**Better Regulation Statement** 

# Expansion of Vapour Recovery at Petrol Service Stations in the NSW Greater Metropolitan Region

Department of **Environment, Climate Change and Water** NSW

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Department of Environment, Climate Change and Water 59–61 Goulburn Street, Sydney PO Box A290 Sydney South 1232 Phone: 131 555 or (02) 9995 5000 (switchboard) Fax: (02) 9995 5999 TTY: (02) 9211 4723 Email: info@environment.nsw.gov.au Web: www.environment.nsw.gov.au

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### 1. <u>Executive Summary</u>

In August 2007 Cabinet approved the release of a Discussion Paper proposing the phased expansion of vapour recovery requirements at petrol service stations in the NSW Greater Metropolitan Region (GMR). After further Cabinet consideration (Cabinet Minute 218-07), in November 2007 the Deputy Premier announced the Government's intention to phase-in the introduction of Stage 2 Vapour Recovery, commencing with new, refurbished and large petrol service stations and then several years later for the medium-sized petrol service stations. The Government agreed to exempt the smallest petrol service stations unless they are rebuilt or substantially modified.

#### Proposed approach is proportionate to the policy problem

Petrol vapour emissions at petrol service stations are a significant and growing source of air pollution in the NSW GMR. Petrol vapour contains toxic volatile organic compounds (VOCs) which contribute to localised and regional-wide (ground-level ozone) air pollution. Vapour recovery at petrol service stations provides immediate health protection benefits by reducing personal exposure to toxic substances in petrol vapours like benzene.

The installation of technology known as Stage 1 Vapour Recovery (VR1) captures the vapour displaced from underground storage tanks as he tanks are filled by road tankers. The installation of Stage 2 Vapour Recovery (VR2) controls the emissions from filling vehicle tanks.

A market intervention is justified to reduce the unintended effects of air pollution. The external cost of air pollution from petrol vapour emissions is not included in the price of petrol and there is no incentive to reduce the impact of fuel on pollution.

In line with NSW State Plan targets, new strategies are required to address the long-term challenge of reducing ground-level ozone pollution in the NSW GMR. The NSW GMR currently is not projected to meet the national health based air quality standards which are key targets in the State Plan air target.

The implementation of refuelling vapour recovery at petrol service stations in the NSW GMR is estimated to provide about 15% of the VOC reduction required to meet the State Plan target.

#### <u>Outline consultation approach and summary of stakeholder views of the proposals</u> Consultation has included:

- convening an Expert Reference Group (including oil company representatives) to consult on the conduct of the equipment trial and subsequent economic analysis
- discussions with local suppliers of service station equipment
- an extensive series of one-on-one meetings with key stakeholders
- a Discussion Paper proposing phased expansion of vapour recovery at petrol service stations for public comment
- several broader industry meetings and speaking engagements at industry association seminars and national conferences
- draft Regulation and 'Standards and Best Practice Guidelines' for public comment
- presentations, open to all stakeholders, provided in Sydney and Melbourne
- summary document providing clarifications and proposing minor changes to resolve technical details forwarded to submitters for information and any further comment
- additional stakeholder meetings offered to any interested stakeholder if requested.

Themes that emerged from the public consultation included:

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- a broad 'in-principle' support for expanding vapour recovery by regulation, provided industry has sufficient time to cost effectively phase-in the technology
- all petrol service stations be required to install VR2 along with robust monitoring and reporting to ensure consistent compliance and verifiable environmental benefits
- smaller petrol service stations and other groups advocated the exemption threshold for petrol service stations be increased to 3.5 million litres per year, which is the threshold in the UK
- local Government and community groups argued that residents outside of the Sydney region should also be afforded the benefits of expanded vapour recovery
- resolution of minor technical matters sought through incorporation of additional flexibility mechanisms without impacting on emission reductions achieved.

#### Show preferred option provides greatest net benefit or least cost to community

The preferred option is the proposed amendment of the Regulation. It would phase in VR2 from mid 2010 to 2017 for all Sydney petrol service stations with a petrol throughput greater than 3.5 million litres per year and Newcastle, Wollongong and Central Coast petrol service stations with a petrol throughput greater than 12 million litres per year. This option also requires VR1 compliance by 2014.

The phase-in enables many petrol service stations to install VR2 as part of their scheduled refurbishment program, and allows sufficient lead-time for a planned and orderly introduction of the new technology.

Existing petrol service stations in Sydney below the threshold limit of 3.5 million litres per year, and those in other metropolitan regions of the GMR below the threshold limit of 12 million litres per year, would only be required to install VR2 during construction or major refurbishment.

This enables these smaller or more remote petrol service stations to install VR2 with minimal disruption and at least cost to the service station operator. As these petrol service stations account for only a small proportion of regional petrol throughput, the slower adoption of VR2 by them does not significantly delay the VOC emission reduction benefits from VR2.

The net benefit of this option is estimated to be \$125 million in health and other costs avoided, expressed in present values terms over the period till 2040. This option also recovers nearly 8 million litres of petrol annually by 2015 and 10 million litres of petrol annually by 2030.

