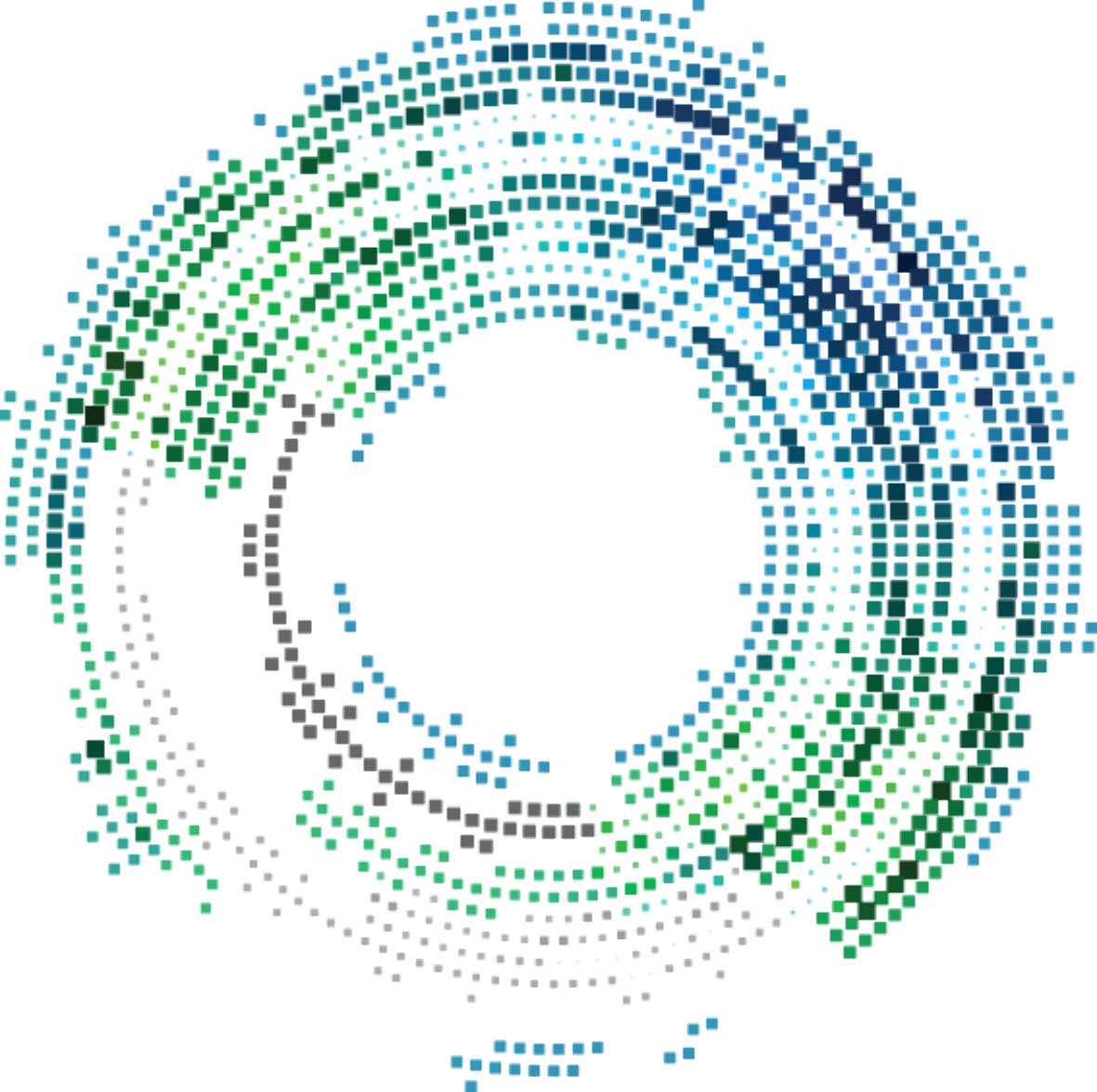
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Regulatory Impact Statement

Phase out of Open Flued

Gas Space Heaters

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| Regulatory Impact Statement: Open Flued Gas Space Heaters  Department of Environment, Land, Water and Planning  November 2020 |

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Glossary

|  |  |
| --- | --- |
| **Acronym** | **Full name** |
| AER | Australian Energy Regulator |
| AGA | Australian Gas Association |
| AG-001 | Standards Australia Committee for Gas Appliances |
| AS | Australian Standard |
| BRV | Better Regulation Victoria |
| Building Act | *Building Act 1993* |
| CABs | Conformity Assessment Bodies |
| CO | Carbon monoxide |
| CAV | Consumer Affairs Victoria |
| CFA | Country Fire Authority |
| DELWP | Department of Environment, Land, Water and Planning |
| DHHS | Department of Health and Human Services |
| ESV | Energy Safe Victoria |
| GS Act | *Gas Safety Act 1997* |
| GTRC | Gas Technical Regulators Committee |
| IAPMO | International Association of Plumbing and Mechanical Officials |
| NatHERS | Nationwide House Energy Rating Scheme |
| NCC | National Construction Code |
| OFGSH | Open flued gas space heater |
| RIS | Regulatory Impact Statement |
| RTR | draft Residential Tenancies Regulations |
| RTAA | *Residential Tenancies Amendment Act 2018* |
| The Rules | The Gas Equipment Certification Scheme Rules established by the Gas Technical Regulators Committee |
| VBA | Victorian Building Authority |
| VEU | Victorian Energy Upgrades |
| NCC | National Construction Code |

Foreword

This Regulatory Impact Statement (RIS) has been prepared to determine the best way to ensure the health and safety of the community by reducing the risk of carbon monoxide (CO) exposure from Open Flued Gas Space Heaters (OFGSHs) in Victoria.

This includes analysis of whether transitional measures, such as CO alarms and servicing for OFGSHs, should be mandated to manage risks from OFGSHs that have already been installed.

The preferred option in this RIS does not require additional Regulations to be made. Irrespective of this conclusion, the Government is seeking feedback on the options and preferred approach proposed through a public consultation process.

How to respond to the proposed regulatory package

Businesses, other interested parties and members of the public are invited to make submissions responding to this RIS.

The closing date for submissions is 22 February 2021.

All relevant materials can be accessed via Engage Victoria’s website: engage.vic.gov.au

Alternatively, comments may be provided via email to the following email address: [gas.safety@delwp.vic.gov.au](mailto:gas.safety@delwp.vic.gov.au)

Hard copy submissions will also be accepted and should be addressed to:

Manager, Gas Heater Safety

Energy Safety and Security Branch

Department of Environment Land Water and Planning

PO Box 500

East Melbourne, VIC, 8002

For further assistance about the public comment process, or to obtain copies of the RIS, please call 136 186.

Executive summary

Executive Summary

In Victoria’s cool climate, heating is important for health and welfare. Like all household appliances, it is important that heaters are well designed, maintained and operated so that they are safe to operate. Open flued gas space heaters (OFGSHs)[[1]](#footnote-2) have a design that is no longer compatible with buildings in Victoria.

Problem being addressed

If not properly installed and maintained, and if operated without adequate ventilation or under negative pressure conditions,[[2]](#footnote-3) OFGSHs can spill carbon monoxide (CO) into the living space in which they are installed, which can lead to serious illness and even death.

OFGSHs, designed over 40 years ago, were designed to be operated with ventilation, which was compatible with housing standards and trends at the time. Since then, Victoria’s housing stock has become increasingly well-sealed through new energy efficiency requirements for new buildings and as consumers increasingly choose to weather seal older properties to improve thermal efficiency. Consumers also have access to more powerful exhaust fans and rangehoods, increasing the risk of creating a negative pressure environment inside the home. These trends increase the likelihood that OFGSHs could be operated without adequate ventilation and in negative pressure environments, which could lead to further CO incidents involving OFGSHs.

Malfunctioning or poorly serviced OFGSHs operated without sufficient ventilation or under negative pressure conditions in residential settings have resulted in the deaths of three Victorians since 2010.[[3]](#footnote-4),[[4]](#footnote-5) The report of findings made by the Coroner following the *Inquest into the death of Sonia Sofianopoulos* (the 2018 Coronial Inquest) made eight recommendations to address risks from OFGSHs; a key recommendation being that a plan and strategy be implemented to phase out all OFGSHs in Victoria.[[5]](#footnote-6)

In its response to the 2018 Coronial Inquest, the Victorian Government has been clear that the safety of Victorians is the government’s priority and there are important lessons to be taken from this tragic incident. The government supported, or supported in-principle, all eight recommendations of the 2018 Coronial Inquest. This included a commitment to conduct a review of OFGSHs which assesses various options to phase out OFGSHs.

Deloitte Access Economics has been commissioned by the Department of Environment, Land, Water and Planning (DELWP) to develop a Regulatory Impact Statement (RIS). The RIS assesses various options to phase out OFGSHs in Victoria and it considers whether or not any transitional measures are required to manage the risk associated with OFGSHs that are already installed in buildings. This RIS has been prepared in accordance with the *Subordinate Legislation Act 1994.*

Objective

The Government’s primary objective is to ensure the health and safety of the community by reducing the risk of CO exposure and CO poisoning from OFGSHs in Victoria. Other considerations are to:

* Ensure people have continued access to heating
* Maintain affordability of heating for consumers
* Maintain consumer confidence in gas
* Limit impacts on industry and support industry transition.

The purpose of the RIS is to undertake an analysis to determine how best to achieves these objectives, including via the potential phase out of the installation of new OFGSHs.

The analysis in this RIS has also considered whether transitional measures, such as CO alarms and the servicing for OFGSHs, should be mandated to manage risks from OFGSHs that have already been installed.

Importantly, this RIS does not analyse options for the potential wholesale removal of existing OFGSHs. However, the Victorian Government has recently announced its intention to spend $335 million to replace inefficient heaters (including OFGSHs). This is expected to result in approximately 100,000 of Victoria’s estimated 287,000 OFGSHs being removed and substantially reduce the risk of harms to health and safety from the existing stock of OFGSHs.[[6]](#footnote-7)

The following key matters have been considered and are discussed throughout this paper:

1. The risk factors that contribute to CO exposure from OFGSHs (the problem being addressed)
2. Options for addressing the problem (i.e. measures to reduce the risks of harm to human health and life due to CO exposure)
3. The costs and benefits of the options proposed to address the problem
4. The preferred option and the rationale for choosing this option
5. Arrangements for implementing the preferred option
6. The evaluation strategy for the preferred option.

Feasible options

As part of this RIS process, two types of options have been considered:

* **Phase out options** – these address the risk associated with any future installations of OFGSHs. Phase out options are mutually exclusive, meaning that only one phase out option can be implemented at a time. Phase out options, on their own, do not address risks associated with OFGSHs that are already installed in buildings. Two main phase out options are considered in detail in this RIS and are assessed against the Base Case.
* **Transitional measures** – address the risk associated with OFGSHs that have already been installed. As such, transitional measures are intended to address the residual risk that remains after a phase out option is implemented and are not intended to be implemented in isolation. The installation of CO alarms is the only transitional measure considered feasible and subject to detailed analysis in the RIS.

Other options were considered but not subject to detailed analysis, mainly because of potential implementation difficulties.

### Phase out options

#### Base case

Description

The Base Case is a counter-factual scenario used in a quantitative analysis to provide a common point of comparison for all phase out options. The Base Case would maintain the current set of Victorian regulations relevant to OFGSHs, which aim to reduce the risk of CO poisoning. In the Base Case, 22 presently certified OFGSH models will continue to be permitted for sale in Victoria.[[7]](#footnote-8) It is assumed that OFGSH sales would reduce to zero by 2027 based on current industry sales forecasts. The installation of CO alarms and regular servicing of gas appliances would be recommended, but not mandated.

The Base Case includes current government initiatives and reforms including:

* The Energy Safe Victoria (ESV) ‘Be Sure’ CO public awareness campaign about risks of CO poisoning and the importance of regular servicing
* Proposed changes to the Residential Tenancies Regulations to prescribe mandatory gas safety checks for gas appliances installed in rental properties. These changes were consulted on through a RIS in late 2019 and the Department of Justice and Community Safety (DJCS) is currently considering the feedback provided through the RIS process ahead of final regulations being made in 2021
* The current DHHS program of removing OFGSHs in public housing
* Regular servicing of heaters in schools
* Annual Victorian Building Authority (VBA) and ESV co-branded seminars and webinars on carbon monoxide safety for gasfitters to detect CO spillage
* Mandatory CO training for gasfitters (approximately 17,920 gasfitters have completed the VBA training module as of August 2020) as part of their licence/registration renewal.

#### Option 1 - Restrictions on future installations of OFGSHs

Description

No new or replacement installations of OFGSHs will be permitted in Victoria under amendments to the Gas Safety (Gas Installation) Regulations. This would include new and like for like replacements. In this option the key regulatory amendment involves inserting a new regulation (25A) stating that a gasfitter must not **install** an OFGSH in any premises, except if the gasfitter is carrying out a repair or service or if the heater is an exempt fan-assisted OFGSHs with a fail-safe interlock (see draft regulation in full at Appendix D). The exemption recognises that fan-assisted OFGSHs with a fail-safe interlock are safe because these heaters would shut down if CO was spilled. OFGSHs already installed would not be affected by this option.

