stations | | 13.4 | 26.8 | 40.2 | 53.6 | 67 | 80.4 | 93.8 | 107.2 | 120.6 | 134 | |
| Refurbishments | | 13.4 | 26.8 | 40.2 | 53.6 | 67 | 80.4 | 93.8 | 107.2 | 120.6 | 134 | |
| Total avoided VOCs | | 52.3 | 104.6 | 210.6 | 237.4 | 264.2 | 291 | 317.8 | 344.6 | 371.4 | 398.2 | 2592.1 |
| Total health benefit of avoided VOCs | $ | 219,660 | 439,320 | 884,520 | 997,080 | 1,109,640 | 1,222,200 | 1,334,760 | 1,447,320 | 1,559,880 | 1,672,440 | |
| PV | | 212,232 | 410,110 | 797,786 | 868,898 | 934,287 | 994,260 | 1,049,109 | 1,099,112 | 1,144,532 | 1,185,624 | |
| TOTAL PV | | | | | | | | | | | | 8,695,951 |
| Savings to suppliers | | | | | | | | | | | | |
| Total savings to suppliers | $ | 59,139 | 118,277 | 238,138 | 268,442 | 298,746 | 329,051 | 359,355 | 389,659 | 419,964 | 450,268 | |
| | | 59,139 | 118,277 | 238,138 | 268,442 | 298,746 | 329,051 | 359,355 | 389,659 | 419,964 | 450,268 | |
| PV | | 57,139 | 110,413 | 214,787 | 233,932 | 251,536 | 267,683 | 282,450 | 295,912 | 308,140 | 319,203 | 2,341,195 |
| TOTAL PV | | | | | | | | | | | | |
| TOTAL BENEFITS | | 278,799 | 557,597 | 1,122,658 | 1,265,522 | 1,408,386 | 1,551,251 | 1,694,115 | 1,836,979 | 1,979,844 | 2,122,708 | |
| | | | | | | | | | | | | 11,037,145 |
| COSTS | | | | | | | | | | | | |
| Cost to industry (equipment) | | 1,244,000 | 1,244,000 | 80,000 | 80,000 | 80,000 | 80,000 | 80,000 | 80,000 | 80,000 | 80,000 | |
| Cost to industry (monitoring and records) | | 138,879 | 138,879 | 138,879 | 138,879 | 138,879 | 138,879 | 138,879 | 138,879 | 138,879 | 138,879 | |
| Total | | 1,382,879 | 1,382,879 | 218,879 | 218,879 | 218,879 | 218,879 | 218,879 | 218,879 | 218,879 | 218,879 | |
| Present value | | 1,336,115 | 1,290,932 | 197,416 | 190,740 | 184,290 | 178,058 | 172,037 | 166,219 | 160,598 | 155,167 | |
| Total present value | | | | | | | | | | | | 4,031,572 |
| Cost to govt | | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | |
| Total | | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | |
| Present value | | 96,618 | 93,351 | 90,194 | 87,144 | 84,197 | 81,350 | 78,599 | 75,941 | 73,373 | 70,892 | |
| Total present value | | | | | | | | | | | | 831,661 |
| TOTAL COSTS | | **1,482,879** | **1,482,879** | **318,879** | **318,879** | **318,879** | **318,879** | **318,879** | **318,879** | **318,879** | **318,879** | |
| Total PV | | | | | | | | | | | | **4,863,232** |
| **NET BENEFITS** | - | **1,204,080** | - **925,281** | **803,779** | **946,643** | **1,089,508** | **1,232,372** | **1,375,236** | **1,518,101** | **1,660,965** | **1,803,829** | |
| **NET PRESENT VALUE** | | | | | | | | | | | | **6,173,913** |

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# Environment Protection (Vehicle Emissions) Regulations

## Exposure Draft

### TABLE OF PROPOSALS

Victoria

# Environment Protection (Vehicle Emissions) Regulations

## Exposure Draft

### PART 1—PRELIMINARY

#### 1 Objectives

The objectives of these Regulations are to—

(a) prescribe air emission standards and standards of maximum permissible concentration for emissions from motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment; and

(b) prescribe noise emission standards for motor vehicles, other than new vehicles and heavy vehicles, to minimise the negative impacts of motor vehicle use on Victorians and the environment; and

(c) provide for offences relating to the supply of petrol to minimise the release of petrol vapours into the environment; and

(d) prescribe various matters necessary for the purposes of the **Environment Protection Act 1970**.