The alternative option, to not specify a compliance date but to require installation of VR2 when petrol service stations are modified, provides a net benefit of only \$54 million, due to the slower rate of upgrade and thus benefit delivered to the community.

## 2. <u>Need for Government Action</u>

### 2.1 Context

Petrol vapour emissions at petrol service stations are a significant and growing source of air pollution in the NSW GMR. Petrol vapour contains toxic volatile organic compounds (VOCs) which contribute to localised and regional-wide ground-level ozone air pollution.

In line with NSW State Plan targets, new strategies are required to address the long-term challenges to reduce ground-level ozone pollution in the NSW GMR. The NSW GMR currently is not projected to meet the national health based air quality standards which are key targets in the State Plan air target.

There is a market failure to allocate the resource of clean air efficiently. Clean air is a public good and price signals fail to reflect true social benefits of clean air. A market intervention is justified to reduce the unintended effects of air pollution. The external cost of air pollution from petrol vapour emissions is not included in the price of petrol and there is no incentive to reduce the impact of fuel on pollution.

A range of market intervention mechanisms are utilised internationally to reduce ozone to safe levels. Vapour recovery at petrol service stations is a very cost effective mechanism able to achieve large VOC emission reductions. Cleaner production equipment at petrol service stations that reduces petrol vapour emissions when vehicles refuel has been required in the United States (US) and many European countries since the mid 1990s, and more recently in parts of Asia.

The need for NSW Government action on this issue was recognised by the Premier in March 2007 when announcing a government initiative to expand vapour recovery at petrol service stations to reduce petrol vapour emissions by over 5,000 tonnes per year and deliver improvements in regional and local air quality.

The implementation of refuelling vapour recovery at petrol service stations in the NSW GMR is estimated to provide about 15% of the VOC reduction required to meet the State Plan target.

#### 2.2 VOC emissions from petrol service stations

Liquid petrol evaporates inside a car fuel tank to fill the empty space in the tank. As a car is refuelled, these petrol vapours are pushed out of the tank by the incoming fuel and, unless controlled, escape into the atmosphere. This is the source of the visible haze and strong odour evident at petrol dispensers when vehicles refuel.

In 2007, petrol service stations in the Sydney region emitted over 7,500 tonnes of VOCs, or about 4-5% of the region's total human related VOC emissions. VOC emissions from petrol service stations are increasing with fuel usage at a rate of about 1.5% per year.

While national vehicle emission standards have tightened over time, refuelling emissions have increased relative to other vehicle related emissions commensurate with growth in fuel use. Motor vehicle refuelling emissions remain the most significant uncontrolled vehicle related emission source.

#### 2.3 Ozone levels in Sydney

In sunny, still conditions and in the presence of nitrogen oxides, VOCs react to form groundlevel ozone. This is one of the components of summertime smog, which harms human health, vegetation and building materials. Each summer the Sydney region exceeds national health-based ozone standards.

Ozone is a highly irritating air pollutant. Exposure to concentrations found in Sydney can be harmful to people's health. Increases in levels of ozone are associated with increased hospitalisations for respiratory diseases and mortality. Repeated exposure to ozone can make people more susceptible to respiratory infection and aggravate pre-existing respiratory diseases such as asthma. Children who are active outdoors during the summer when ozone levels are at their highest are particularly at risk of experiencing such effects. Other at-risk groups include outdoor workers, the elderly and individuals with pre-existing respiratory diseases such as asthma.

The population of the NSW GMR is forecast to grow to 5.91 million by 2022. This growth will increase industrial and residential development, and see continued growth in the ownership and use of motor vehicles and fuels. Global warming is also expected to exacerbate ozone formation, making national standards even more difficult to achieve.

If the Sydney region is to meet national ozone standards the Department of Environment, Climate Change and Water (DECCW) estimates that VOC emissions need to be reduced by at least 34,000 tonnes per year (or 25%) from present levels.

Ground level ozone is also a potent global warming gas and is the third most important greenhouse forcing agent after carbon dioxide and methane. Notwithstanding, ozone receives less attention for its contribution to global warming than for its direct impacts on human health. Ozone precursor emissions are not directly controlled under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, however, in recognition of the role these pollutants have as greenhouse gases, Parties must report on their emissions of VOCs, oxides of nitrogen and carbon monoxide.

#### 2.4 VOC emissions and air toxics

As well as contributing to ozone formation, VOCs in petrol vapour can have direct health and odour amenity impacts on service station employees, and people living and working in the vicinity of a service station.

Petrol contains 1% benzene. Benzene is a human carcinogen and there is no safe level of human exposure to benzene. Long-term exposure to benzene has been linked with increased incidence of leukaemia.

Recent Australian research (Horton *et al.* 2006) has found that vehicle refuelling is associated with exposure to benzene concentrations up to 3 orders of magnitude (1,000 times) higher than typical ambient concentrations. The research also found that vehicle refuelling makes the most significant contribution to the population's non-occupational exposure to benzene, accounting for 85% of the population's summertime exposure to benzene.