The *Gas Safety Act 1997* (the GS Act) provides the relevant Minister (Minister for Energy, Environment and Climate Change) with powers to recommend regulations to restrict the installation of OFGSHs. The GS Act also provides ESV with powers to declare the non-acceptance of OFGSHs (which means these appliances could not be certified for use in Victoria and therefore it would be an offence to **sell, supply or install** them), and to prohibit the **sale and supply** of OFGSHs.

ESV’s powers and the Minister’s powers complement each other but are distinct decisions by different persons.

It is possible that ESV may consider exercising its own powers separately to the Minister and declare non-acceptance and/or prohibit sale and supply of OFGSHs. As such, the assessment of Option 1 takes into account the range of scenarios under which regulations could be made, including:

* **Scenario 1** - standalone Regulations implementing a restriction on future new or replacement installations of OFGSHs
* **Scenario 2** - Regulations **(Scenario 1)** together with a separate decision by ESV to restrict certification and/or sale and supply. Within Scenario 2 there are two possibilities:
  + Regulations are made before any ESV decision **(Scenario 2a)**;
  + Any ESV decision/s is made before the Regulations **(Scenario 2b)**.

All of Option 1’s scenarios are assumed to have very similar costs and benefits hence the modelling undertaken for Option 1 is applicable to all scenarios. It is worth noting that Scenario 2a and 2b would provide a more comprehensive and consistent regulatory regime, covering acceptance, sale and supply directly in addition to the Regulations covering installation.

Timing

Option 1’s proposed regulatory amendments would commence on 1 June 2021. From this date, OFGSHs would no longer be allowed to be installed in Victoria.

Compliance

In Option 1 gasfitters would be required to comply with proposed regulations and would not be allowed to install OFGSHs. Penalties for non-compliance would apply under the GS Act (40 penalty units in the case of a natural person and 200 penalty units in the case of a body corporate). ESV would also ensure retailers are aware of regulations and point of sale would be monitored to ensure retailers are aware certain heaters cannot be installed in Victoria.

If regulations are made under a scenario where ESV has also made a decision to declare non-acceptance of OFGSHs or prohibit their sale and supply, then ESV would ensure that manufacturers, retailers and suppliers are aware of the point of sale legislation. In addition, manufacturers, retailers, suppliers would not be permitted to sell or supply OFGSHs for use in Victoria, and penalties for non-compliance would apply under the GS Act(40 penalty units apply in the case of a natural person and 200 penalty units apply in the case of a body corporate).

Option 1 is a Victorian-only solution. In other States and Territories OFGSHs could still display a certification label or badge for sale or supply, and as such the following measures would likely be required:

* Additional markings displayed on the appliance and/or additional instructions to indicate that an OFGSH is not acceptable for installation in Victoria
* Communications material (either on a website or through email alerts) notifying gasfitters of the list of models that are not acceptable for sale or installation in Victoria.

#### Option 2 – Fast-tracked standards-based approach

Description

In Option 2, amendments would be introduced by the relevant Australian Standards (AS/NZS5263.1.3 and AS/NZS5263.1.8) by the relevant Standards Australia working group, to require that OFGSHs and Type 2 decorative effect appliances (that meet thermal efficiency requirements respectively) shut down safely in a negative pressure environment. The amended standards would apply to all Australian jurisdictions that recognise those standards, not just Victoria. Any amendments to the Australian Standard would only apply to newly manufactured appliances and would not apply to appliances already installed. Retrofitting installed appliances is out of the scope of the standards process. Any OFGSH that meets the requirements could be sold, supplied, and installed.[[8]](#footnote-9)

The amendment to the Australian Standard would require OFGSHs to shut down within 15 minutes in a negative pressure environment, thereby preventing long term CO spillage that can be detrimental to health. The shut-down condition would be a non-volatile lockout (i.e. the appliance would not automatically restart but would instead require manual intervention by a qualified practitioner, using a tool, in order to reset).

Option 2 would require all OFGSHs meet the amended certification testing standards and non-compliant stock would not be able to be certified. Under this option industry could sell existing OFGSH stock, however it is likely that such sales would be low because manufacturers are expected to sell down existing OFGSH stock prior to the change, and sales are already decreasing (discussed in detail in Chapter 5).

Typically, amending an Australian Standard requires a proposal to be submitted to Standards Australia for consideration, and if the amendment is progressed it would usually take 18 to 24 months to amend after which manufacturers would be given an additional 2 years to comply.[[9]](#footnote-10)

However, under Option 2 the preferred approach is to fast-track adoption of the relevant Australian Standards (AS/NZS 5263.1.3 and AS/NZS 5263.1.8) through the issuance of a Gas Technical Regulators Committee (GTRC) Technical Guidance Bulletin. Technical Guidance Bulletins are the method Australia’s gas technical regulators (including ESV) use to require the implementation of changes without waiting for standards to be amended or revised. Technical Guidance Bulletins provide technical guidance to conformity assessment bodies (CABs) and other stakeholders on a position by jurisdictions on specific issues. They require CABs to ensure information in Technical Guidance Bulletins is taken into account when considering whether to certify gas equipment. Importantly, CABs must withhold certification if appliances do not meet the requirements in GTRC Technical Guidance Bulletins.

The GTRC approach also ensures a national approach and therefore ensures consistency between jurisdictions. It removes any confusion that would occur if appliances were still accepted in other jurisdictions and displayed a certification label. Once the revised standard is released all non-conforming OFGSHs would be phased-out across Australia.

The GTRC has indicated its support for this approach and under Option 2 ESV is assumed to release a Technical Guidance Bulletin in 2021 with a compliance date of 1 January 2022.[[10]](#footnote-11)

While the GTRC approach is in place, the usual process for amending the Australian Standards will proceed, although this is not expected to be implemented before 31 December 2023. Once the amended Australian Standards have been published the GTRC Technical Guidance Bulletin will be withdrawn.

It should be noted that, if the Minister is not satisfied that the Australian Standards amendments and GTRC process are progressing reasonably towards a compliance date of 1 January 2022, or if the approach appears to be unfeasible or ineffective, she will consider recommending the regulations set out in Option 1 be implemented with a commencement date either on or before 1 January 2022. Reserving the flexibility to implement the regulations specified under Option 1 limits the potential impact that might result from uncertainty in timelines under Option 2.

### Transitional measures

#### Regulations to mandate the installation of CO alarms

Currently in Australia, CO alarms are recommended, but not required. CO alarms are similar in function and appearance to smoke alarms.[[11]](#footnote-12) They monitor the concentration of CO in the air, providing a visual and audible alarm where a certain concentration of CO has been detected over a given period of time. By alerting building occupants to the presence of CO, occupants are given the opportunity to turn off the gas appliance and seek fresh air. This can reduce the likelihood of fatal or non-fatal incidents of CO exposure and other associated harms.

This RIS considers whether regulations should be introduced to mandate building owners/rental providers to install CO alarms. It considers the costs and benefits of mandatory installation in only rental buildings because compliance in rental buildings is much easier to monitor and enforce than in owner-occupied buildings.

### Options considered but not included for detailed RIS analysis

Throughout the process of developing the phase out options and transitional measures, a number of other options were identified and carefully considered but determined not feasible because they do not meet the objectives of the reforms. These are:

* **Phase out of OFGSHs through additional safety requirements prescribed in regulation** - In this option, the Victorian Government would prescribe the shut-down requirements agreed in principle by the Australian Standards committee (AG-001) and published in the GTRC Bulletin (if this has occurred) in Victorian regulation. However, further investigation identified that GTRC bulletins are interim documents with limited life spans. If a standard is published, then the bulletin would be withdrawn from the GTRC website. Therefore, legislation would refer to a document that no longer exists, making this option nonviable.
* **Mandatory removal of all OFGSHs in households where they are already installed -** This would remove safety risks from existing OFGSHs. However, it would be difficult to enforce, particularly in owner-occupied homes, could cause affordability issues (and lead to unintended health and safety risks such as vulnerable people not having heating in cold weather) and increases the likelihood of people using outdoor appliances inside.
* **Not prohibiting installations of “like for like replacements” -** (i.e. an existing OFGSH could still be replaced with a new OFGSH). This option would address a very small part of the problem because most new installations are like for like replacements.
* **A standards-based approach under normal timeliness** – Under normal timelines amending a standard requires a proposal to be submitted to Standards Australia for consideration, and if the amendment is progressed it would usually take 18 to 24 months to amend the standard after which manufacturers would be given an additional 2 years to comply. This option was not considered appropriate because of its extended timeframes, and the fast-tracked standards-based approach was progressed as a feasible option instead.
* **Mandate regular servicing of OFGSHs in all buildings where they are installed** – This is not considered to be feasible because it would be difficult to monitor and enforce in owner-occupied buildings. As noted above, gas safety checks are expected to be introduced into the Residential Tenancies Regulations which is expected to address the risk of CO exposure from OFGSHs in rental homes.
* **Potential change to compliance certificates -** Under the *Building Act 1993* (the Building Act), a certificate of compliance is required to be issued to consumers and lodged with the VBA by a licensed plumber (including gasfitters), where the total value of work is $750 or more as well as in other specified circumstances, such as the installation of gas appliances[[12]](#footnote-13). However, currently, a compliance certificate for gas servicing work is only required where the value of the work exceeds $750. Any change to the requirements for compliance certificates is outside the scope of this RIS process and would require an amendment to the Building Act*.*
* **Public education** on the risks of CO poisoning and measures households could take such as servicing and installation of CO alarms – ESV has already undertaken substantial yearly public awareness campaigns. Continuing public education campaigns are a part of the Base Case. Additional public education is not likely to lead to a significant further reduction in harms.

Methodology

Options have been assessed using a breakeven approach with key assumptions outlined in section 4.2.6. Breakeven has been chosen as the preferred analysis tool because of the nature of benefits (reduction in fatalities/injuries) combined with the uncertain and episodic nature of such incidents.

In practice, given that a large number of the benefits and costs have been quantified, the analysis is similar to a full cost-benefit analysis. However, given the uncertainty around some of the quantification (e.g. the low illness number for people experiencing non-lethal CO poisoning), results of the analysis have been expressed as breakeven analysis. Importantly, conclusions of the analysis are highly likely to be the same regardless of method and terminology used.

Much of the analysis in this report is based on previous analysis and data describing the period prior to coronavirus (COVID-19). Coronavirus (COVID-19) has the potential to impact the analysis, including in regard to relative energy prices (notably lower gas prices) and consumer choices. If coronavirus (COVID-19) results in individuals being at home longer and using OFGSHs more than they otherwise would, it may also increase the likelihood of CO poisoning. Coronavirus (COVID-19) may also lead some individuals to experience reductions in income, impacting their ability to service and properly maintain OFGSHs installed in their home. Given uncertainty around these impacts, and the extent to which they are just temporary or longer term, no changes have been made to the underlying assumptions, however sensitivity analysis has been undertaken to test the impact of changes in some key assumptions.

Summary of breakeven analysis

The table below presents estimates of benefits associated with each option, relative to the Base Case. Both phase out options are expected to at least break even.

Benefits from switching to more energy efficient heating appliances are significant for all options and are expected to achieve benefits almost as great as the total costs of each option. These benefits amount to nearly $4.9 million for Option 1, and about $3.6 million for Option 2. Further, significant avoided health costs are expected for both options. These benefits are nearly $4.1 million for Option 1 and about $3 million for Option 2. Together, these benefits outweigh the estimated costs of $6.1m for Option 1 and $4.9m for Option 2.

The likelihood that the benefits will outweigh the costs for all options is increased when taking account of the trauma and grief avoided from death and serious injuries, as well as other avoided costs such as hospital, police and coroner’s inquest costs, which are likely to be significant but have not been assigned a monetary value. Interruption to life and anxiety resulting from low level illnesses is also likely to occur, particularly if it is ongoing and the cause of illness is unknown or misdiagnosed, however has also not been measured quantitatively.

Option 1 becomes effective earlier than Option 2 leading to higher costs but slightly better safety outcomes. Option 2 meets more of the other considerations on the objectives of the RIS than Option 1.[[13]](#footnote-14) Furthermore, the costs of Option 2 are around 25 per cent lower than other Option 1.

Table 1 Benefits of phase out options, relative to the Base Case, over 10 years

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Base Case** | **Option 1 - Restriction  on all future installations through regulatory change** | **Option 2 - Phase out through a fast-tracked standards-based approach** |
| **Total estimated cost of options** | **$0** | **$6,126,089** | **$4,917,344** |
|  |  |  |  |
| **Avoided deaths and illnesses** | | | |
| Number of lives saved[[14]](#footnote-15) | 0 | 0.06 | 0.05 |
| Lives saved | $0 | $346,325 | $256,908 |
| Number of serious non-fatal illnesses[[15]](#footnote-16) | 0 | 0.13 | 0.09 |
| Avoided serious non-fatal illnesses | $0 | $161,715 | $119,962 |
| Number of avoided low level illnesses[[16]](#footnote-17) | 0 | 543 | 403 |
| Avoided low level illnesses | $0 | $3,546,364 | $2,630,740 |
| **Other benefits** | | | |
| Incremental profits to reverse cycle manufacturers | $0 | $1,251,915 | $967,795 |
| Reduced household energy costs | $0 | $4,872,288 | $3,614,328 |
| Reduced greenhouse gas emissions | $0 | $114,667 | $86,567 |
| **Total estimated and quantified benefits** | **$0** | **$10,293,273** | **$7,676,300** |

Note: Some totals do not sum due to rounding

Preferred phase out approach

While all phase out options are expected to breakeven and achieve the primary objective of ensuring the health and safety of the community (see section 2.5), the preferred approach is the fast-tracked standards-based approach (Option 2). Although the estimated safety benefits of Option 1 outweigh those expected to occur under Option 2, Option 2 is the preferred option of this RIS because:

* Option 2 reduces the likelihood of intermittent stock shortages for alternative heaters, which could temporarily reduce the affordability of heating for some consumers.
* Option 2’s implementation delay gives industry more time to prepare for the changes and transition production towards other heaters, limiting revenue reductions and potential jobs lost.
* Option 2 is also expected to have lower impact on the broader gas market (i.e. impact on consumer perceptions of gas as an energy source) and therefore better maintains consumer confidence in gas.