**2 Authorising provisions**

These Regulations are made under sections 53P and 71 of the **Environment Protection Act 1970**.

**3 Commencement**

These Regulations come into operation on 1 December 2013.

**4 Revocations**

The Environment Protection (Vehicle Emissions) Regulations 2003[1] and the Environment Protection (Vehicle Emissions) (Amendment) Regulations 2006[2] are **revoked**.

**5 Definitions**

In these Regulations—

***ADR 83/00*** means Australian Design Rule 83/00 "External Noise" determined under section 7 of the Motor Vehicle Standards Act 1989 of the Commonwealth;

***A-weighted*** means frequency weighted as specified in Australian Standard 1055.1-1997 "Acoustics—Description and Measurement of Environmental Noise—General Procedures" published by Standards Australia;

***bus*** has the same meaning as in the **Bus Safety Act 2009**;

***dB(A)*** means the A-weighted sound pressure level expressed in decibels;

***diesel engine*** means an internal combustion engine that operates on the compression-ignition principle;

***DT80 Test Cycle*** means the DT80 transient test procedure for the testing of diesel-fuelled vehicle exhaust emissions as set out in Schedule 1 to the National Transport Commission (Road Transport Legislation—Vehicle Standards) Amendment Regulations 2006 (No. 1) of the Commonwealth;

***ethanol-blended petrol*** means petrol containing 4 per cent or more of ethanol by volume but not more than 20 per cent of ethanol by volume;

***forward-control passenger vehicle*** has the same meaning as ***forward-control passenger vehicle (MB)*** has in the Road Safety (Vehicles) Regulations 2009;

***goods vehicle*** means any motor vehicle, other than a passenger car or passenger car derivative, that—

(a) is constructed principally for the carriage of goods; and

(b) has at least 4 wheels;

***GVM*** (gross vehicle mass) has the same meaning as in the **Road Safety Act 1986**;

***monthly volumetric average vapour pressure*** means monthly volumetric average vapour pressure calculated in accordance with regulation 18;

***motor cycle*** has the same meaning as in the **Road Safety Act 1986**;

***motor trike*** means a motor vehicle with 3 wheels, but does not include a 2-wheeled motor vehicle with a sidecar attached to it that is supported by a third wheel;

***off-road passenger vehicle*** has the same meaning as ***off-road passenger vehicle (MC)*** has in the Road Safety (Vehicles) Regulations 2009;

***passenger car*** has the same meaning as ***passenger car (MA)*** has in the Road Safety (Vehicles) Regulations 2009;

***passenger car derivative*** means any motor vehicle—

(a) of the type known as a utility or panel van and of the same make as a factory produced passenger car; and

(b) in which the greater part of the body form and the greater part of the forward mechanical equipment are the same as those in the passenger car;

***passenger vehicle*** means a forward-control passenger vehicle, an off-road passenger vehicle, a passenger car or a passenger car derivative;

***petrol*** has the same meaning as in section 42A of the Act;

***petrol supplier*** has the same meaning as in section 42B of the Act;

***recreational motor cycle*** means any 2-wheeled motor cycle that is registered as a recreation motor cycle under the Road Safety (Vehicles) Regulations 2009;

***spark ignition engine*** means an internal combustion engine in which the mixture of air and fuel is ignited by means of an electrical spark;

***summer period*** means the period commencing on 1 November and ending on 31 March of each year;

***the Act*** means the **Environment Protection Act 1970**;

***unladen mass*** for a motor vehicle means the mass of that motor vehicle without any load;

***vapour pressure***, in relation to petrol, means the petrol's volatility at 37·8°C measured using the test method specified in ASTM D4953-06 "Standard Test Method for Vapor Pressure of Gasoline and Gasoline-Oxygenate Blends (Dry Method)" published by ASTM International in 2006;

***vehicle test mass*** for a motor vehicle means half the sum of its unladen mass and its GVM.

**6 Regulations do not apply to new vehicles or heavy vehicles**

These Regulations do not apply to a new vehicle or a heavy vehicle.