## 3. Objective of Government Action

The objective of the proposed action is to reduce risks to human health and prevent the degradation of the environment by reducing VOC emissions from motor vehicles and petrol service stations. The reduction of VOC emissions in the NSW GMR will help NSW meet national air quality goals as required by the State Plan air target.

#### 3.1 The reduction of petrol vapour emissions at petrol service stations

VOC emissions arise from a number of sources at petrol stations, including the vapour expelled from a vehicle's petrol tank as the tank is filled; drips from the filling nozzle; leaks from hoses and gaskets; and vapour expelled from underground storage tanks as they are refilled by road tankers.

VR1 technology captures the emissions from underground storage tanks as the tanks are filled by road tankers. The installation of Stage 2 Vapour Recovery (VR2) controls the emissions from filling vehicle tanks at the petrol pump.

#### Stage 1 Vapour Recovery

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. See diagram below.



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

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. Condensers and/or activated carbon beds commonly control vapour release from the storage tanks at the refinery or terminal.

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

VR1 at petrol service stations has been required by regulation in the majority of the Sydney metropolitan area since 1986. A number of new and newly refurbished petrol service stations in the Newcastle, Central Coast and Wollongong regions have installed VR1, even though this has not been required by regulation. They have done this for occupational health and safety reasons, and because it is cost effective to do so especially when fuel is delivered by road tanker from a terminal in the Sydney region.

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Since the introduction of VR1 in Sydney in 1986, the population and urban areas of Sydney have grown rapidly. International best practice for emission controls at petrol service stations has also developed substantially in this time.

#### Stage 2 Vapour Recovery

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. See diagram below.



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

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. This vacuum is controlled to capture at least 95 per cent of petrol vapours.

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. A summary of international schemes to implement VR2 is shown in the table below.

State	First Year in	Implementation Timescale	% of petrol service stations with VR2 (2004)				
Austria	1993	5 years	99%				
Czech Rep	Details unavail	able	52%				
Denmark	1995	5 years	>90%				
France	2001	18 months	45%				
Germany	1993	5 years	100%				
Hungary	Details unavail	able	71%				
Italy	1996	4 years	100%				
Luxembourg	1992	4 years	98%				
Netherlands	1996	3 years	100%				
Sweden	1992	3 years	90%				
Switzerland	Details unavail	able	100%				
US (Clean Air Act) ~ 27 States	1993	Varies across states					
Mexico	Details unavail	able	>90%				
Taiwan	1997 & 2005	2 years	>88%				
China (Hong Kong)	2005	3 years					
China (Beijing)	2004	Details unavailable					
UK	2006	5 years	3%				

International schemes to implement VR2 at petrol service stations

## 4. <u>Consideration of Options</u>

#### 4.1 Evaluation of vapour recovery commenced in 2002

In 2002 the then Environment Protection Authority commenced an evaluation of refuelling vapour recovery at petrol service stations to inform future decision-making on ozone management strategies. This evaluation included:

- undertaking an equipment trial of VR2 systems, including management and user surveys, in partnership with Gosford and Blacktown City Councils;
- convening an Expert Reference Group (including oil company representatives) to consult on the conduct of the equipment trial and subsequent economic analysis;
- commissioning independent economic analysis on the cost effectiveness and retail market impacts of VR2;
- undertaking a survey of all retail petrol service stations identified in the NSW GMR;
- consulting with local suppliers of service station equipment; and
- reviewing the costs and policy and regulatory frameworks of international schemes to implement VR2.

On the basis of the comprehensive work undertaken by DECCW, in March 2007 the Premier announced the Government's intention to reduce "harmful petrol vapours by capturing smog-forming emissions through equipment installed at petrol station pumps".

#### 4.2 Release of Public Discussion Paper in August 2007 and consideration of public submissions

Following Cabinet approval, the NSW Government released a Public Discussion Paper in August 2007 outlining a rationale for emission controls at petrol service stations and proposing the phased expansion of refuelling vapour recovery at petrol service stations in the NSW GMR. At the time of the Discussion Paper's release, DECCW undertook an extensive series of meetings with all key stakeholders to inform them about the proposal and seek their formal comment.

Key themes to emerge from the public consultation guided significant changes in the policy proposal, and included the following:

- There was broad 'in-principle' support for expanding vapour recovery by regulation, provided industry has sufficient time to cost effectively phase-in the technology and that new cost data is considered.
- All petrol service stations be required to install VR2 along with robust monitoring reporting to ensure consistent compliance and verifiable environmental benefits.
- Smaller petrol service stations and other groups advocated the exemption threshold for petrol service stations be increased to 3.5 million litres per year, which is the threshold in the UK.
- Equipment manufacturers, suppliers and certifying bodies advised that sufficient lead-in time would be required to bring suitably certified VR2 technology to the Australian market that is compliant with Australian Standards.
- Local Government and community groups argued that residents outside of the Sydney region should also be afforded the benefits of expanded vapour recovery.
- Contractors advised of the industry's current skills shortage, the backlog of the service station construction work and technical constraints on industry to immediately roll-out VR2, should this be required.