It is proposed the fast-tracked standards-based approach will come into effect on 1 January 2022. This approach would not affect OFGSHs that have already been installed in Victoria.[[17]](#footnote-18) Voluntary measures such as regular servicing (at least once every two years) in private properties with an OFGSH and CO alarms for all properties with an OFGSH will continue to be encouraged.

In the unlikely event that the fast-tracked standards-based approach cannot come into effect on 1 January 2022, or within acceptable timeframes, DELWP will proceed to introduce the proposed regulatory amendments for Option 1 to achieve its objectives.

**Transitional measures - Mandatory installation of CO alarms**

A number of practical and technical barriers regarding mandating CO alarms specifically for OFGSHs have been identified, which would need to be resolved before regulations are introduced to mandate their installation.

Practical barriers

Many owner-occupiers may not know whether they have an OFGSH and monitoring and enforcing compliance in these properties is not currently considered feasible. For these reasons, this RIS does not provide a detailed analysis of the costs and benefits of mandatory CO alarms for OFGSHs in owner-occupied properties. However, detailed analysis of the safety-related maintenance costs for mandatory CO alarms in public rental properties managed by the Director of Housing (i.e. public housing) was undertaken (with proposed changes to mandate gas appliance servicing in all rental properties, anticipated to come into effect on 29 March 2021 when the *Residential Tenancies Amendment Act 2018* (RRTAA) and proposed Residential Tenancies Regulations (RTR) commence).

Mandating alarms for products more broadly than OFGSHs (for example, for all combustion heaters which have the potential to create CO) is consistent with the approach in some jurisdictions overseas and may help to resolve the compliance and enforcement issues in owner-occupied homes, but this is out of scope for this RIS.

Technical barriers

Technical experts advised that heater servicing was the most effective measure to prevent CO exposure risks and that mandating CO alarms could lead people to stop servicing their heaters due to a false sense of security. Potential barriers which may impact the effectiveness of CO alarms were also identified, including:

* Technical experts advised that the type of CO alarm, and the way it is installed and maintained are critical to proper functioning, and there is currently no Australian Standard for CO alarms or for installation. While US and UK standards exist for CO alarms, they may not be appropriate for the Australian context, as Australia’s housing stock is different to that in the US and UK, so their effectiveness could vary. Standards Australia has advised the Victorian Government it is open to developing or adopting a standard for CO alarms in Australia. This could be considered separate to this RIS process.
* Research indicates consumers may not respond appropriately to alarms because of the odourless, colourless nature of CO.

For these reasons, there is significant uncertainty about the potential benefits from mandating CO alarms in rental properties. Assuming a 5 per cent reduction in residual risk of CO poisoning from the alarms, benefits will be $3.7 million, less than half the $7.9 million cost of installing CO alarms in all rental buildings. If the risk reduction is higher – using the 11.3 per cent risk reduction that was used in the 2012 National Decision RIS (DRIS) which considered a number of approaches to manage the risk of CO poisoning from gas appliances (the 2012 DRIS)[[18]](#footnote-19) then the measure would just breakeven, with $8.5 million of benefits versus costs of $7.9 million.

Given these considerations, further work to resolve these issues for CO alarms would appear to be needed before regulations are introduced to mandate their installation. This RIS therefore does not recommend the mandatory installation of CO alarms for OFGSHs at this stage. CO alarms will continue to be recommended as a voluntary precautionary measure alongside regular heater servicing.

Small business and competition impacts

The preferred option determined in this RIS (a fast-tracked standards-based approach to commence 1 January 2022) is expected to have a more significant impact on smaller and less diversified manufacturing businesses operating in Victoria than larger and more diversified businesses in the market. The most impacted businesses will be those that are smaller and/or have a product range that is less diversified across different types of appliance, because they will experience disproportionately more change to their manufacturing process e.g. cost of changes to manufacturing plant/design). However, it is understood there are only a few such businesses at most.

Consultation with industry indicated that several businesses in the industry are already shifting their manufacturing processes away from the manufacture of OFGSHs. As discussed in this RIS, sales of OFGSHs are declining and forecast to approach zero in 2027, reflecting a shift in consumer trends and manufacturing that is already underway. Most manufacturers are already producing gas heaters (such as room-sealed heaters) that eliminate the risks posed by OFGSHs. OFGSHs are based on old technology that has already been superseded, prior to government intervention. Industry has also advised that the forecasted decline in OFGSH sales to approach zero would likely occur up to five years earlier than the Base Case under this approach.

Extensive consultation has also been undertaken with industry over multiple years on this issue and it is therefore expected that industry would generally be anticipating change and have already adjusted their processes or, is planning to do so. It is noted that industry has broadly supported the standards-based approach.

The preferred option might impact competition in the gas appliance manufacturing sector if small businesses that are less diversified end up exiting the industry. It is possible that the gas heating sector will become slightly more concentrated as a result, although again this impact is expected to be small as impacted small businesses only comprise a small share of the sector.

Adopting the standards-based approach means there is still opportunity to innovate solutions that partially address the CO risk (the safety outcomes of this innovation are as yet untested, however would be tested for compliance with the new requirements prior to an appliance being certified by a CAB). One business noted this view during consultation, although consultation with industry has generally indicated that development of new OFGSHs that meet the Australian Standard is unlikely. There was broad agreement across manufacturing businesses that technological innovation for OFGSHs was infeasible from a technology and cost perspective. Consumer and manufacturing trends show innovation is more likely to be focused on other types of heating rather than OFGSHs.

In summary, industry has indicated broad support for the preferred option and the impact on small business and competition is expected to be minimal.

Implementation plan

Key tasks for implementation of the proposed changes, which will be led by DELWP and ESV with support from the VBA, include:

* Industry to submit project proposal to Standards Australia to amend AS/NZS 5263.1.3 and AS/NZS 5263.1.8 to include the new requirements
* Develop GTRC Technical Guidance Bulletin requiring the new requirements to come into effect from 1 January 2022 until such time as AS/NZS5263.1.3 and AS/NZS 5263.1.8 are formally amended
* Develop compliance and enforcement policy
* Develop new guidance materials for manufacturers, suppliers, retailers, CABs and gasfitters to support the new Standard
* Develop evaluation information and data strategy

Implementation of the changes will be supported by communications with the public and industry. Communication will include:

* Public advice through the annual CO awareness campaign running over winter
* Guidance materials for industry (manufacturers, suppliers, retailers) and CABs
* Guidance materials for gasfitters.[[19]](#footnote-20)

Under the current regulatory framework, ESV and the VBA both have separate responsibilities to enforce compliance under the GS Act*,* the Building Act and associated regulations.

ESV will be primarily responsible for implementation of the proposed changes through the GTRC Technical Guidance Bulletin, including monitoring compliance through the CAB assessment process.

DELWP will lead key strategic policy development and stakeholder communications.

ESV will take appropriate enforcement action where any decisions are found to have been breached.

Monitoring of overall implementation, including identification and management of implementation risks, will be undertaken by DELWP, with support from ESV and the VBA. ESV will monitor the implementation of its own actions and report to DELWP.

It is unlikely but possible that not all members of the GTRC (i.e. every state in Australia) may agree to the GTRC Bulletin (although advice from ESV is that all members agree at the present time). In the event that the process is not proceeding as expected by the second half of 2021 then:

* ESV can release a Victoria-specific bulletin if necessary or consider using its statutory powers under the GS Act to affect certification, sale and supply of OFGSHs
* DELWP will give consideration to implementing a restriction on the installation of OFGSHs through amendments to the Gas Safety (Gas Installation) Regulations. Draft amendments to these Regulations are set out in Appendix D.

Evaluation Strategy

The evaluation will measure whether the preferred option has met its objectives and achieved its desired outcomes. The detailed evaluation strategy is outlined in Chapter 7 of the RIS.

The effectiveness of the preferred option (Option 2) will be measured by the number of enforcement activities and illnesses and deaths as a result of CO poisoning from OFGSHs.

The evaluation will adopt a mix of both qualitative and quantitative methods.

Qualitative evaluation methods will draw on stakeholder consultation (such as interview and surveys) with organisations and individuals that are impacted by the change:

* DELWP, ESV, DHHS, VBA and other Victorian Government Departments and agencies as appropriate
* Retailers, suppliers, manufacturing businesses and industry groups
* Health professionals.

The quantitative method of evaluation will involve assessment of baseline data against data collected after the preferred option comes into effect.

DELWP will undertake a review of existing data sources to assess gaps in data and identify areas and strategies for improvement. This will include considering whether new types of data/information will need to be collected to better understand the effects of the new approach.

# Introduction

This chapter outlines the background, the purpose of the RIS, key steps in the RIS process and the current regulatory environment.

### Background

Like all household appliances, it is important that heaters are well designed so that they are safe to operate. OFGSHs have a design that is no longer compatible with Victorian buildings.

OFGSHs draw air from inside the room (or space) in which they are installed, generate heat and expel combustion products outside the room, through the flue. Due to this design, OFGSHs provide a direct pathway into the room, through which combustion products, such as CO, can spill into the room under certain conditions. This poses a risk of CO poisoning which can have serious long and short term health impacts and can even cause death. CO is an invisible and odourless gas that can only be detected with specific monitoring equipment. At high concentrations, even short exposures to CO can be lethal. There is a risk that an OFGSH can spill CO into the room if not properly installed, maintained or operated without adequate ventilation or under negative pressure conditions.

Since OFGSHs were designed over 40 years ago, Victoria’s housing stock has become increasingly well-sealed both due to new builds as well as the renovation of existing houses. Consumers also have access to more powerful exhaust fans and rangehoods, increasing the risk of creating a negative pressure environment inside the home. This increases the likelihood that OFGSHs could be operated without adequate ventilation or under negative pressure conditions. As a result, OFGSHs are no longer compatible with Victorian buildings.

There have been three confirmed fatalities caused by CO poisoning from OFGSHs in Victoria since 2010; two young children, Chase and Tyler Robinson (2010) and Sonia Sofianopoulos (2017).[[20]](#footnote-21) In the same period, five serious, non-fatal suspected CO poisonings were linked to OFGSHs and reported to ESV. While eight people were hospitalised as a result of these incidents, due to privacy, detailed information of these episodes is not readily available including those people who have residual health impacts beyond the actual CO poisoning event(s). It is likely that other non-fatal CO poisonings have also occurred which have not been diagnosed as CO exposure, misdiagnosed and treated as another medical condition or not reported.

### Coronial Inquests

The resulting coronial inquest into the deaths of Chase and Tyler Robinson (the 2013 Coronial Inquest) found that the boys’ deaths *“occurred due to the ingestion[[21]](#footnote-22) of carbon monoxide in circumstances in which an open flued gas furnace emitted carbon monoxide into [their] home at dangerously high levels”.* [[22]](#footnote-23)

Key recommendations of the 2013 Coronial Inquest were:

* That ESV continue to alert the public of the need to have gas appliances serviced regularly by licensed gasfitters
* That ESV target their educational materials to homeowners and tradespeople whose actions can increase the risk of OFGSHs malfunctioning
* That ESV stress the difference between CO alarms and smoke detectors in their educational materials
* That ESV investigate the ventilation options available in five and six-star energy rated homes that could be fitted where OFGSHs are installed
* That ESV continue to train gasfitters to test for spillage of CO from open-flued appliances and continue to conduct presentations and education on this issue
* That ESV continue to persuade manufacturers of gas heating appliances to nominate within their Owners Manuals the appropriate periodic checking and servicing of such appliances.

In 2017, Sonia Sofianopoulos, a 62-year-old female, passed away in the bathroom of her home. She had been living in public housing managed by the Department of Health and Human Services (DHHS) at the time of her death. The 2018 Coronial Inquest found that Ms Sofianopoulos’ death had been caused by *“carbon monoxide toxicity”* and that the source of the CO was the OFGSH installed in the home.[[23]](#footnote-24)

The Coroner made eight recommendations, the main recommendation being that open flue gas space heaters should be phased out (Recommendation 1).

The Coroner’s other seven recommendations focused on four key areas:

* Improved testing of CO leakage; by ensuring “up-to-date knowledge” of gasfitters and plumbers, including investigation of mandatory continuous professional development training; advice on “appropriate CO spillage testing equipment”; and updating standards to readily identify CO poisoning risks (Recommendations 2, 4 and 6)
* Strengthened compliance to assure quality of work, with issuing of compliance certificates for servicing work to be investigated in consultation with industry (Recommendation 5)
* More effective communication with relevant industry stakeholders: identifying a range of mechanisms for communicating updates to statutory requirements (Recommendation 7)
* Targeted risk information for the community: Criticality of appropriate and accurate community information on the dangers associated with these types of heaters, especially in combination with negative pressure and inadequate ventilation, and targeted advice regarding specific models that have identified safety issues (Recommendations 3 and 8).[[24]](#footnote-25)

### The Government’s commitment

In its response to the 2018 Coronial Inquest, the Victorian Government has been clear that the safety of Victorians is the Government’s first priority and there are important lessons to be taken from this and previous tragic incidents. The Victorian Government is taking action in response to the Coroner’s recommendations and to address related issues that will improve safety for Victorian households. Actions already underway are outlined in section 1.4.