## PART 2—VEHICLE AIR EMISSION STANDARDS

### 7 Prescribed emission standard for visible emissions from motor vehicles

(1) For the purposes of sections 42(1)(b)(i) and 43A(1)(b)(i) of the Act, a prescribed emission standard for a motor vehicle propelled by an internal combustion engine is that the emissions from that motor vehicle must not be visible for a continuous period of 10 or more seconds.

(2) This regulation does not apply if—

(a) the emissions are visible solely because of heat or the condensation of water vapour; or

(b) the motor vehicle was manufactured before 1 January 1930.

### 8 Prescribed standard of maximum permissible concentration of carbon monoxide and hydrocarbon for spark ignition motor vehicles

(1) In this regulation—

***at high idle*** means as determined by the high idle test set out in Part B of the Schedule;

***at idle*** means as determined by the idle test set out in Part A of the Schedule.

(2) For the purposes of sections 42(1)(b)(ii) and 43A(1)(b)(ii) of the Act, the prescribed standard of maximum permissible concentration for the emission of carbon monoxide for a passenger vehicle propelled by a spark ignition engine with a date of manufacture specified in column 1 of the following Table is the corresponding level specified in column 2 of that Table.

**Table**

| *Column 1* | *Column 2* |
|---|---|
| *Date of manufacture* | *Carbon monoxide level (% by volume)* |
| On or after 1 July 1976 and before 1 February 1986 | ≤4.5 at idle |
| On or after 1 February 1986 | ≤4.5 at idle or ≤1.0 at high idle |

(3) For the purposes of section 43A(1)(b)(ii) of the Act, the prescribed standard of maximum permissible concentration for the emission of hydrocarbon for a passenger vehicle propelled by a spark ignition engine that has a date of manufacture specified in column 1 of the following Table is the corresponding level specified in column 2 of that Table.

**Table**

| *Column 1* | *Column 2* |
|---|---|
| *Date of manufacture* | *Hydrocarbon limit (ppm)* |
| On or after 1 July 1976 and before 1 February 1986 | ≤1200 at idle |
| On or after 1 February 1986 | ≤600 at idle or ≤200 at high idle |

(4) For the purposes of section 42(2B) of the Act, the prescribed manner for keeping, maintaining or adjusting a vehicle specified in column 1 of the Table following subregulation (3) is the keeping, maintaining or adjusting of that vehicle so that the vehicle complies with the corresponding maximum permissible concentration for the emission of hydrocarbon specified in column 2 of that Table.

## 9 Prescribed emission standards for diesel engine vehicles

(1) In this regulation, ***motor vehicle*** means a passenger vehicle, a bus or a goods vehicle that—

(a) is registered in Victoria; and

(b) is powered by a diesel engine.

(2) For the purposes of section 43A(1)(b)(i) of the Act, for a motor vehicle manufactured before 1 January 1996 with a GVM specified in column 1 of the following Table, the prescribed emission standard for—

(a) oxides of nitrogen in exhaust gases, is that the exhaust gases emitted must not exceed the corresponding rate specified in column 2 of that Table; and

(b) particles in exhaust gases, is that the exhaust gases emitted must not exceed the corresponding rate specified in column 3 of that Table.

**Table**

| *Column 1* | *Column 2* | *Column 3* |
|---|---|---|
| *GVM (t)* | *Rate of NOx emissions (grams/kilometre/ tonne of vehicle test mass)* | *Rate of particle emission (grams/kilometre/ tonne of vehicle test mass)* |
| Not greater than 3.5 | 1.5 | 0.23 |
| More than 3.5 but less than or equal to 4.5 | 2.0 | 0.23 |

(3) For the purposes of section 43A(1)(b)(i) of the Act, for a motor vehicle manufactured on or after 1 January 1996 with a GVM specified in column 1

of the following Table, the prescribed emission standard for—

(a) oxides of nitrogen in exhaust gases, is that the exhaust gases emitted must not exceed the corresponding rate specified in column 2 of that Table; and

(b) particles in exhaust gases, is that the exhaust gases emitted must not exceed the corresponding rate specified in column 3 of that Table.