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• The Australian motor vehicle industry strongly opposed the consideration of Onboard refuelling vapour recovery (ORVR) as an alternate option to refuelling vapour recovery.

In response to issues raised, the original proposal outlined in the Discussion Paper was revised to incorporate the following key changes:

- increasing the exemption threshold for the retrofitting of VR2 to 3.5 million litres per annum, and requiring all new petrol service stations and those undergoing major modification to install VR2, regardless of their size
- expanding the geographic area where VR1 and VR2 technology is prescribed
- providing a two-year lead-in period to allow equipment suppliers to bring certified equipment to the market, for the up-skilling of industry and the development of industry guidance.

## 4.3 Revised economic analysis of costs of proposed approach and retail market impacts

In September 2007, the Department of Environment, Climate Change and Water (DECCW) contracted an independent economic consultant McLennan Magasanik Associates (MMA) to update its earlier (2005) analysis of the cost effectiveness and retail market impacts of expanding vapour recovery in the NSW GMR. The study, which also estimated impacts on petrol prices, was re-run to include updated cost and fuel throughput data received during public consultation.

The cost of implementing VR1 is estimated to be between \$2,000 and \$6,000 per underground storage tank depending on whether installation occurs at the time of a scheduled refurbishment.

The cost of implementing VR2 is estimated to be between \$20,000 and \$450,000 per service station, depending on its size (the number of dispensers) and the timing of refurbishment i.e. whether the installation coincides with a refurbishment. It is estimated that the extended compliance time-frame will allow the implementation of VR2 at nearly all petrol service stations to coincide with a scheduled major refurbishment.

The capital equipment and installation costs depend on whether the service station already has VR1 installed, the timing of the installation, and whether it is carried out at the same time as a major station refurbishment.

Operating costs of VR1 and VR2 include the additional maintenance and repair costs and the additional electricity consumption associated with vacuum pumps and controls.

Compliance costs include type certification of the equipment, compliance monitoring at installation, periodical compliance monitoring and in station diagnostics (equipment monitoring by service station workers).

Loss of trade may occur due to the disruption of installing the equipment. Depending on the number of bowsers the site may be partially closed or out of operation.

By proposing a compliance time-frame from 2010 to 2017 and excluding petrol service stations with throughputs of less than 3.5 million litres per year, the cost to the community per litre of fuel, ranges from 0.02 to 0.19 cents per litre, depending on the size and fuel throughput levels of the service station. Given that the price of petrol regularly fluctuates daily by many cents per litre, the impact of implementing VR2 will be negligible.

With an average weekly petrol consumption of around 35 litres per household, a price increase of between 0.02 cents and 0.19 cents per litre, would add between 0.7 cents and 7 cents to weekly household expenditure.

#### 4.4 Reducing the potential impacts on smaller petrol service stations

The proposed threshold to exempt petrol service stations with fuel throughput of less than 3.5 million litres per year will protect smaller sites from the potential disproportional impacts of the cost of installing VR2, especially in circumstances where small petrol stations provide local services in addition to fuel sales such as groceries and vehicle repairs, and where there may be fewer options available for local residents.

Submissions received during public consultation and information published in relation to Australian Competition and Consumer Commission inquiries highlight that small petrol service stations are often placed under considerable pressure from lower priced fuel offered by supermarkets and oil majors. This pressure will continue to have the greatest bearing on the profitability of smaller sites and continue to drive their further rationalisation.

Smaller petrol stations emit proportionately fewer emissions than other categories of petrol service stations as they comprise only a small proportion (approximately 13%) of total fuel sold. Economic analysis shows that the introduction of VR2 is considerably less cost effective for small petrol service stations and results in only a relatively small additional decrease in emissions.

The proposed threshold excluding small petrol service stations from VR2 requirements is based on equity considerations and aims to maximise emission reductions whilst minimising the economic and community impacts.

#### 4.5 November 2007 announcement on vapour recovery

After Cabinet consideration (Cabinet Minute 218-07) the Government announced in November 2007 its intention to expand vapour recovery at petrol service stations in the NSW GMR. Key elements of the proposal take into account a range of issues raised in the public consultation phase which included:

- Broadening the geographic area of VR1 to include all of the Sydney metropolitan area and the Lower Hunter, Illawarra, and Central Coast.
- Requiring VR2 be installed at new sites and when major modifications take place in Sydney, Newcastle, Central Coast and Wollongong regions.
- Requiring VR2 be fitted to existing sites in Sydney and also at the very largest petrol service stations in Newcastle, Central Coast and Wollongong.
- Exempting small petrol service stations from any requirement to install VR2, unless they are rebuilt or undergo major modification.
- Providing a lead-in from 2008 to 2010 to undertake a range of issues includes equipment certification, industry up-skilling, resolution of technical issues and development of industry code of practice and guidelines.

A phased approach to implementation of VR1 and VR2 was proposed based on the size of the service station and whether they are new versus existing petrol service stations. This is to achieve the greatest pollution reductions while at the same time managing the practical

issues around the roll-out and certification of equipment and the cost implications for different sized petrol service stations.