The Government supported or supported in-principle all eight recommendations of the 2018 Coronial Inquest. This included a commitment to conduct a review of OFGSHs, with options such as a phase out to be assessed. Regulatory changes require a regulatory impact statement (RIS) under the *Subordinate Legislation Act 1994 (Vic).* Deloitte Access Economics has been commissioned by the Department of Environment, Land, Water and Planning (DELWP) to develop the RIS.

### Purpose of the RIS

The purpose of the analysis in this RIS is to determine which phase out option best ensures the health and safety of the community and reduces the risk of CO spillage resulting in CO poisoning from OFGSHs in Victoria. Transitional measures to manage risks from OFGSHs already installed have also been considered.

The following key matters have been considered and are discussed throughout this paper:

1. The risk factors that contribute to CO exposure from OFGSHs (the problem being addressed)
2. Options for addressing the problem (i.e. measures to reduce the risks of harm to human health and life due to CO exposure)
3. The costs and benefits of the options proposed to address the problem
4. The preferred option and the rationale for choosing this option
5. Arrangements for implementing the preferred option
6. The evaluation strategy for the preferred option.

### Why a RIS is required

The options that have been considered to reduce the risks associated with OFGSHs in Victoria will have implications for Victorian businesses and consumers. In Victoria, a RIS is required under the *Subordinate Legislation Act 1994* for any proposals that are ‘likely to impose a significant economic or social burden on a sector of the public’.[[25]](#footnote-26)

A RIS presents sound analysis based on credible evidence that enables the Government to consider all relevant information before making a policy or regulatory change. Deloitte has prepared this RIS in accordance with the *Victorian Guide to Regulation,*[[26]](#footnote-27) which provides a best practice approach to analysing any proposed regulatory intervention. It supports informed and effective consultation by enabling stakeholders to comment on the detailed analysis, evidence and judgements being considered by Government. As part of this RIS process there has been consultation with key stakeholders across the gas appliance industry, consumer representatives, health professionals and regulators. Findings from stakeholder consultation has informed understanding of the problem, option development, options analysis and implementation requirements. A description of the stakeholder consultation process is provided in Appendix A.

### Public comment

This RIS will be released for an 8-week period to provide businesses, members of the public and other interested parties the opportunity to provide feedback on these items. Public consultation is expected to close by 15 February 2021.

The process for public commentary is outlined in the Foreword to this report. The RIS will be made available on Engage Victoria, which is the Victorian Government's Online Consultation platform, and DELWP’s website.

DELWP will consider all submissions received during the period of public review. DELWP will prepare a formal Response to Public Comment summarising the submissions received and DELWP’s response. Submissions to the review, and the formal Response to Public Comment document, will also be made available on Engage Victoria and DELWP’s website.

### The current regulatory environment

### Regulators

ESV and the Victorian Building Authority (VBA) play important roles in ensuring the safety of gas heaters and other gas appliances for Victorian households.

*Energy Safe Victoria*

Established under the *Energy Safe Victoria Act 2005 (Vic*), ESV is the independent regulator for gas, electricity and pipeline safety in Victoria. It is responsible for administering and enforcing gas safety regulations, testing products to verify their safety, determining which gas appliances can be accepted in Victoria or authorising CABs to undertake this on ESV’s behalf, and investigating safety issues in homes and businesses. ESV’s activities in relation to residential gas appliance safety include:

* Investigating gas incidents and the safety of gas appliances
* Providing technical input on Standards Committees
* Hosting a 24-hour gas emergency hotline for gasfitters
* Maintaining information on gas heater safety and the dangers of CO
* Issuing safety alerts for heaters that have failed safety tests, including urging Victorians not to use specific OFGSH models until serviced by a qualified gasfitter.

*Victorian Building Authority*

The VBA is an independent authority established by the Building Act and is responsible for regulating building and plumbing practitioners and building and plumbing (including gasfitting) work in Victoria. It registers, licenses and disciplines plumbing practitioners (including gasfitters), administers and enforces compliance with the plumbing laws set out in the Building Act and Plumbing Regulations 2018, provides training and expert technical advice to practitioners, and undertakes compliance inspections and audits to ensure consumers are protected. The VBA oversees standard gas installation work which is defined as work involving Type A gas appliances in residential and certain prescribed commercial buildings.

In addition to ESV and the VBA:

* Department of Justice and Community Safety (DJCS) released draft Residential Tenancies Regulations for public consultation in 2019 that proposed a two yearly ‘gas safety check’ of all gas appliances installed in rental properties. The making of the final Regulations by DJCS has been delayed due to coronavirus (COVID-19). The final Regulations are anticipated to commence by 29 March 2021.Compliance with proposed gas safety‑related activities would be enforced by Consumer Affairs Victoria (CAV). CAV is also responsible for informing stakeholders about relevant changes to Victorian consumer laws and enforcing compliance with these laws.
* Department of Health and Human Services (DHHS) is responsible for managing gas heaters in public housing developments, and through the role of the Chief Health Officer the provision of advice to government and other stakeholders on potential public health risks (as required).

### Legislative framework

Relevant legislation and regulations affecting OFGSHs and gas safety in Victoria include the *Gas Safety Act 1997* (GS Act), the Gas Safety (Gas Installation) Regulations 2018, the Building Act and the Plumbing Regulations 2018.

The GS Act provides the regulatory framework for OFGSHs in Victoria. Under this legislation, gas appliances are defined as either Type A or Type B gas appliances, and installations are defined as either standard or complex gas installations.

Type A appliances are domestic and light commercial type appliances for which a certification scheme exists. An OFGSH is a Type A appliance. Type B appliances include an appliance with gas consumption in excess of 10MJ/h (for example a commercial kitchen) but do not include Type A appliances.

Standard gas installations include installations which contain only Type A appliances and are located in residential and certain prescribed commercial premises and in caravans. Complex gas installations include installation of Type B appliances and Type A appliances in certain premises other than residential (such as schools, hospitals and commercial premises). The VBA monitor compliance for standard gas installations, while ESV monitors compliance for complex gas installations in all other premises.

Under the GS Act, before Type A appliances (including OFGSHs) can be legally supplied, sold or installed in Victoria, their safe design must be accepted by ESV. Importantly, ESV can recognise CABs to undertake this process on its behalf under agreed acceptance schemes. ESV requires that the CABs confirm that the appliance conforms with the relevant Australian Standards (AS/NZS5263.0 and AS/NZS5263.1.3 apply to OFGSHs).

The GS Act provides ESV with power to declare the non-acceptance of an appliance or class of appliances[[27]](#footnote-28) (for example OFGSHs) which means these appliances could not be certified for use in Victoria and therefore it would be an offence to sell, supply or install them (under the Act a Type A appliance cannot be sold, supplied or installed unless it has been accepted). The GS Act also provides ESV with the power to prohibit the sale or supply of an appliance or class of appliances.[[28]](#footnote-29) The effect of these two powers are similar, in that it would be an offence to sell or supply affected appliances, however the penalties for non-compliance differ.

The GS Act also provides the responsible Minister (the Minister for Energy, Environment and Climate Change) The Minister with can recommend to the Governor in Council that regulations be made, which can include regulations to prohibit the installation of OFGSHs.

ESV’s powers and the Minister’s powers complement each other but are distinct decisions by different persons.

### Regulation of gas heaters

#### Gas appliance acceptance

Acceptance schemes assist manufacturers and distributors with obtaining gas appliance and component certification to appropriate Australian Standards. Compliance to the relevant standard is confirmed through independent testing and review of test reports by CABs. A product evaluation (conducted typically annually), involving a visual inspection is carried out by CABs on the certified product to ensure ongoing compliance.

Gas Equipment Certification Scheme “The Rules”

The Gas Technical Regulators Committee (GTRC), comprising the gas technical regulators of Australia and New Zealand, has developed the Gas Equipment Certification Scheme (“The Rules”) to establish a consistent regulatory framework across Australia. All Type A gas appliances available for sale in Victoria must bear a Gas Compliance Mark in accordance with The Rules, verifying that the appliance complies with Australian regulations, standards and codes and is certified for use in Victoria.

The Rules apply to CABs that are recognised on a state by state basis by Gas Technical Regulators in Australia to certify gas equipment. In Victoria, ESV requires that CABs demonstrate compliance with The Rules in order for their acceptance scheme to be authorised by ESV. If a CAB is found to be non-compliant with The Rules, ESV can withdraw its authorisation.

The Rules currently set out which standards OFGSHs must comply with and provide manufacturers with up to 2 years to comply with any changes to those standards.

Under The Rules, the GTRC can publish Technical Guidance Bulletins specifying additional requirements that are not included in the standards for some products. This approach has been used to occasionally address safety issues before the standards are updated.

The acceptance schemes authorised by ESV are operated by the Australian Gas Association, the International Association of Plumbing and Mechanical Officials (IAPMO), SAI Global, Global-Mark and BSI Group ANZ. Gas safety regulators in all other State and Territories have also accepted these schemes.

Australian Standards

The Rules require gas equipment to meet the requirements of Australian Standard AS 3645 Essential requirements for gas equipment. AS 3645sets out minimum standards for gas equipment to be accepted and requires specific appliances to comply with additional standards referenced. This includes AS/NZS 5263.0 (gas appliances – general requirements) and AS/NZS5263.1. (gas appliances – gas space heating appliances) and AS/NZS5263.1.8 (gas appliances – decorative effect gas appliances).

*Definition of OFGSHs under the Australian Standards*

There is currently no definition for OFGSHs in the Australian Standards. AS/NZS 5263.0 (gas appliances – general requirements) defines open flued appliances as an indoor appliance designed to be connected to a flue system, its combustion air being drawn from the room or space in which it is installed.

While there is a specific standard for space heating appliances (AS/NZS5263.1.3 - gas appliances – gas space heating appliances), there is no definition of a space heater. The space heating standard outlines minimum thermal efficiency requirements for space heaters, which indicate the proportion of heat produced that is transferred to heat the space in which the appliance is installed.

Standards Australia facilitates the development of Australian Standards by establishing committees to provide the technical expertise to develop relevant standards.[[29]](#footnote-30) Standards Committee AG-001 oversees gas appliance standards and AG-006 oversees gas installation and servicing standards. It is understood that the relevant Standards Australia committee (AG-001) will consider including a definition for ‘space heater’ in AS/NZS 5263.1.3 in late 2020 or early 2021.

The development or amendment process begins by a proponent submitting a project proposal to Standards Australia. Once Standards Australia approves a proposal, the relevant committee is responsible for drafting the standard. Timeframes for revising or amending a standard are heavily dependent on the number and nature of the proposed changes. Once a draft has been finalised, it is released by Standards Australia for public comment. Following consultation, the committee votes on the adoption of the standard. If a majority agree, the standard is approved, and it is subsequently published by Standards Australia.

#### Gas appliance installation and servicing

Part 4 of the Plumbing Regulations 2018 defines “gasfitting work” and requires that fixed gas space heaters must be installed by a suitably qualified plumbing practitioner that has been licensed by the VBA to undertake work on Type A gas appliances. Part 12A of the Building Act requires that a compliance certificate, certifying that plumbing (gasfitting) work complies with the prescribed gasfitting standards, be submitted to the VBA for the installation, relocation or replacement of all gas-using appliances, regardless of the value of the work, within 5 days of the completion of the work. In addition, compliance certificates must be submitted where any gas using appliance is installed, relocated or replaced. Plumbers self-certify their work by lodging a compliance certificate and the VBA audit a sample of compliance certificates. Samples are selected based on the nature of the work and the risks involved.

Under the Gas Safety (Gas Installation) Regulations 2018, it is a prescribed requirement for the carrying out of gasfitting work on a gas installation that the installation not be made unsafe during the work and that it is safe for use on the completion of the gasfitting work.[[30]](#footnote-31)

There are no specific regulations that mandate gas heaters be maintained or serviced at any regular interval. However, it is a requirement of AS/NZS5263.0 that each appliance is supplied with operating instructions that include a reference to a recommended maintenance schedule for the life expectancy of the appliance. ESV currently recommends that all gas heaters be serviced by a qualified gasfitter at least every 2 years.[[31]](#footnote-32)

In the UK, the Gas Safety (Installation and Use) Regulations require a landlord to service gas appliances according to the manufacturer’s instructions. In the absence of appropriate instruction, the UK government recommends that gas appliances are serviced annually, unless a Gas Safe registered engineer advises otherwise.[[32]](#footnote-33)

In the event that an OFGSH is serviced by a qualified gasfitter and unsafe levels of CO are detected indoors, qualified gasfitters have obligations to ensure the installation is left safe for use and are required to take a prescribed set of actions:

* If negative pressure is found to be causing CO to accumulate indoors, the gasfitter is required to install adequate permanent ventilation or make the appliance safe by isolation of the gas supply. If the home owner refuses to have permanent ventilation installed, or it is not possible to install the appropriate level of ventilation, or the home owner refuses to allow the gasfitter to isolate the appliance, the gasfitter should inform the home owner of the dangerous health implications that may result from continued use of the heating appliance. If homeowners do not allow the gasfitter to make the installation safe continue, the gasfitter must then contact ESV (under the Gas Safety (Gas Installation) Regulations 2018), who will take further action.
* If some other fault is found to be causing CO to accumulate indoors, the gasfitter is required to isolate (disconnect) the OFGSH from the gas source. If the homeowner instructs them not to, the gasfitter is then advised to inform the homeowner of the dangerous health implications that may result from continued use of the heating appliance. If homeowners do not allow the gasfitter to make the installation safe, the gasfitter must then contact ESV, who will arrange for the appliance to be made safe.