**Table**

| *Column 1* | *Column 2* | *Column 3* |
|---|---|---|
| *GVM (t)* | *Rate of NOx emissions (grams/kilometre/ tonne of vehicle test mass)* | *Rate of particle emission (grams/kilometre/ tonne of vehicle test mass)* |
| Not greater than 3.5 | 1.5 | 0.23 |
| More than 3.5 but less than or equal to 4.5 | 2.0 | 0.15 |

(4) For the purposes of sections 42(1)(b)(i) and 43A(1)(b)(i) of the Act, the prescribed emission standard for exhaust gas opacity for a motor vehicle is that the exhaust gases emitted must not exceed 25% opacity averaged over a DT80 Test Cycle.

(5) The Authority may in writing exempt a motor vehicle from the requirement to comply with an emission standard prescribed by this regulation if the Authority is of the opinion that it is impracticable for that vehicle to comply.

## PART 3—VEHICLE NOISE EMISSION STANDARDS

### 10 Noise from motor vehicles certified in accordance with ADR 83/00

For the purposes of sections 48B and 48D(3A) of the Act, the prescribed standard for a motor vehicle certified in accordance with ADR 83/00 is that the vehicle must not emit noise exceeding, by more than 5 dB(A), the stationary noise level established for that vehicle when it was certified.

### 11 Noise from passenger vehicles not certified in accordance with ADR 83/00

For the purposes of sections 48B and 48D(3A) of the Act, the prescribed standard for a passenger vehicle not certified in accordance with ADR 83/00 that has a date of manufacture specified in column 1 of the following Table is that the passenger vehicle must not emit noise exceeding the corresponding level specified in column 2 of that Table.

**Table**

| *Column 1* | *Column 2* |
|---|---|
| *Date of manufacture* | *Noise level (dB(A))* |
| Before 1 November 1983 | 96 |
| On or after 1 November 1983 | 90 |

### 12 Noise from goods vehicles and buses not certified in accordance with ADR 83/00

(1) For the purposes of sections 48B and 48D(3A) of the Act, the prescribed standard for a goods vehicle or bus propelled by a spark ignition engine not certified in accordance with ADR 83/00 that has a date of manufacture specified in column 1 of the following Table, a GVM specified in column 2 of that Table and an exhaust height specified in

column 3 of the Table, is that the vehicle must not emit noise exceeding the corresponding level specified in column 4 of the Table.

**Table**

| *Column 1* | *Column 2* | *Column 3* | *Column 4* |
|---|---|---|---|
| *Date of manufacture* | *GVM (t)* | *Exhaust height (millimetres)* | *Noise level (dB(A))* |
| Before 1 July 1983 | ≤ 3.5 | < 1500 | 92 |
| Before 1 July 1983 | > 3.5 and ≤ 4.5 | < 1500 | 98 |
| Before 1 July 1983 | ≤ 3.5 | ≥ 1500 | 88 |
| Before 1 July 1983 | > 3.5 and ≤ 4.5 | ≥ 1500 | 94 |
| On or after 1 July 1983 | ≤ 3.5 | < 1500 | 89 |
| On or after 1 July 1983 | > 3.5 and ≤ 4.5 | < 1500 | 95 |
| On or after 1 July 1983 | ≤ 3.5 | ≥ 1500 | 85 |
| On or after 1 July 1983 | > 3.5 and ≤ 4.5 | ≥ 1500 | 91 |

(2) For the purposes of sections 48B and 48D(3A) of the Act, the prescribed standard for a goods vehicle or bus propelled by a diesel engine not certified in accordance with ADR 83/00 that has a date of manufacture specified in column 1 of the following Table, a GVM specified in column 2 of that Table and an exhaust height specified in column 3 of the Table, is that the vehicle must not emit noise exceeding the corresponding level specified in column 4 of the Table.