The 2010 to 2017 staging of VR1 and VR2 compliance provides the opportunity for nearly all petrol service stations to install equipment as part of a scheduled refurbishment and gives sufficient lead-time for a planned and orderly introduction of new technology.

#### 4.6 December 2008 release of draft Regulation for public comment

Public consultation on the draft Regulation and Guidelines was undertaken between mid December 2008 and late February 2009.

Stakeholder submissions received were largely of a technical nature. Due to the detailed nature of these technical comments a summary document providing clarifications and proposed minor changes was forwarded to submitters for information and any further comment. Additional stakeholder meetings were also offered to any interested stakeholder. This additional consultation step has assisted development of the regulation and guidelines and promotion of a flexible approach which also ensures industry best practice.

A Code of Practice providing technical guidance in relation to the design, installation, commissioning, operation and maintenance of stage 2 vapour recovery equipment at petrol service stations is planned to be finalised by September 2009.

#### 4.7 Identified Options

#### Option 1: No VR2 required - 'business as usual' or maintaining the status quo

The status quo or 'do-nothing approach' would not result in any reduction of VOC emissions. It would maintain the current situation whereby the petrol vapour expelled from motor vehicle fuel tanks during refuelling would continue to be emitted to the atmosphere and result in local exposure to VOC emissions and ground-level ozone. Petrol vapour emissions would continue to grow at a rate of between 1 to 2% per annum, commensurate with growth in fuel use.

#### Option 2: VR2 with phased-in compliance

This option is the proposed amendment of the Regulation. It would phase in VR2 from mid 2010 to 2017 for all Sydney petrol service stations with a petrol throughput greater than 3.5 million litres per year and Newcastle, Wollongong and Central Coast petrol service stations with a petrol throughput greater than 12 million litres per year. This option also requires VR1 compliance by 2014.

The phase-in enables many petrol service stations to install VR2 as part of their scheduled refurbishment program, and allows sufficient lead-time for a planned and orderly introduction of the new technology.

Existing petrol service stations in Sydney below the threshold limit of 3.5 million litres per year, and those in other metropolitan regions of the GMR below the threshold limit of 12 million litres per year, would only be required to install VR2 during construction or major refurbishment. This enables these smaller or more remote petrol service stations to install VR2 with minimal disruption and at least cost to the service station operator. As these petrol service stations account for only a small proportion of regional petrol throughput, the slower adoption of VR2 by them does not significantly delay the VOC emission reduction benefits from VR2.

#### Option 3: VR2 with no compliance date

This option requires VR2 installation with no compliance date deadline for existing petrol service stations. It would allow all petrol service stations to install VR2 during either construction or major refurbishment. Installing VR2 at these times minimises the installation and disruption costs incurred by the service station operator. However, as VR2 is installed more gradually, reductions in emissions would also occur at a slower rate.

#### Option 4: Voluntary agreement with fuel retail industry to employ VR2

DECCW has considered the introduction of VR2 via a negotiated agreement with industry, an approach that was tried in the UK.

The negotiated agreement would be based on industry achieving an 85 to 90% reduction in refuelling emissions in the GMR region within a specified timeframe. Such an approach would enable industry to install VR2 at locations of its choosing where it would be most cost effective, and offer flexibility in meeting required VOC reductions. Such an agreement potentially offers scope for reducing the cost of the measures.

However, given market competition, fragmentation and a multitude of business ownership structures it is difficult to envisage how a consistent industry-wide agreement could be executed. The UK experience was not successful, and does not lend support to a negotiated approach to the implementation of VR2 in NSW.

DECCW has also had poor experience with the oil industry in executing and honouring voluntary agreements in relation to meeting fuel quality specifications.

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.

#### Option 5: National regulation requiring on-board refuelling vapour recovery

Onboard refuelling vapour recovery (ORVR) is an in-vehicle emission-control system that utilises a large canister to capture fuel vapours from the vehicle's petrol tank during refuelling. ORVR is an alternative approach to VR2 for capturing fuel vapours. ORVR is used across North America (in addition to VR2 which is required in many US States).

The use of ORVR in Australian vehicles would require new Commonwealth regulation (to change Australian Design Rules (ADR) for motor vehicles) and the reengineering of new vehicles sold in Australia. ORVR cannot be retrofitted to the existing vehicle fleet, therefore refuelling emission reductions will only be commensurate with the retirement of old vehicles and the uptake of new vehicles. Significant emission reductions could not be realised until the new national vehicle standards have been developed (~5 years); sufficient lead-time is given to vehicle manufacturers (~5 years); and sufficient fleet turnover has taken place (10 to 15 years).

The Australian motor vehicle industry strongly opposes the consideration of ORVR as a viable alternative to refuelling vapour recovery, noting that requirements for ORVR are inconsistent with the Australian Government's policy to harmonise with international vehicle regulations and inconsistent with international agreements affecting vehicle regulations,

including United Nations Economic Commission for Europe, World Trade Organisation (WTO) and Asia- Pacific Economic Cooperation (APEC) commitments.