#### Ventilation requirements for OFGSH

Under the Australian Standards, it is a requirement for OFGSHs to be installed in rooms with adequate permanent ventilation where the gas consumption of the appliance relative to the volume of the room does not exceed a certain value (see below). Due to their design, OFGSHs require a certain amount of adequate ventilation for satisfactory combustion, to expel the products of combustion from the home and operate safely.

Buildings approved for construction prior to 31 March 2014 must comply with the ventilation requirements of 3MJ/h per cubic metre, which means that 1 cubic metre of room volume is needed for every 3MJ/h of gas consumption. For example, a heater with a total maximum gas consumption of 30MJ/h needs to be installed in a room with a volume no smaller than 10 cubic metres. If the room is smaller than 10 cubic metres, it will require additional permanent ventilation.

Buildings approved for construction after 31 March 2014 must comply with the ventilation requirements of 0.4MJ/h per cubic metre. For example, a heater with a total maximum gas consumption of 30MJ/h needs to be installed in a room with a volume no smaller than 75 cubic metres. If the room is smaller than 75 cubic metres it will require additional permanent ventilation.

Most OFGSHs have a maximum gas consumption range of between range between 18MJ/h and 30MJ/h total input. During installation, the gasfitter must assess the maximum gas consumption of the heater and the size of the room to the requirements listed above and if necessary, add permanent ventilation.

Subsequent alterations to the home, such as covering up permanent ventilation, will result in a room which does not meet the requirements for an OFGSH to operate safely. Covering up permanent ventilation holes can increase the likelihood of creating a negative pressure environment dependent on the amount and size of openings around the windows and doors, relative to the area of the permanent vents.

More information on the specific regulations pertaining to gas heaters (and Type A gas appliances more broadly) can be found in Appendix B.

#### CO alarms

A CO alarm is a device designed to alert people when it detects high, unsafe concentrations of CO in its immediate environment. The alarms are intended to limit people’s duration of exposure to a high concentration of CO and therefore mitigate the potential negative health impacts associated with CO poisoning. CO alarms can be a useful back-up precaution but should not be considered a substitute for the proper installation and regular maintenance of gas appliances.[[33]](#footnote-34)

There is currently no requirement that CO alarms be installed in any Victorian building (or buildings elsewhere in Australia). While tenants can request to have CO alarms installed at their property, landlords currently have no legal obligation to meet their request.

ESV advises that CO alarms are a back-up precaution to warn users about very high concentrations of CO, which could cause serious injury or death. They are not intended to be a substitute for regular servicing of the gas appliance as CO monitors are not fail safe and could result in complacency. ESV advises that CO alarms should not be considered a replacement for proper installation and maintenance of heaters. ESV also recommends that consumers only purchase CO alarms that comply with either an EN50291 (the European standard) or UL2034 (the US standard) and have visual or audible alarms indicating when the electrochemical sensor or battery has expired. ESV notes that while these alarms may indicate the presence of CO in the air, an alarm’s effectiveness may be limited by the location where it is installed. CO concentrations may vary significantly throughout the room and high concentrations of CO may go undetected if the alarm is not in the correct position.[[34]](#footnote-35)

In 2012, a DRIS was prepared by the Allen Consulting Group to consider a number of approaches to manage the risk of CO poisoning from gas appliances (the 2012 DRIS).[[35]](#footnote-36) The 2012 DRIS found that the cost of requiring CO alarms was large and did not outweigh the relatively small benefits. The recommended option was for community education.[[36]](#footnote-37)

There are currently no minimum Australian Standards that specify design, manufacturing, installation or servicing requirements for CO alarms.[[37]](#footnote-38) The quality and effectiveness of CO alarms available for purchase can vary significantly as a result. Many CO alarms available in Victoria carry no official product safety certification. While ESV recommends that consumers purchase CO alarms that comply with relevant European or US standards, consumers are not legally required to do so. Households may instead favour cheaper, low-quality alternatives.[[38]](#footnote-39) Appendix C provides the details of a selection of CO alarms available for sale in Victoria, as well as an overview of their international certifications.

No data is available on sales of CO alarms or households with CO alarms in Victoria or Australia.

UK Regulations

Current UK regulations require CO alarms to be fitted in all rental properties where certain heating appliances are installed. In England and Wales, this applies only to heaters that burn solid fuels, such wood and coal,[[39]](#footnote-40) while in Scotland and Northern Ireland, the requirement is extended to all fixed combustion (including gas) heaters.[[40]](#footnote-41) In Northern Ireland, CO alarms are a mandatory requirement in all new homes.[[41]](#footnote-42) In Scotland, from February 2021, all homes with a carbon fuelled appliance or flue will have to comply with the requirement for CO detectors to be fitted.[[42]](#footnote-43)

The European standard for CO alarm installation, BS EN 50291, recommends that CO alarms be fitted:

* In every room that contains a fuel burning appliance
* At least 300mm from any wall (for ceiling mounted alarms)
* At least 150mm from the ceiling, above the height of any door or window (for wall mounted alarms)
* Between 1m and 3m (measured horizontally) from the potential source of CO.[[43]](#footnote-44)

The standard also recommends that CO alarms are not fitted:

* In enclosed spaces
* Where they can be obstructed
* Directly above a sink
* Next to a door, window, extractor fan, air vent, or similar ventilation opening
* Where the temperature may drop below -5ºC or rise above 40ºC.

US and Canadian regulations

While regulation varies by state, the majority of US states require CO alarms to be installed in residential buildings under certain conditions (e.g. where heating appliances are installed that use carbon based fuel for combustion).[[44]](#footnote-45) Further, regulation in Ontario, Canada, requires CO alarms to be installed in close vicinity to sleeping areas in all residential occupancies where fuel-burning appliances such as furnaces, stoves and gas heaters are located.[[45]](#footnote-46)

#### Restriction of flueless gas space heaters

In 2008, a RIS was prepared to amend the Gas Safety (Gas Installation) Regulations to restrict new flueless gas space heater installations (where one did not previously exist) in Victoria.[[46]](#footnote-47) The restriction was introduced due to the health risks of flueless gas space heater emissions, in particular the potential impacts of NOx (nitrous oxide), CO and water emissions on asthmatics and other health conditions.[[47]](#footnote-48) The restriction came into effect in 2009. New LPG low emission flueless gas heaters are still permitted to be installed in residences if they replace an existing LPG flueless gas heater installation and comply with the regulations[[48]](#footnote-49) and the Australian Standard AS/NZS5601.1. This form of heating is not permitted in hospitals, community health centres, day procedure centres, residential care services or supported residential services, schools, TAFE or university or children’s service (kindergarten, childcare).

Some states specify minimum room sizing and ventilation requirements or have restrictions on the types of rooms where a flueless gas heater can be installed. All installations must comply with the relevant Australian Standard.

### Actions already underway to address the risks

In addition to implementing the recommendations made during the 2018 Coronial Inquest, the Victorian Government is taking the following actions to respond to the risks of CO poisoning from OFGSHs.

### Removal of OFGSHs

In November 2020 the Victorian Government announced its intention to spend $335 million to replace inefficient heaters in Victoria (including OFGSHs). Although final details of the program are yet to be announced, this is anticipated to result in approximately 100,000 of Victoria’s estimated 287,000 OFGSHs being removed and will substantially reduce the risk of harms to health and safety from the existing stock of OFGSHs.

### Public education

ESV has run a carbon monoxide campaign every year since 2011 after the deaths of Chase and Tyler Robinson in 2010.

ESV’s most recent campaigns include:

* The ‘Be Sure’ campaign (2019 to current), which urged Victorians to have their gas heaters serviced and understand how to manage the risks associated with their use
* The ‘Cold Feet’ campaign (2015 to 2018), which focused on informing the public that CO poisoning can happen in any home or building with gas heating appliances, as well as urging consumers to service their gas heaters at least every two years.

The campaigns have traditionally been aimed at a general cohort – Victorians with gas appliances, particularly gas heating – and not just owners of OFGSHs. In the most recent campaign, particular attention was paid to renters and rental providers after it was identified many renters don’t know their rights and rental providers don’t know their responsibilities. The campaigns have always had a strong focus on engaging culturally and linguistically diverse people. The 2019 campaign was broadcast through a variety of advertising channels, including social media, radio, sign boards, TV and in retail outlets.

Figure 1‑1 Actions taken as a result of seeing or hearing information about CO poisoning

Figure 1-1 Actions taken as a result of seeing or hearing information about CO poisoning.

Source: Quantum Market Research. (2018, July). *Energy Safe Victoria Gas Heaters Research.*

### Testing and safety alerts

ESV, as the independent regulator, is responsible for decisions concerning heater recalls under the GS Act. In response to the involvement of a Vulcan/Pyrox Heritage OFGSH in the CO poisoning and death of Ms Sofianopoulos in 2017, ESV required all OFGSH models to be check tested, commencing in April 2018. All testing was completed by early December 2018. In April 2018, ESV triggered standards and safety testing of all OFGSH models on the Victorian market in response to the death of Ms Sofianopoulos.

Testing resulted in eight open flued gas space heater certificates being suspended in addition to the Vulcan/Pyrox Heritage, which was already suspended. A further eight certificates were retained and unaffected.

Of the eight suspended certifications, four OFGSH models were found to have safety risks and were further tested. ESV issued safety alerts regarding these heaters and manufacturers are now required to rectify affected heaters installed in Victoria. These safety alerts urge people with these appliances installed in their homes to contact the supplier and have their heater checked by a qualified gasfitter immediately.[[49]](#footnote-50)

ESV currently has safety alerts released for the following gas heaters:

* Vulcan/Pyrox Heritage
* Inbuilt Cannon Fitzroy/Canterbury heaters built between 20 March 2001 and 8 October 2009
* Regency i31 manufactured between 13 January 2010 and 8 May 2018
* Regency FG38 manufactured between 11 March 2004 and 23 April 2018, and F38 manufactured between 18 February 2003 and 20 April 2018
* Nectre 2000 manufactured between 1 January 2007 and 26 June 2018
* Real Flame Pyrotech manufactured between 1 January 2012 and 5 July 2018.

All eight suspended certifications were reinstated following modifications and found to be compliant through independent laboratory testing (therefore the safety alerts only affect heaters within a particular date range, before these modifications were made to the designs). The Vulcan/Pyrox Heritage certification remains suspended as there is no fix for this appliance.

### Public housing

Following advice from ESV, the Department of Health and Human Services (DHHS) moved from a 5 year servicing regime of OFGSHs to a 2 year servicing regime as of March 2018.

In response to the death of Ms Sofianopoulos, DHHS is currently undertaking a program to inspect and or replace OFGSHs in Victorian public housing developments. DHHS is replacing all Vulcan Heritage and Pyrox Heritage heaters (the gas space heater model found to have contributed to Ms Sofianopoulos’ death) with alternative heating appliances, predominantly room sealed gas space heaters.

Tenants were instructed to immediately stop using these heaters due to safety concerns and were also provided with temporary heating units, until DHHS could arrange for a new permanent heater installation. As of 30 September 2020, DHHS had replaced 99.9 per cent of Vulcan Heritage and Pyrox Heritage heaters in its public housing stock.

DHHS is also completing gas heater inspections for other OFGSH models and replacing unsafe appliances with room sealed heaters. DHHS has completed a total of 75,870 gas heater inspections and of these 30,118 have been replaced. Tenants with medical or health related issues, and tenants over 75 years of age were prioritised in this program. DHHS expects all replacement appliances to be installed within the next 12 months.

Furthermore, DHHS is installing CO alarms in all homes with a gas heater, including those where the OFGSH passed DHHS administered CO tests, as well as those where a new heater was installed. As of 30 September 2020, DHHS has installed 53,043 CO alarms across the State.[[50]](#footnote-51)

### Improvements for residential tenants

“Renting a home: a guide for tenants” clearly sets out tenants’ rights with regards to gas appliance maintenance.[[51]](#footnote-52) The guide states that:

*Landlords/agents or owners must ensure that rented premises are maintained in good repair. This includes ensuring that all gas appliances provided by the landlord/ agent or owner, such as heaters and stoves, are safe to use and properly maintained. All installation and maintenance of a gasfitting or fixture should be done by a licensed gasfitter. Failing to ensure gas appliances are safe to use or properly maintained can result in death, serious injury or considerable property damage. Energy Safe Victoria recommends gas heaters and water heaters are serviced every two years.*

In September 2018, the Victorian Government passed the *Residential Tenancies Amendment Act 2018* (RTAA) to amend the *Residential Tenancies Act 1997* as part of its commitment to ensure Victorians who rent have access to fairer, safer housing. The amendments enable the imposition of mandatory safety-related activities, which are required to be undertaken by the residential rental provider (landlord) and the renter. The draft Residential Tenancies Regulations (RTR), which were released by the Department of Justice and Community Safety (DJCS) for public consultation in November and December 2019, propose a range of safety-related activities, including that residential rental providers will be required to have a licenced or registered gasfitter conduct a gas safety check on gas appliances, fixtures and fittings contained in the rented premises every two years.