**Table**

| *Column 1* | *Column 2* | *Column 3* | *Column 4* |
|---|---|---|---|
| *Date of manufacture* | *GVM (t)* | *Exhaust height (millimetres)* | *Noise level (dB(A))* |
| Before 1 July 1980 | ≤ 3.5 | < 1500 | 105 |
| Before 1 July 1980 | > 3.5 and ≤ 4.5 | < 1500 | 107 |
| Before 1 July 1980 | ≤ 3.5 | ≥ 1500 | 101 |
| Before 1 July 1980 | > 3.5 and ≤ 4.5 | ≥ 1500 | 103 |
| On or after 1 July 1980 and before 1 July 1983 | ≤ 3.5 | < 1500 | 102 |
| On or after 1 July 1980 and before 1 July 1983 | > 3.5 and ≤ 4.5 | < 1500 | 104 |
| On or after 1 July 1980 and before 1 July 1983 | ≤ 3.5 | ≥ 1500 | 98 |
| On or after 1 July 1980 and before 1 July 1983 | > 3.5 and ≤ 4.5 | ≥ 1500 | 100 |
| On or after 1 July 1983 | ≤ 3.5 | < 1500 | 99 |
| On or after 1 July 1983 | > 3.5 and ≤ 4.5 | < 1500 | 101 |
| On or after 1 July 1983 | ≤ 3.5 | ≥ 1500 | 95 |
| On or after 1 July 1983 | > 3.5 and ≤ 4.5 | ≥ 1500 | 97 |

## 13 Noise from motor cycles and motor trikes not certified in accordance with ADR 83/00

For the purposes of sections 48B and 48D(3A) of the Act, the prescribed standard for a motor cycle or motor trike not certified in accordance with ADR 83/00 that is of a vehicle type specified in column 1 of the following Table and has a date of manufacture specified in column 2 of that Table, is that the vehicle must not emit noise exceeding the corresponding level specified in column 3 of the Table.

**Table**

| *Column 1*<br><br>*Vehicle type* | *Column 2*<br><br>*Date of manufacture* | *Column 3*<br><br>*Noise level (dB(A))* |
|---|---|---|
| Motor cycle or motor trike, other than a recreational motor cycle | Before 1 March 1985 | 100 |
| Motor cycle or motor trike, other than a recreational motor cycle | On or after 1 March 1985 | 94 |
| Recreational motor cycle | On or after 1 January 1994 | 94 |

## 14 Method for determining motor vehicle noise emissions

(1) For the purposes of this Part, the noise emitted by a motor vehicle must be determined using a method described in the "National Stationary Exhaust Noise Test Procedures for In-Service Motor Vehicles" published by the National Transport Commission as in force from time to time.

(2) For the purposes of subregulation (1), in the "National Stationary Exhaust Noise Test Procedures for In-Service Motor Vehicles" the

engine speed at maximum power of a motor vehicle is that specified in the "ESMP Data Manual 1992" published by the Authority as in force from time to time.

## PART 4—VEHICLE NOISE LABELLING STANDARDS

### 15 Labelling of motor cycles and motor trikes

(1) In this regulation—

***engine speed at maximum power*** means the speed, expressed in revolutions per minute, at which maximum power is developed by an engine;

***relevant information*** means—

(a) a heading "STATIONARY NOISE TEST INFORMATION"; and

(b) a statement containing the recorded stationary sound level value and the 50 per cent engine speed at maximum power value in the following format—

"Tested …..dB(A) at …..r/min
Silencing System: (manufacturer) Identification: (trade description)".

(2) A person must not use a motor cycle or motor trike manufactured on or after 1 March 1988 that does not have the relevant information—

(a) embossed or etched in a readily visible position or carried on a label of plastic or metal which is welded, riveted or otherwise permanently attached to the motor cycle or motor trike in a readily visible position; and

(b) in the English language in block letters and numerals of a height not less than 3 millimetres and of a colour contrasting with their background; and

(c) affixed to the motor cycle or motor trike so that the relevant information cannot be removed without being destroyed or defaced.