Notwithstanding, given that ORVR is not prescribed under international vehicle regulations, there would be a lengthy and resource-intensive process to adopt a new rule incorporating ORVR into Australian Design Rules (ADRs). There are also uncertainties relating to the legality of such a move under WTO regulation.

The adoption of ORVR for the Sydney region is not considered a feasible alternative approach. It would require new ADRs for light passenger vehicles and would take at least 20 years to become sufficiently widespread across the vehicle fleet to make a significant impact on VOC emissions. Accordingly, ORVR as an option to reduce refuelling emissions in the NSW GMR is not considered a viable option, and further analysis is not warranted.

## 5. Cost and Benefits of Options

#### 5.1 Costs

The costs and benefits of the phased-in compliance option and no compliance date option, relative to the base case of business as usual, are outlined below.

#### Option 1: Business as usual

This 'do nothing' option would maintain the current situation whereby the petrol vapour expelled from motor vehicle fuel tanks during refuelling would continue to be emitted to the atmosphere and result in VOC emissions and ground-level ozone.

Petrol service stations will continue to incur costs of inventory losses estimated to be 0.15% of service station fuel throughput at a total retail value of \$45 million per year, with an average annual throughput of 20,000ML.

#### **Option 2: Phased-in compliance**

The total cost of this option is estimated to be \$106 million expressed in present value terms over the period till 2040.

This cost includes the cost of capital equipment and installation, ongoing operating costs, disruption costs (foregone revenue while the service station is closed for installation), and compliance costs of ongoing inspection and certification. These costs are offset by the benefit of recovering petrol from the petrol vapour.

This option would result in an estimated additional cost to service station operators of less than 0.2 cents per litre of petrol sold. Although service station operators incur these costs, it is expected that some of this cost would be passed on to customers through higher petrol prices than would otherwise be the case.

The cost of installing VR2 at a service station varies depending upon the size of the service station and the number of bowsers, whether the installation occurs during construction or a scheduled refurbishment, and the location of the service station. Depending upon these factors, the total cost of implementing VR2 is estimated at between \$20,000 and \$450,000 per service station. It is cheaper to install VR2 during construction or major refurbishment as the bowsers would already be out of operation and the underground pipes exposed.

#### Option 3: No compliance date

The total cost of this option is estimated to be \$43 million expressed in present values terms over the period till 2040. This option would result in an estimated additional cost to service station operators of less than 0.05 cents per litre of petrol sold.

The total cost would be lower with this option because it costs less for petrol service stations to install VR2 during construction or major refurbishment. The costs also occur more evenly over the period as there is no compliance date. However, the costs are less evenly distributed across the industry with the potential for some petrol service stations to benefit from installing VR2 later than their competitors.

#### 5.2 Benefits

The principal environmental and health benefit of implementation will be the decrease in air pollution due to the reduction in VOC emissions released during petrol refuelling processes. VOCs are a precursor to ground level ozone, which is harmful to human health, vegetation and building materials. Petrol vapours also contain benzene, which is a human carcinogen.

The benefit of VR2 is the capture of petrol vapour that would otherwise be released into the air at petrol service stations as VOC emissions from the refuelling of motor vehicles.

Reducing petrol vapour at petrol service stations reduces people's exposure to benzene. Vehicle refuelling currently accounts for most of the Australian population's summertime exposure to benzene (Horton *et al.* 2006), which is a human carcinogen with no safe level of exposure (NICNAS 2001).

VOC emissions contribute to the formation of ground-level ozone, which increases mortality rates and respiratory related hospitalisations. Ozone also damages materials, crops and ecosystems. Estimates of the damage cost of VOC emissions and ground-level ozone are discussed below.

McLennan Magasanik Associates Pty Ltd recently investigated damage cost estimates and recommended the estimate for damage cost of VOC emissions in Sydney of \$4,200 per tonne of VOC (MMA 2008). This estimate is derived from the €2,100 per tonne of VOCs estimate by the European Commission (Holland and Watkiss, 2002).

The European Commission estimate is based on a meta-analysis of damage cost estimates for major cities in Europe. It includes the cost of VOC emissions and ground-level ozone on human health, materials, crops and ecosystems. Mortality is valued using the value of life years lost, as opposed to the higher value of statistical life. This estimate also assumes that there is no concentration level threshold for damage.

Factors that may affect the transferability of this estimate to the GMR include:

- Population density is similar for the two relevant areas.
- Health systems are similar.
- Preferences upon which values are based. Australia ranks 15th in the GDP per capita list, while the European Union is 27th. Using average income as an indicator, the preferences upon which the European Commission estimates are based are comparable with preferences in the GMR.

The recommended damage cost estimate of \$4,200 per tonne of VOC has therefore been used to value benefits within this assessment.

An alternative estimate is a damage cost of \$19,300 per tonne of hydrocarbons by CSIRO (Beer 2002). Although this is an Australian estimate, it represents an upper-bound as it uses the value of statistical life method for mortality with a cost of \$7.2 million per death, instead of the value of life years lost.