The RTR have not been finalised at the time this RIS was prepared. The RTR are expected to commence at the same time as the RTAA, which is scheduled to commence on 29 March 2021.

Regular gas safety checks, which include testing for CO spillage and negative pressure conditions, are an important way of mitigating health and safety risks associated with OFGSHs already installed in Victorian homes. It is estimated that 30 per cent of existing heaters are installed in rental properties.[[52]](#footnote-53) Renters may often be unaware of which type of heater is installed and its service history.

### Changes to standards

#### OFGSH servicing

Australian Standard AS 4575 outlines the requirements for servicing Type A gas appliances, including OFGSHs. Australian Standard AS/NZS 5601.1 outlines the requirements for the installation of Type A gas appliances, including OFGSHs.

Prior to 2019, only the standard outlining installation procedures AS/NZS 5601.1 included protocols to test for a negative pressure environment.

In line with the recommendations of Coroner Hawkins in August 2018, AS 4575 was revised in 2019 to include protocols to test for a negative pressure environment.

The revised AS 4575 was published on 9 August 2019. The Victorian Government is currently considering mandating the requirements of the Standard in Victorian regulations. While some stakeholders recommended that mandating this standard should be considered as part of this RIS process, it is out of scope of this RIS, as the standard applies to all Type A gas appliances (including domestic gas heaters, hot water services and stoves), not just OFGSHs.

#### Electrical installations

Australian Standards AS/NZS 3000 *Electrical installations* (known as the Wiring Rules) amendment 1 was published on 31 January 2020 and AS/NZS 60335.2.31 amendment 4 *Household and similar electrical appliances-Particular requirements for range hoods and other cooking fume extractors* was published on 26 June 2020. The amended standards alert electricians about the risk that installation of exhaust fans and rangehoods may pose to the safe operation of OFGSHs, due to the potential for them to create a negative pressure environment in the home.

### Gasfitter training

Following the death of Ms Sofianopoulos, the VBA introduced a mandatory training module and examination on carbon monoxide for all Victorian gasfitters. If a gasfitter \ fails to complete the training module and its associated examination, the VBA will not renew the gasfitter’s licence.

In May 2019 ESV launched a CO Awareness Program for plumbers and gasfitters, in partnership with the VBA and Master Plumbers. The training courses aim to provide Victorian plumbers with the skills and knowledge to use CO testing equipment and complete the practical procedures necessary to test gas appliances for CO emissions. This training was not mandatory.

The 2018 Coronial Inquest made a recommendation that DELWP conduct a RIS to consider the implementation of a system of mandatory continuous professional development (CPD) training for Type A Gas Appliance plumbers and fitters as a condition of being registered or licenced. The Victorian Government response committed to implementing a CPD scheme for all plumbers and gasfitters.

This process is underway and DELWP is developing a CPD framework for registered and licensed plumbers (including gasfitters) to ensure that practitioners maintain and develop their knowledge and skills throughout their professional careers. Training in CO safety is being considered as a mandatory course for all gasfitters due to the seriousness of potential consequences associated with the use of outdated equipment or techniques in this area. The RIS for this CPD framework is expected to be released for consultation in mid-2021 with regulations to be made by the end of 2021.

# Problem analysis

This chapter outlines the nature and extent of the problem

### Effect of CO exposure on human health

CO is an invisible, odourless and tasteless by-product of combustion (the process of burning fuel such as wood, coal or gas). Exposure to high concentrations of CO can lead to a range of adverse health outcomes and in extreme cases, can even cause death.

When inhaled, CO binds strongly to haemoglobin in red blood cells and displaces oxygen from the blood. This process reduces the amount of oxygen available for body tissues and organs to properly function, particularly the heart, brain and muscles. If exposure leads to a high concentration of CO in the blood stream, the exposed individual can experience a range of adverse health effects. High blood concentrations of CO may occur if someone is exposed to very high CO levels for a short time period, or they are exposed to medium to high CO levels over an extended period in areas where CO cannot disperse.

The effect of CO exposure on human health depends on the quantity and duration of exposure, as well as the health of the exposed individual. Low level exposure can cause fatigue, headaches, nausea, vertigo, malaise and flu-like symptoms. In more serious cases, symptoms can advance to feelings of confusion, respiratory failure, convulsions, long-term neuropsychological and cardiovascular issues, and even death.[[53]](#footnote-54) People who survive CO poisoning may also experience long-term reductions in quality of life including as a result of neurological damage. A US study suggests up to 50 per cent of people experience neurological impacts from CO poisoning[[54]](#footnote-55) and hearing loss can also be an outcome.

CO poisoning may also impact health indirectly, though this is difficult to quantify. For example, injuries in the home may be more likely to occur when people suffer from symptoms such as tiredness, confusion and loss of balance. Ongoing symptoms may also affect mental health.

While all people are susceptible to CO poisoning, certain groups are more likely to suffer from the adverse effects associated with CO exposure. Children, people over 65 years, pregnant women, and people with pre-existing conditions (such as asthma, heart or respiratory conditions, or anaemia) are more likely to experience serious health impacts from CO exposure.

Case studies detailing fatal and non-fatal episodes of CO exposure are provided in this chapter.

### Risk of CO poisoning from OFGSHs

While any combustion appliance (such as coal, wood or gas burning appliance) can produce CO, OFGSHs have a design that poses a risk to users.[[55]](#footnote-56)

OFGSHs draw in air for combustion from inside the room in which the heater is installed through primary air openings in the heater. This air is then used to fuel combustion and the resulting combustion by-products are expelled outdoors through the flue. The flue is designed to ensure that CO and other toxic fumes are not inhaled by humans.

However, certain circumstances can cause combustion by-products to be released into the room either through the primary air openings or draught diverter openings, posing a risk to human health. For this to happen, two events need to occur simultaneously:

* A high concentration of CO needs to be produced through incomplete combustion
* CO then needs to spill into the room in which the heater is located (“CO spillage”).

### Incomplete combustion

Incomplete combustion is the process that occurs when a flame is deprived of sufficient oxygen. When fuel (such as coal, wood or gas) is burnt in an abundance of oxygen, only a small concentration of CO is produced. However, when oxygen is limited during combustion, the ratio of fuel to oxygen is increased and high concentrations of CO can be produced.

There are several reasons why incomplete combustion might occur in OFGSHs, including:

* Dirt, dust, lint or other items blocking the primary and secondary air openings and burner ports
* Partial or full blockages of flues and flue terminals (e.g. bird nests, vermin, etc.)
* Poorly designed draught diverter resulting in outdoor weather conditions, strong winds or negative pressure inside the home impacting on flame stability
* Build-up of carbon deposits (soot) in the flue and combustion chamber reducing the ability of combustion products to be discharged into the outside atmosphere
* Incorrect burner operating pressure.

Under normal circumstances, incomplete combustion alone in an OFGSH is not sufficient to endanger human life if there is sufficient ventilation to prevent adverse (reverse) flow of combustion products from the flue back into the room. The high concentrations of CO should simply be discharged through the flue to the outside atmosphere. Human health and safety is only at risk when negative pressure caused by a lack of ventilation or flue blockage (for example due to a lack of maintenance) prevents the CO from travelling up the flue, and instead causes the gas to spill into the room where the heater is located.

### CO spillage

Unlike many other heating appliances, OFGSHs interact with the immediate environment to function. This means that, unlike other appliances, the safety of an OFGSH depends on the environmental conditions it operates in. This can be illustrated by comparing an OFGSH to a room-sealed gas heater. All else being equal, a well-maintained room-sealed gas heater should operate safely regardless of whether it is installed in one dwelling or another. This relationship does not hold for an OFGSH. As soon as the ventilation of the environment becomes inadequate, the ability of an OFGSH to operate safely is affected.

Several factors could prevent CO and other combustion by-products from escaping through the flue, such as a negative pressure environment, an incorrectly installed or damaged flue, a poorly maintained flue, any flue blockages, or any prolonged periods of volatile outdoor weather and strong winds. The older the OFGSH the more likely it is to create conditions that endanger human life if not regularly serviced.

Of these factors, negative pressure is frequently responsible for drawing CO into homes instead of discharging to the outdoor environment via the flue. Negative pressure arises when the indoor atmospheric pressure is lower than the outside atmospheric pressure. This can cause combustion products (including hazardous levels of CO) to be drawn into the home, rather than discharged through the flue as intended.

There are a number of ways that negative pressure environments occur. The use of powerful exhaust fans in contemporary kitchens and bathrooms is one example. Operating exhaust fans can lower the indoor atmospheric pressure and cause combustion products to spill into the room. With increased energy efficiency at the forefront of modern architecture, modern building designs are becoming increasingly airtight. Many older buildings are also being modified to reduce existing ventilation and improve window sealing and reduce draughts around doors. The impact of energy efficiency on ventilation and then the risk of CO poisoning is discussed in section 2.3.1.

Under normal circumstances, operating an OFGSH in a negative pressure environment is not necessarily sufficient to endanger human life. If combustion is clean with little CO produced, then the concentration of CO that is spilled into the room would be low and therefore not considered life threating. However, should incomplete combustion occur in an OFGSH being operated in a negative pressure environment, high concentrations of CO could spill into the room and pose a serious threat to human health and life.

In June 2018, audits conducted by the VBA and ESV reviewed a sample of 105 homes that had been built or renovated since 2005. They found that more than half of the homes presented a significant risk of negative pressure.[[56]](#footnote-57)

The following case study demonstrates the role that inadequate ventilation and negative pressure played in the death of Sonia Sofianopoulos.

**Case study: Sonia Sofianopoulos**

In the Victorian Coroner’s report following an inquest into the death of Sonia Sofianopoulos, who was killed by CO poisoning in July 2017, it was determined that a combination of events had resulted in Ms Sofianopoulos’ death. The combination of the draught diverter of the heater, under low velocity down draught, induced by a negative pressure environment in the room, caused the heater to produce poor combustion, resulting in high levels of carbon monoxide in the flue products which were introduced into the room air by the down draught.

**Inadequate adventitious ventilation**

A gas certification expert noted that “*the unit must have been sealed tight, and had very little room for natural ventilation, also known as adventitious ventilation*.” Consistent with this, a representative from ESV stated that “*due to the design of the heater, under a negative pressure environment, it would be probable that CO would enter into a house where there is a lack of ventilation*.” A consultant engineer noted that “*if there had have [sic] been effective ventilation in the unit, the death would have been prevented*”.

**Negative pressure environment**

ESV asserted that the CO spillage was not caused by the heater, but by a negative pressure environment. ESV stated that “*in all likelihood it was the effect of the two exhaust fans being operated in conjunction with each other*”, with issues with the weather ruled out by experts. These exhaust fans had been installed as part of modifications to the unit in 2008.

Source: Coroners Court of Victoria. (2018*). Inquest into the death of Sonia Sofianopoulos* (File No. COR 2017/3566).

As discussed in section 1.3, OFGSHs are certified against Australian Standards in order to ensure the safety and performance of these appliances.[[57]](#footnote-58) Incidents such as the death of Sonia Sofianopoulos have resulted in some manufactures expressing a view “*that it* [is] *the environment and not the heater itself that* [is] *at fault.*”[[58]](#footnote-59)Certification bodies are tasked with assessing the design of an OFGSH against the requirements prescribed in the Australian Standards. These products are tested in a laboratory setting under a range of simulated conditions. Once the appliance meets the requirements of the standard, it is issued a product certification.[[59]](#footnote-60) Ongoing certification is subject to successful periodic product inspections against a design freeze. According to consultations, certification bodies are not responsible for ensuring testing of these appliances occurs under all conditions that could practically eventuate in a building. OFGSHs require both sufficient air to operate correctly and that extraction fans cannot have an adverse effect on the operation of the appliance. Whilst this can be confirmed at point of installation it cannot be controlled in the case of changing conditions (i.e. if ventilation is sealed or the use of extraction fans). The preferred fast-tracked Australian Standards approach is designed to shut the appliance down if these conditions present themselves.

Plumbers are required to install OFGSHs safely – which means that OFGSHs must be installed with sufficient ventilation and tested for negative pressure. However, there is a risk that the installed environment will not remain the same throughout the life of a heater. Consumers or tradespeople may not be aware of the risks of negative pressure when undertaking energy efficiency improvements such as weather sealing doors and windows or installing more powerful extraction fans. While some tradespeople may be aware of how their work might affect the safe operation of OFGSHs, it is equally likely that many might not be. Either way, there is currently no formal obligation that requires tradespeople to prove their work does not affect the safe operation of any gas appliance. It is however noted that in January 2020 the standard AS/NZS 3000 for wiring had been amended to include a warning about the possible adverse effects of an air extract system in the presence of combustion appliances. Australia’s regulatory system differs from the system in the UK, where it is illegal for a tradesperson to alter a dwelling in such a way that compromises the safety of a gas heater.

### Variation between OFGSH models

There is some variation between OFGSH models that impacts the risk of CO poisoning. For example, some OFGSHs have a draught diverter (a component installed in OFGSHs designed to prevent downdraught interfering with combustion performance) and some do not, however both varieties are susceptible to negative pressure and can spill CO under certain conditions.