Penalty: In the case of an individual, 20 penalty units.

In the case of a body corporate, 50 penalty units.

(3) A person must not remove or deface—

(a) relevant information that is embossed or etched on a motor cycle or motor trike; or

(b) a label described in subregulation (2)(a).

Penalty: In the case of an individual, 20 penalty units.

In the case of a body corporate, 50 penalty units.

## PART 5—GENERAL VEHICLE OFFENCES

### 16 Offence to sell a motor vehicle capable of exceeding a prescribed standard for the emission of noise

A person must not sell a motor vehicle that does not comply with a standard prescribed by Part 3 of these Regulations relating to the emission of noise by that vehicle.

Penalty: In the case of an individual, 20 penalty units.

In the case of a body corporate, 50 penalty units.

### 17 Offences concerning temporary noise defeat devices

(1) A person must not use a motor vehicle equipped with any temporary defeat device, inlet port restrictor, exhaust port restrictor or temporary noise reduction device if the vehicle was not equipped with that device when it was a new vehicle.

Penalty: In the case of an individual, 20 penalty units.

In the case of a body corporate, 50 penalty units.

(2) A person must not install onto a motor vehicle any temporary defeat device, inlet port restrictor, exhaust port restrictor or temporary noise reduction device if the vehicle was not equipped with that device when it was a new vehicle.

Penalty: In the case of an individual, 20 penalty units.

In the case of a body corporate, 50 penalty units.

(3) A person must not sell a motor vehicle equipped with any temporary defeat device, inlet port restrictor, exhaust port restrictor or temporary noise reduction device unless the vehicle was equipped with that device when it was a new vehicle.

Penalty: In the case of an individual, 20 penalty units.

In the case of a body corporate, 50 penalty units.

## PART 6—PETROL VAPOUR PRESSURE

### 18 Monthly average volumetric vapour pressure

(1) For the purposes of these Regulations, the monthly average volumetric vapour pressure expressed in kPa for a grade of petrol is the sum of samples, weighted by volume calculated in accordance with the following formula, that are collected during the relevant month—

$$\frac{S \times B}{G}$$

where—

**S** is the vapour pressure measured over a particular batch of a grade of petrol; and

**B** is the volume of a batch of a grade of petrol in litres relating to a sample S; and

**G** is the total volume in litres of a grade of petrol supplied in a month by a petrol supplier.

(2) For the purposes of the formula contained in subregulation (1), a petrol supplier must—

(a) take not less than 4 samples of each grade of petrol held by the petrol supplier every month during the summer period; and

(b) take each sample on different days, with at least 6 days between the taking of each sample; and

(c) measure the vapour pressure of each sample; and

(d) measure the volume of each grade of the petrol supplied in a month during the summer period.

**19 Offences relating to the supply of petrol with excess vapour pressure**

(1) A petrol supplier must not supply ethanol-blended petrol that has, during the summer period, a maximum vapour pressure of more than 71 kPa.

Penalty: 50 penalty units.

(2) A petrol supplier must not supply petrol that is not ethanol-blended petrol if that petrol has, during the summer period, a monthly volumetric average vapour pressure of more than 62 kPa.

Penalty: 50 penalty units.

(3) A petrol supplier must not supply petrol that is not ethanol-blended petrol if that petrol has, during the summer period, a maximum vapour pressure of more than 64 kPa.

Penalty: 50 penalty units.

**20 Authority may exempt a person from vapour pressure provisions**

(1) On the application of a petrol supplier, the Authority may grant the petrol supplier an exemption in writing from the need to comply with any provision of regulation 19.

(2) An application by a petrol supplier for an exemption under subregulation (1) must—

(a) be made in writing; and

(b) be accompanied by the following information—

(i) the reasons for the application; and

(ii) an assessment of the environmental impact of the proposed exemption if approved; and

(iii) the volume and grade of petrol covered by the application; and

(iv) the likely geographic location where the petrol will be sold for retail; and

(v) the vapour pressure of the petrol to be supplied; and

(vi) the period for which the exemption is requested; and

(c) be accompanied by a fee of 69·9 fee units.