Less VOC emission and ground-level ozone may reduce deaths from VOCs or ozone related diseases. As these deaths would have occurred later in a person's life, the statistical average of the value of life may over-value the cost of that death. The value of life years lost method is more appropriate where the death occurs late in life and is brought forward as a result of VOC or ozone related diseases.

#### Option 1: Business as usual

This 'do nothing' option would maintain the current situation whereby the petrol vapour expelled from motor vehicle fuel tanks during refuelling would continue to be emitted to the atmosphere and result in VOC emissions and ground-level ozone.

No benefits result from this option.

#### **Option 2: Phased-in compliance of VR2**

The health benefit of this option is estimated to be \$231 million expressed in present values terms over the period till 2040. This option also recovers nearly 8 million litres of petrol annually by 2015 and 10 million litres of petrol annually by 2030.

#### Option 3: No compliance date

The health benefit of this option is estimated to be \$97 million expressed in present values terms over the period till 2040. This option recovers over 1 million litres of petrol annually by 2015 and about 6 million litres of petrol annually by 2030.

## 6. <u>Consultation</u>

Consultation has been collaborative over six years, including the forming of a Reference Group for the trial of VR2 equipment, consultation on the release of the discussion paper and regular consultation throughout the drafting of the Regulation and Guidelines.

A project Reference Group comprising the Australian hstitute of Petroleum, Caltex, Shell, Service Stations Association of NSW, Blacktown City Council, Gosford City Council, an independent expert from the University of Technology Sydney, and DECCW was established in November 2003 for the duration of the trial. The Reference Group's role was to keep stakeholders abreast of the work of the trial and receive their views and input on the trial; to consider reports on the trial's operation; and to consider general issues related to any wider application of VR2 in the Sydney region.

Formal consultation was held during August 2007 on the release of the discussion paper. DECCW undertook an extensive series of meetings with all key stakeholders to inform them about the proposal and seek their formal comment.

In response to issues raised the original proposal outlined in the Discussion Paper was revised to incorporate the following key changes:

- increasing the exemption threshold for the retrofitting of VR2 to 3.5 million litres per annum, and requiring all new petrol service stations and those undergoing major modification to install VR2, regardless of their size.
- expanding the geographic area where VR1 and VR2 technology is prescribed.
- providing a two-year lead-in period to allow equipment suppliers to bring certified equipment to the market and for the up-skilling of industry and the development of industry guidance.

DECCW has continued to consult widely with all stakeholders throughout the drafting of the Regulation and the 'Standards and Best Practice Guidelines'. Key stakeholders include the oil majors (Caltex, Shell, BP, Mobil), Woolworths, Service Station Association, health and environmental community groups, local government, equipment suppliers and industry contractors and national approval agencies for the certification of equipment.

Consultation has comprised a series of one-on-one meetings with key stakeholders, several broader industry meetings and speaking engagements at industry association seminars and national conferences. Stakeholders are well informed of the policy work and documents being prepared for exhibition.

Formal consultation for the draft Regulation and 'Standards and Best Practice Guidelines' was held between early December 2008 and late February 2009. Public presentations open to all stakeholders were provided in Sydney and Melbourne. A summary document providing clarifications and proposing minor changes to resolve technical details was forwarded to submitters for information and any further comment. Additional stakeholder meetings were also offered to any interested stakeholder.

A Code of Practice, jointly developed by industry and Government, is planned to be finalised in September 2009. The Code of Practice will provide technical guidance on the design, installation, commissioning, operation and maintenance of stage 2 vapour recovery equipment.

## Preferred Option

#### **Option 2: VR2 with phased-in compliance**

This option is the proposed amendment Regulation. It would phase in VR2 from mid 2010 to 2017 for all Sydney petrol service stations with a petrol throughput greater than 3.5 million litres per year and Newcastle, Wollongong and Central Coast petrol service stations with a petrol throughput greater than 12 million litres per year. This option also requires VR1 compliance by 2014.

The phase-in enables many petrol service stations to install VR2 as part of their scheduled refurbishment program, and allows sufficient lead-time for a planned and orderly introduction of the new technology.

Existing petrol service stations in Sydney below the threshold limit of 3.5 million litres per year, and those in other metropolitan regions of the GMR below the threshold limit of 12 million litres per year, would only be required to install VR2 during construction or major refurbishment. This enables these smaller or more remote petrol service stations to install VR2 with minimal disruption and at least cost to the service station operator. As these petrol service stations account for only a small proportion of regional petrol throughput, the slower adoption of VR2 by them does not significantly delay the VOC emission reduction benefits from VR2.

The total cost of this option is estimated to be \$106 million expressed in present value terms over the period till 2040.

The health benefit of this option is estimated to be \$231 million expressed in present values terms over the period till 2040. This option also recovers nearly 8 million litres of petrol annually by 2015 and 10 million litres of petrol annually by 2030.