Some OFGSHs are fan assisted (include a combustion fan that either forces or induces air and combustion products up the flue), reducing the likelihood of CO spillage under negative pressure. However, if the combustion fan fails or slows down due to wear and tear while the heater is operating and there is no interlock to shut down the appliance, then the same risks are present as with natural draught OFGSHs[[60]](#footnote-61). This is especially the case where the negative pressure generated by exhaust fans and rangehoods is greater than the pressure generated by the appliance combustion fan. Whereas, some OFGSHs are fan-assisted and have an interlock device and will shut down under negative pressure or blocked flue conditions.

#### Other installed gas space heaters not in scope of this RIS

Broadly speaking, installed gas space heaters are differentiated based upon the presence or absence of a flue and the type of flue[[61]](#footnote-62) system (if any) and their ability to heat a space or their thermal efficiency.

**Flueless (or unflued) space heaters** draw in air from inside the room through primary air openings in the heater. This air is then mixed with gas and the mixture is ignited for combustion to occur. The resulting combustion products are released back into the room through a flueway in the heater. These heaters have no mechanism to expel combustion products outdoors. In 2008, the Victorian government restricted new installations of these appliances in buildings where they were not previously installed (like for like replacement of flueless heaters operating on LPG is still permitted in Victoria as long as specific criteria in the Victorian regulations are met). Notwithstanding this, it is a prescribed requirement that flueless space heaters are not installed in hospitals, community health centres, day procedure centres, residential care services or supported residential services, schools, TAFE or university and children’s services (kindergartens, childcare).

**Room sealed (including balanced flue) space heaters** draw in air from outside using a sealed air duct. This air is then mixed with gas and ignited for combustion to occur and the resulting combustion products are expelled outdoors through a separate sealed flue. Where the air duct and flue terminate at a common terminal this is known as a balanced flue terminal. Room sealed gas space heaters essentially function independent of the room they are located in*.* The key difference between OFGSHs and room sealed space heaters is where they draw air from (see Figure 2‑1). In an OFGSH, the air openings interact with the room and its ability to function correctly is subject to environmental conditions within the building. By contrast, a room sealed space heater operates independently of a building’s environment and poses a negligible risk of releasing combustion products indoors. Like OFGSHs, these heaters must conform to the space heating standard (AS/NZS5263.1.3 - Gas appliances – Gas space heating appliances).

There are a number of other open flued appliances that are not fixed heaters that are out of scope of the RIS (such as ducted heaters and water heaters). These appliances have not been the subject of Coroner’s reports and are different to OFGSHs. The Government Response committed to consider the phase out of OFGSHs only.

The primary function of **decorative effect gas appliances** is their aesthetic effect. Unlike space heaters, decorative effect appliances are not designed to heat the living space in which they are installed. These appliances therefore do not have an energy efficiency rating and are generally inefficient at providing heat into the living space. In contrast, OFGSHs are required to meet minimum energy efficiency standards and will have an energy efficiency rating. While some decorative effect appliances do draw air for combustion from the living space (as OFGSHs do), due to the inefficiency of decorative effect appliances the flue gasses are hotter and less susceptible to negative pressure.[[62]](#footnote-63) Decorative effect appliances are therefore not in scope of this RIS except for any open flued Type 2 decorative effect appliances that meet the thermal efficiency requirements for OFGSHs which is discussed further below.

Figure 2‑1 OFGSHs vs. room sealed heaters

Diagram of open flued gas space heaters vs room sealed heaters



Source: Energy Safe Victoria. (2019). [FAQs – Open-flued gas heaters](https://esv.vic.gov.au/safety-education/heating-your-home-with-gas/open-flued-heaters-faqs/)

#### Definition of OFGSH

As noted, the Australian Standards currently do not have a definition for “open flued gas space heater”. A definition is required to ensure the scope of this RIS analysis is clear. The following definition has been developed for the purposes of this RIS[[63]](#footnote-64):

***Open-flued gas space heater*** means an appliance—

1. that has the primary function of heating an indoor room or space in which it is installed (through either radiant or convective heat or a combination of both) demonstrated through conformance with the applicable thermal efficiency requirements of AS/NZS5263.1.3; and
2. that is designed to be connected to a flue system including chimneys; and
3. where the combustion air is drawn from the room or space in which it is installed.

Furthermore, that fan assisted OFGSHs with all the following attributes should be exempt from the scope of the definition and not subject to the RIS.

1. The burner shall only operate while the combustion fan is functioning; and
2. The appliance incorporates a fail-safe interlock that will:
3. shut down the appliance before the appliance has been operating for 15 minutes under either negative pressure or blocked flue conditions or both.
4. in the event of a shut-down, not allow the appliance to automatically reset and any manual reset shall only be accessed by the use of a tool; and
5. The CO/CO2 ratio of carbon monoxide to carbon dioxide in the combustion products does not exceed 0.02 after 10 minutes of operation under any operating condition; and
6. When testing for operation of the fail-safe interlock under negative pressure conditions the CO concentration in the test room or extraction system does not exceed 150ppm.

This definition would mean that all OFGSHs are in scope for this RIS, except for fan-assisted OFGSHs that meet the requirements of the above definition. While Type 2 decorative effect appliances are similar to OFGSHs, they are certified under a different standard, AS/NZS5263.1.8, and are less likely than OFGSHs to spill combustion products in a negative pressure environment. This is because decorative effect appliances are inefficient, so combustion products emitted from the appliance are significantly hotter than combustion products from the more efficient OFGSHs. The buoyancy effect of the hotter combustion products is more likely to overcome negative pressure in a building; in addition, unlike OFGSHs, decorative effect appliances are less likely to be left operating unattended overnight as they are primarily used for aesthetic purposes. Also, unlike OFGSHs, decorative effect appliances are required to be installed with permanent ventilation equivalent to the cross-sectional area of the flue cowl in accordance with AS/NZS5601.1.

While OFGSHs must have an energy efficiency rating and therefore be tested for energy efficiency, decorative effect appliances are not required to have an energy efficiency rating and therefore are not typically tested for energy efficiency. Therefore, it may be possible that some open flued Type 2 decorative effect appliances are as efficient as OFGSHs, and therefore pose the same safety risks due to a lower buoyancy effect in the flue. Therefore, it is proposed that any open flued Type 2 decorative effect appliances that meet the thermal efficiency requirements for OFGSHs would be classified as OFGSHs and are in scope.

### Key drivers of the risk of CO poisoning

Key drivers of the CO poisoning risks associated with OFGSHs include reduced ventilation in buildings, increased energy efficiency of homes, and the insufficient servicing and maintenance of heaters. These are each discussed below, noting that additional factors – such as leaving an OFGSH running overnight – can also increase risks.

### Reduced ventilation in buildings

To improve the energy efficiency of a home and decrease the heat loss, homes are becoming airtight through actions such as sealing doors, windows and vents. However, by reducing the ventilation, this can reduce the amount of air available for combustion and compromise the combustion efficiency of the burner, resulting in the production of higher levels of CO.

Reduced ventilation often occurs alongside the installation of extraction fans in bathrooms and other areas to remove moisture-rich air. Combining the use of powerful extraction fans (e.g. kitchen rangehoods) with improved weather sealing can establish a negative pressure environment, where combustion products, such as CO, are drawn into the home.

Energy efficiency provisions that discourage uncontrolled ventilation have been introduced into the Building Code of Australia as a mechanism to reduce household energy consumption.[[64]](#footnote-65) Specific building requirements and incentive schemes have been implemented by the Victorian and Australian Governments.

* **The National Construction Code (NCC)**: The NCC specifies minimum energy efficiency performance requirements for new buildings. The NCC was an initiative of the (former) Council of Australian Governments (COAG) developed to incorporate all on-site building and plumbing requirements into a single code. The NCC sets the minimum requirements for the design, construction and performance of buildings throughout Australia.[[65]](#footnote-66) The Building Code of Australia Housing Provision Part 3.12.3 (b) (ii) makes allowances for gas appliances, excluding “a permanent building ventilation opening that is necessary for the safe operation of a gas appliance” for consideration of a building meeting minimum energy efficiency standards. The Australian Building Code Board argue the energy efficient requirements in the BCA, if followed correctly, provides no barriers to developing buildings with the conditions necessary for the safe operation of gas appliances. The options available to meet the minimum energy efficiency requirements in the NCC are:
  + the deemed-to-satisfy Nationwide House Energy Rating Scheme (NatHERS) software;
  + the deemed-to-satisfy elemental provisions; and
  + the performance solutions.
* **NatHERS**: Since 2013, new Victorian apartments that follow the NatHERS pathway of compliance must achieve an average NatHERS 6-star rating collectively for all sole-occupancy units and not less than a 5-star rating for each individual sole-occupancy unit. New detached homes and townhouses must achieve at least a 6-star rating.[[66]](#footnote-67) The NatHERS measures a building’s energy efficiency based on its design. The rating depends on the orientation and layout of the building, as well as the materials used in construction. A 6-star rating is the minimum standard in most states and territories.[[67]](#footnote-68) Where NatHERS is used to demonstrate compliance with the NCC, homes are still required to meet the deemed-to-satisfy elemental provisions under 3.12.3 of the NCC that deal specifically with building sealing. These provisions require (under some climate and design conditions): dampers and flaps for chimneys; seals for external windows, doors and roof lights; self-closing dampers for exhaust fans; close-fitting construction of ceiling, walls and floors; and self-closing dampers of evaporative coolers. Since the release of the NCC 2019, compliance with the building envelope sealing provisions of the NCC can also be demonstrated through air tightness testing, by verifying an air permeability of not more than 10 m3/hr.m2 at 50 Pa reference pressure in accordance with AS/NZS ISO 9972 Method 1.
* **Victorian Energy Upgrades (VEU)**: VEU is a Victorian Government initiative that provides discounted energy saving products and services to households and businesses through accredited providers. Participation is entirely voluntary. The program incentives allow accredited providers to complete energy efficient upgrades at a discounted rate, and free in some circumstances. Eligible upgrade activities include installing LED lights, water efficient shower roses, energy efficient water heaters, undertaking weather sealing (including for doors, windows, vents and chimneys) and heating and cooling appliance upgrades.[[68]](#footnote-69) Gas space heaters installed as part of the VEU program are required to be room sealed.
* **Victorian Healthy Homes Program**: The Victorian Healthy Homes Program is a Victorian Government home energy efficiency program. It provides free home energy upgrades to up to 1,000 Victorians who live with complex healthcare needs, and have low incomes, in Melbourne's western suburbs and the Goulburn Valley. The upgrades can include the installation of draught proofing, ceiling or sub-floor insulation, high-efficiency heating/cooling appliances and window coverings.[[69]](#footnote-70)

Research into indoor air quality in Australian dwellings show the trend towards reduced ventilation in new buildings constructed over recent decades.[[70]](#footnote-71) For the existing housing stock, draught proofing is found to be one of the most cost-effective measures to improve the energy efficiency rating of the home and lower the cost of heating and cooling.[[71]](#footnote-72) Draught proofing was found to reduce heating costs by up to 18 per cent and cooling costs by up to nine per cent. Further, market research commissioned by ESV in 2018 found that, of respondents with fixed gas space heaters, 32 per cent had recently sealed up air leaks in and around doors and windows, while ten per cent reported they had closed over permanent ventilation holes.[[72]](#footnote-73) Closing permanent ventilation holes can increase the likelihood of creating a negative pressure environment dependent on the amount and size of openings around the windows and doors, relative to the area of the permanent vents.

The risk is lessened somewhat by changing consumer trends. Increasing awareness by consumers, technological change and the availability of cheaper alternatives means there is a move away from using older gas heating systems such as OFGSHs. Instead, consumers are installing more energy efficient appliances, such as efficient room-sealed heaters, ducted gas heaters in roofs and underfloor, and reverse cycle air-conditioners. Therefore, there is a natural attrition of OFGSH installation and use of existing units.

### Infrequent servicing and maintenance

Regular servicing ensures gas appliances, including OFGSHs, are in good condition and operating safely, and is critical to mitigating the risk of CO exposure.[[73]](#footnote-74) This is particularly important with older appliances, as the likelihood of OFGSHs malfunctioning increases as an appliance gets older. Market research commissioned by ESV found that 29 per cent of fixed gas space heaters in Victorian homes were at least 15 years old.[[74]](#footnote-75)

ESV and the VBA recommend that all gas heaters should be serviced at least every 2 years by a qualified gasfitter[[75]](#footnote-76), and run ongoing public education campaigns about the importance of regular servicing. However, ESV’s market research evaluating the effectiveness of its *Cold Feet* media campaign (discussed in section 2.2.1) found that while 80 per cent of survey respondents understood the dangers of CO, only 19 per cent had arranged for their gas heater(s) to be serviced in response to the campaign.[[76]](#footnote-77),[[77]](#footnote-78) It was also found that of people with ducted gas or fixed gas space heating:[[78]](#footnote-79)

* At least 80 per cent were aware that CO spillage can be lethal, that gas heaters that are faulty or poorly maintained can leak CO and that CO is a colourless, odourless and tasteless gas
* 67 per cent had seen or heard something about carbon monoxide in the media in the past 12 months
* Less than 30 per cent of Victoria’s gas heaters were serviced within the recommended interval of 2 years
* 45 per cent of respondents with a fixed gas space heater had not had it serviced in the last three years
* 18 per cent had not had their heater serviced in the last five years or had never had it serviced and 18 per cent did not know when it was last serviced.