(3) The Authority may request a petrol supplier to provide any further information that the Authority considers necessary to determine an application under this regulation.

(4) An exemption granted under subregulation (1) may be granted subject to conditions and may apply to all petrol supplied or to a specified grade of petrol supplied.

(5) The Authority must publish a notice of an exemption granted under this regulation and any condition imposed under subregulation (4) in the Government Gazette and on the Authority's website.

(6) A petrol supplier must not contravene any condition to which an exemption granted to that petrol supplier under this regulation is subject.

Penalty: 50 penalty units.

**21 Vapour pressure—record keeping**

A petrol supplier must keep the information used to calculate the monthly average volumetric vapour pressure of petrol for no less than 24 months from the date that information was collected.

Penalty: 50 penalty units.

**22 Annual compliance report**

(1) A petrol supplier must submit an annual compliance report to the Authority by 30 April of each year.

Penalty: 50 penalty units.

(2) A petrol supplier must include the following information in an annual compliance report submitted under subregulation (1)—

(a) the monthly average volumetric vapour pressure of each grade of petrol, that is not ethanol-blended petrol, supplied by the petrol supplier in each month during the summer period; and

(b) the maximum vapour pressure of all the petrol supplied by the petrol supplier in each month during the summer period; and

(c) details of all the petrol supplied by the petrol supplier during the summer period, including—

(i) the grade of petrol; and

(ii) the monthly volume of each grade of petrol.

Penalty: 50 penalty units.

## SCHEDULE

Regulation 8

### METHOD FOR DETERMINING THE CONCENTRATION OF CARBON MONOXIDE AND HYDROCARBON IN THE EXHAUST GASES OF A MOTOR VEHICLE

### PART A—IDLE TEST

1. An idle test of a motor vehicle must be conducted in the following manner—
   (a) the engine of the vehicle must be running and be at normal operating temperature; and
   (b) the inlet end of a sampling probe must be positioned in the exhaust pipe of the vehicle at any point between 35 centimetres and 50 centimetres from the discharge end of the exhaust pipe; and
   (c) the accelerator pedal of the vehicle must not be depressed; and
   (d) if the vehicle is equipped with a manual transmission, the transmission must be kept in neutral gear with the clutch engaged; and
   (e) if the vehicle is equipped with automatic or semi-automatic transmission, the transmission must be kept with the gear selector engaged in the drive position with the vehicle's handbrake in the fully on position; and
   (f) if the vehicle is equipped with a manual choke, the choke must be off.
2. The measurement must be taken by noting the maximum value of the concentration of carbon monoxide [in %vol] and total hydrocarbons [in ppm] as determined by the analyser over a period of between 30 seconds and

60 seconds beginning not earlier than 60 seconds after the probe has been inserted in the exhaust pipe.

3. If the motor vehicle is equipped with more than one exhaust pipe, the concentration must be measured in each exhaust pipe and the maximum value shall be the average value from both pipes.

4. If required for the purposes of testing, the exhaust pipe may be temporarily extended by an extension piece connected to the designed discharge outlet by means of a suitable connection which does not allow dilution of the exhaust gases by air.

**PART B—HIGH IDLE TEST**

5. A high idle test of a motor vehicle must be conducted in the following manner—

   (a) the engine of the vehicle must be running and be at normal operating temperature; and

   (b) the inlet end of a sampling probe must be positioned in the exhaust pipe of the vehicle at any point between 35 centimetres and 50 centimetres from the discharge end of the exhaust pipe; and

   (c) the accelerator pedal of the vehicle must be depressed and the engine rotational speed must be stabilised within the range of 2500 rpm to 3000 rpm; and

   (d) if the vehicle is equipped with a manual transmission, the transmission must be kept in neutral gear with the clutch engaged; and

   (e) if the vehicle is equipped with automatic or semi-automatic transmission, the transmission must be kept with the gear selector engaged in the neutral or park position with the handbrake in the fully on position; and

   (f) if the vehicle is equipped with a manual choke, the choke must be off.