VR2 compliance date for <b>new and</b> <b>newly modified</b> petrol service stations in: Sydney Newcastle Wollongong Central Coast	VR1 compliance date for existing petrol service stations in: Sydney Illawarra Lower Hunter Central Coast	VR2 compliance date for <b>existing</b> petro service stations in: Sydney Newcastle Wollongong Central Coast		
		Largest petrol service stations Service station sells more than 12 million litres of petrol per annum	2014	
July 2010	2014	Medium sized petrol service stations2017Service station sells between 3.5 and 12 million litres (Sydney only)2017		
		Smallest petrol service stations Service station sells less than 3.5 million litres	None (unless modified)	

Summary of Stages of regulatory requirements for Petrol Vapour recovery in NSW

#### Implementation and compliance

DECCW has aimed to establish a VR2 system that encourages compliance and adopts a risk-based approach to enable resources to be targeted to the areas where they are most needed and will prove most effective. The views of stakeholders have been sought to assist development of this system.

VR1 and VR2 compliance will be phased-in from mid 2010 to 2017 according to throughput of the petrol service stations and local government areas and to all new or newly modified petrol service stations in the Greater Metropolitan Region. The phase-in enables many petrol service stations to install VR2 as part of their scheduled refurbishment program, and allows sufficient lead-time for a planned and orderly introduction of the new technology.

Existing petrol service stations in Sydney below the threshold limit of 3.5 million litres per year, and those in other metropolitan regions below the threshold limit of 12 million litres per year, would only be required to install VR2 during construction or major refurbishment. Excluding the smallest petrol service stations from VR2 requirements is based on equity considerations and aims to achieve the greatest pollution reductions while at the same time managing the practical issues around the cost implications for different sized petrol service stations as well as potential community impacts.

The compliance measures DECCW is taking include the release of approved 'Standards and Best Practice Guidelines' which describes the certification details and sets out compliance measures to use. Recommended non-mandatory operational techniques and system testing techniques have been included in the Guidelines. To assist compliance a Code of Practice providing technical guidance in relation to the design, installation, commissioning, operation and maintenance of stage 2 vapour recovery equipment at services stations is to be provided for use by industry.

Industry reporting to DECCW is limited to reporting at system commissioning and exception reporting once the vapour recovery system becomes operational, thereby reducing business compliance costs. Compliance investigations can include random inspections of petrol service stations, random inspection of log books, and targeted inspections and audits of petrol service stations based on EPA records and other sources of information and data. When non-compliance is apparent the operator is given a reasonable time frame to repair and comply.

## 7. Evaluation and Review

The phased-in compliance option (option 2) is estimated to provide a net benefit of \$125 million using the recommended estimate of \$4,200 per tonne of VOCs. By comparison, the net benefit of the no compliance date option (option 3) is estimated to be \$54 million.

The no compliance date option would minimise the service station operators' costs, but would result in VOC emission reductions occurring at a slower rate. The following table presents the estimated avoided VOC emissions under the three options.

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Option Year	2008	2010	2015	2020	2025	2030	2035	2040	2010 to 2040	Total emission reduction
Option 1 Business as Usual	0	0	0	0	0	0	0	0	0	0
Option 2 Phased VR2 compliance	0	660	4,570	5,990	6,840	7,400	7,850	8,450	6670	206740
Option 3 No VR2 compliance date	0	180	990	1,930	3,030	4,280	5,580	6,880	3220	99770

Policy options and associated VOC emission reduction per year (tonnes per year)

VOC emission reductions of around 34,000 tonnes per year in the GMR are required to meet national air quality goals and the State Plan priority E3. The above table illustrates the no compliance date option would not meaningfully contribute to VOC emission reductions until around 2020. This option, therefore, does not materially reduce the risks to human health from motor vehicle fuels in the immediate term.

Both options provide a net benefit to society using the damage cost estimate of \$4,200 per tonne of VOC. The implementation of VR2 would breakeven with a damage cost of \$1,926 per tonne of VOC avoided for phased-in compliance option, and \$1,870 per tonne of VOC avoided for the no compliance date option. These breakeven health costs are less than half of the estimate recommended by MMA (2008).

The net benefit to society would be \$231 million for the phased-in compliance option and \$97 million for the no compliance date option. The phased-in compliance option also meets the objective, while in the immediate term the no compliance date option does not. The additional benefit from a reduction in the exposure of people to benzene in the vicinity of petrol service stations has not been quantified.

The preferred option is the phased-in compliance option (option 2). This option meets the objective of reducing risks to human health and preventing the degradation of the environment by reducing VOC emissions from motor vehicle fuels. It also meaningfully contributes bwards meeting national air quality goals and State Plan priority E3, and is estimated to provide a net benefit to society of \$125 million over the period till 2040.

The preferred option would amend the *Protection of the Environment Operations (Clean Air) Regulation 2002* under the *Protection of the Environment Operations Act 1997* to phase in compliance of vapour recovery stage 2 at petrol service stations in the NSW GMR.

The Regulation will be reviewed every 5 years in accordance with the *Subordinate Legislation Act 1989*. However, DECCW will undertake to keep in contact and obtain feedback from stakeholders as to the efficacy and efficiency of the Regulation and Guidelines. Both the Guidelines and Industry Code of Practice can be updated in consultation with industry to enhance operation of the regulation if required.