6. The measurement must be taken by noting the maximum value of the concentration of carbon monoxide [in %vol] and total hydrocarbons [in ppm] as determined by the analyser over a period of between 30 seconds and 60 seconds beginning not earlier than 60 seconds after the probe has been inserted in the exhaust pipe.
7. If the motor vehicle is equipped with more than one exhaust pipe, the concentration must be measured in each exhaust pipe and the maximum value shall be the average value from both pipes.
8. If required for the purposes of testing, the exhaust pipe may be temporarily extended by an extension piece connected to the designed discharge outlet by means of a suitable connection which does not allow dilution of the exhaust gases by air.

**PART C—EQUIPMENT FOR IDLE TEST AND HIGH IDLE TEST**

9. The concentration of carbon monoxide and hydrocarbon in the exhaust gases of the motor vehicle must be measured with a non-dispersive infrared carbon monoxide and hydrocarbon analyser.
10. The analyser must be calibrated within the preceding 12 months by being zeroed with dry nitrogen or air containing less than 10 ppm carbon monoxide, or 6 ppm total hydrocarbon (equivalent carbon response), as applicable, and spanned with a carbon monoxide or total hydrocarbon mixture, as applicable, which will result in a response equivalent to not less than 70 per cent of the full scale deflection for each gas.
11. The analyser instrument must be zeroed and spanned using a secondary electronic or mechanical system prior to each measurement.

## ENDNOTES

[1] Reg. 4: S.R. No. 10/2003. Reprint No. 1 as at 23 October 2008. Reprinted to S.R. No. 65/2006. Subsequently extended in operation by S.R. No. 153/2012.

[2] Reg. 4: S.R. No. 65/2006.

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### Fee Units

These Regulations provide for fees by reference to fee units within the meaning of the **Monetary Units Act 2004**.

The amount of the fee is to be calculated, in accordance with section 7 of that Act, by multiplying the number of fee units applicable by the value of a fee unit.

The value of a fee unit for the financial year commencing 1 July 2013 is $12.84. The amount of the calculated fee may be rounded to the nearest 10 cents.

The value of a fee unit for future financial years is to be fixed by the Treasurer under section 5 of the **Monetary Units Act 2004**. The value of a fee unit for a financial year must be published in the Government Gazette and a Victorian newspaper before 1 June in the preceding financial year.

### Penalty Units

These Regulations provide for penalties by reference to penalty units within the meaning of section 110 of the **Sentencing Act 1991**. The amount of the penalty is to be calculated, in accordance with section 7 of the **Monetary Units Act 2004**, by multiplying the number of penalty units applicable by the value of a penalty unit.

The value of a penalty unit for the financial year commencing 1 July 2013 is $144.36.

The amount of the calculated penalty may be rounded to the nearest dollar.

The value of a penalty unit for future financial years is to be fixed by the Treasurer under section 5 of the **Monetary Units Act 2004**. The value of a penalty unit for a financial year must be published in the Government Gazette and a Victorian newspaper before 1 June in the preceding financial year.

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**Table of Applied, Adopted or Incorporated Matter**

The following table of applied, adopted or incorporated matter is included in accordance with the requirements of regulation 5 of the Subordinate Legislation Regulations 2004.

| **Statutory Rule Provision** | **Title of applied, adopted or incorporated document** | **Matter in applied, adopted or incorporated document** |
|---|---|---|
| Regulation 5 | Australian Standard 1055.1–1997 Acoustics—Description and Measurement of Environmental Noise Part 1—General Procedures (published by Standards Australia on 5 August 1997). | The whole |
| Regulation 5 | ASTM D4953-06 Standard Test Method for Vapor Pressure of Gasoline and Gasoline-Oxygenate Blends (Dry Method) 2006 (published by the American Society for Testing and Materials International on 1 August 2006). | The whole |
| Regulation 14 | National Stationary Exhaust Noise Test Procedures for In-Service Motor Vehicles (published by the National Transport Commission and as in force from time to time). | The whole |
| Regulation 14 | ESMP Data Manual 1992 (published by the Environment Protection Authority and as in force from time to time). | The whole |