Similar results were obtained through research commissioned following the 2019 ‘Be Sure’ campaign, which indicted that of the 1,260 respondents (who all had gas heating in their homes):[[79]](#footnote-80)

* While generally, most Victorians are aware of the dangers of CO poisoning (around 80 per cent or more are aware), knowledge about the need for servicing heaters every two years by a qualified gasfitter was much lower (around 54 per cent of respondents)
* The majority of survey respondents (81 per cent) acknowledged learning something new after seeing the campaign and 41 per cent indicated that they learnt about the importance of gas heater servicing and 78 per cent reported they were more likely to get their heater serviced after seeing the campaign
* Over half (53 per cent) recalled seeing advertising or communications about safe use of gas heating in the previous six months
* Among those who had seen the campaign, 15 per cent said they had had their gas heater serviced and 17 per cent said they had arranged for servicing. A further 19 per cent had looked into or planned to get their heater serviced
* Around half of survey respondents (51 per cent) said they have had their heaters serviced in the last two years
* Those who had not had their heater serviced in the last two years reported that the main reason for not doing so was because: it is working fine and they didn’t need to (30 per cent); they didn’t know they should (22 per cent); they never thought about it (20 per cent) or it costs too much (19 per cent).

There are a number of possible reasons why Victorians have failed to ensure their gas heaters are serviced regularly, including:

* **Lack of knowledge**: Market research suggests that only 61 per cent of survey respondents were aware of the servicing requirements for gas heaters following ESV’s *Be Sure* campaign.[[80]](#footnote-81) This is despite Australian Standards prescribing that a recommended maintenance schedule for the life expectancy of the appliance must be included in the operation manual.
* **Lack of mandatory servicing**: There are currently no mandatory requirements to service gas heaters. This may create some confusion around whether servicing is required, and if so, who is responsible for servicing gas heaters. The 2013 Coronial Inquest noted that since landlords are not required to service gas heaters, they typically choose not to do so.[[81]](#footnote-82) Landlords are however required to respond to an ‘urgent repair’ request, if the heater requires repairs or if a gas leak is suspected by the tenant under the *Residential Tenancies Act 1997*.[[82]](#footnote-83),[[83]](#footnote-84) As discussed in chapter 1, it is anticipated that mandatory gas safety checks for rental properties will be prescribed in the Residential Tenancies Regulations which will come into effect on 29 March 2021, thus addressing some of this risk.
* **Affordability**: Servicing costs may be unaffordable for some Victorians. ESV estimates the base cost of servicing a gas heater to be approximately $180 to $300.[[84]](#footnote-85) If CO is detected during the service, the gasfitter is required to conduct necessary repairs, install appropriate ventilation, or isolate the heater; all of which may incur additional costs.[[85]](#footnote-86)
* **Inconvenience**: Convenience costs may reduce the frequency of servicing. To service their gas heaters, Victorians need to schedule a service with a licenced gasfitter and ensure that the gasfitter has access to the premises during testing.
* **Lack of concern**: Lack of concern amongst Victorian households may reduce the frequency at which gas heaters are serviced, if they are serviced at all. Market research by Quantum found that, despite being aware of the risks associated with CO, less than half of survey respondents took the necessary steps to ensure their fixed space gas heater was operating safely.[[86]](#footnote-87)

Even if OFGSHs are serviced as recommended, due to their design, in some circumstances use of OFGSHs may still result in fatal levels of CO being produced. Expert witness testimonies from ESV, supplied during the 2013 Coronial Inquest, said that any obstruction to the primary air inlet of an OFGSH will result in an unacceptably high level of CO being produced.[[87]](#footnote-88) In other words; any dust, dirt, lint, or hair which blocks the air inlet of a heater would result in high concentrations of CO. During this process, soot will also accumulate within the heater, blocking the path for combustion products to exit through the flue.[[88]](#footnote-89)

These facts suggest that regular cleaning of the primary air openings of an OFGSH is also essential to the safe operation of these devices. There is limited evidence to suggest that Victorian households are aware of the importance of maintaining the primary air openings of OFGSHs. It is noted that carpet lint and/or dust likely played a role in the deaths of Chase and Tyler and Robinson in 2010. A number of non-fatal CO exposures occur every year and inadequate maintenance is frequently cited as the cause. One such case is presented below.

**Serious CO poisoning incident (adult female, 2015)**

The premises had been vacant for some time prior to the victim moving in. It is believed that the current property owner purchased the property as a deceased estate from an elderly couple. ESV was advised that no maintenance had been conducted on any of the appliances since the victim moved in.

The victim was found collapsed on the floor in the bedroom. Her eyes were closed. She was moaning and disorientated. The OFGSH heater in the bedroom was running on a low heat setting. Windows were opened and an ambulance was called. The victim was then moved to fresh air, before being taken to hospital. The heater was subsequently disconnected.

Assembly, connection and installation error, as well as maintenance deficiency were cited by ESV as the causes of this incident.

Source: DELWP data

While there are a range of contributing factors, it is evident that Victorians are at risk of CO poisoning from OFGSHs due to inadequate servicing and maintenance of these devices.

### Extent of the problem

In this section, we describe the extent of the problem posed by OFGSHs in Victoria and detail incidents of fatal and non-fatal CO exposure.

### Size of the problem

OFGSHs are still a common source of heating in Victorian homes. Consultations suggest that some consumers still have a strong preference for these heaters. This is thought to be driven by several factors, including:

* OFGSHs are relatively inexpensive to purchase
* The radiant heat offered by an OFGSH delivers a different feeling of warmth, which few alternative heaters can replicate, although it is acknowledged that there are room sealed heaters that can provide radiant heat
* The ambiance offered by the warm yellow glow of an OFGSH is desirable and generally not offered by alternative products, although it is acknowledged that there are room sealed heaters that can provide a similar ambiance.

Current estimates suggest about 287,000 OFGSHs will be installed in Victorian buildings at the end of 2020 (Figure 2‑2). Previous modelling suggested this to be much higher. Estimates formed in 2018 indicated as many as 340,000 OFGSHs could be installed across Victoria at the end of 2020.[[89]](#footnote-90) However, recent industry data provided for this RIS notes that historical OFGSH sales were lower than previously thought. A significant number of OFGSHs have also been removed from Victorian public housing developments (approximately 19,500 removals as of September 2019), as part of a safety program currently being administered by the Department of Health and Human Services (DHHS). These removals were not captured in 2018 modelling. It is likely that a number of OFGSHs currently installed in homes that no longer function as the household’s primary source of heating. A proportion of households may have units installed but, due to the cost of decommissioning existing units, allow OFGSHs to lie dormant. These dormant heaters generally pose no risk of CO poisoning, although in some circumstances dust build-up may mean that on the occasions when they are used (e.g. when located in a short-term rental) they do not function properly.

While it is unclear exactly how many different OFGSH models are installed and in use, there are currently 22 certifications of OFGSHs. Approximately 12,500 units are sold annually, although cost-competitiveness and growing community awareness of the health risks associated with OFGSHs is likely to result in a decline in sales over time.[[90]](#footnote-91) Figure 2‑2 forecasts the future number of installed OFGSHs in Victoria over the next decade, assuming current circumstances remain unchanged.

Figure 2‑2 Forecast stock of OFGSHs in Victoria installed from 2020 to 2030

Source: Deloitte Access Economics analysis of industry data and previous DELWP commissioned estimates.  
Note: Values presented are for end of financial year.

### Impact of the problem

Exposure to harmful concentrations of CO have resulted in a series of fatal and non-fatal incidents in Victoria. Since 2010, three fatalities and numerous non-fatal incidents have been attributed to CO toxicity from OFGSHs.

#### Fatalities

Since 2010, malfunctioning OFGSHs have led to the deaths of three Victorians; two young children, Chase and Tyler Robinson (aged 8 and 6) and Sonia Sofianopoulos. The following case study presents a summary of the 2013 Coronial Inquest, which investigated the deaths of Chase and Tyler Robinson and the circumstances that lead to the event.

**2010**

At the time of their deaths, Chase (8 years old) and Tyler (6 years old) resided with their mother Vanessa at a rental property in Mooroopna. On Saturday, 29 May, both boys were put to bed at 8:30pm. At some stage (during the night) the boys came into her room crying. She settled them in her bed, and they all went to sleep.

Throughout the night the gas wall furnace (open flued) located in the kitchen/dining area down the hallway from the bedrooms was left operating. Both the heater and the appliance fan were switched to the highest level.

Vanessa woke during Sunday afternoon with severe pain in her left arm. She managed to get to the shower in the adjoining ensuite and upon returning to the bedroom noticed that both boys were unrouseable and appeared deceased. She telephoned their father, Scott, who immediately went to the house, and then an ambulance. Police attended, followed by the ambulance. No resuscitation was attempted as it was evident that the boys were deceased.

Toxicological analysis revealed that the causes of death was ingestion of CO.

Vanessa required hospitalisation for over a month, suffering hypoxia, renal failure, rhabdomyolysis and brachial plexus injury due to acute exposure to CO, and has residual injuries from the exposure.

**Coroner’s findings of fact**

Coroner, Jacinta Heffey, made the following findings: “the deaths of Chase and Tyler Robinson occurred due to the ingestion of carbon monoxide under circumstances in which an open flued gas furnace emitted carbon monoxide into the boys’ home at dangerously high levels. I find that carbon monoxide was caused by incomplete combustion, likely due to the obstruction to the primary air inlet by the build-up of a contaminant, possibly carpet lint and/or dust. I find that it was this presenting situation, combined with the negative pressure caused by the operation of more than one extractor fan in the home over a period of at least a couple of hours, that had the effect of drawing off the carbon monoxide product from the appliance and expelling it along the hallway of the house towards any open bedrooms and ultimately to the master bedroom. There being little ventilation in the sealed house, it reached dangerous density, leading to the deaths of the two boys”.

Source: Coroners Court of Victoria. (2013). *Inquest into the death of Chase Robinson* (File No. COR 2010/2037) and *Inquest into the death of Tyler Robinson* (File No. COR 2010/2038)

#### Non-fatal exposure

Non-fatal exposures can range from serious non-fatal illnesses – which can include long term and non-reversible health impacts - to low level illnesses that generally resolve after exposure ceases.

Although cases of fatal CO poisoning from OFGSHs are well documented, the number of non-fatal incidents is less clear, due to a lack of relevant data as well as a high likelihood that many cases remain undiagnosed. A submission made to the discussion paper consultation stated that ‘(a)s a healthcare practitioner (medical hospital doctor), I suspect that the prevalence and incidence of carbon monoxide effects is under-recognised…patients may not think to mention their gas heaters and doctors omit to question’.

Reports to ESV since 2010 indicate that five suspected incidents of serious but non-fatal CO poisonings have occurred due to OFGSHs, leading to the hospitalisation of eight people. However, it is possible that this under states the true number of serious non-fatal CO exposures caused by OFGSHs due to misdiagnosis or underreporting.

In the period between June 2005 and May 2018, there were 1,179 admissions to Victorian hospitals (includes both public and private) linked to cases of accidental and deliberate CO poisoning.[[91]](#footnote-92) This translates to an average of just under 100 hospitalisation events each year, however there was significant variation between years. The number of hospital admissions related to CO poisoning is shown in Figure 2‑3.

Figure 2‑3 Number of hospital admissions related to CO poisoning

Figure 2-3 Number of hospital admissions related to CO poisoning (from 2005 to 2018)

Source: Victorian Admitted Episode Dataset. (2018). Victorian Carbon Monoxide Admission Analysis (provided by DHHS  
Notes: \* the figure for 2005 is only for the period between June and December  
 \*\* the figure for 2018 is only for the period between January and May

Figure 2‑3 shows the largest number of admissions in any one year was 119 (in 2006 and 2007), whereas the lowest number of recorded admissions for a full year was 48 (in 2014).[[92]](#footnote-93) The dataset also indicated that there was a statistically significantly higher number of admissions for male patients (71 per cent) compared with female (29 per cent).

However, there are limitations of using this dataset to understand the health impact of CO poisoning as a result of accidental exposure from OFGSHs. This is because:

* The dataset includes admissions from all causes of CO poisoning, both in the workplace and home environment, and from all causes - not just OFGSHs. For example, it includes admissions from the use of heat beads or outdoor gas appliances being used indoors
* The dataset includes admissions where CO poisoning is intended, such as fumes from cars.
* There may have been changes in coding or clinical practices that may have influenced how comprehensively admissions related to CO poisoning are recognised and captured in different hospital records
* The dataset captures the number of admissions rather than the number of unique individuals admitted
* Some patients may have been incorrectly diagnosed with a different ailment and CO poisoning not identified, and therefore are not captured within this dataset
* Some people may not get admitted to hospital or admit themselves to hospital as the symptoms are not very severe.

Nevertheless, this data still contributes to a base of evidence that suggests there is a material incidence of accidental CO poisoning as a result of OFGSHs in Victoria.

In other cases, where people suspect that they might be poisoned, they might contact the Victorian Poisons Information Centre (VPIC). The VPIC reports that it received an average of 75 calls a year as a result of exposure to CO over the last 7 years.[[93]](#footnote-94) The VPIC receives calls from a range of people including family members, self-reporting, medical professionals and emergency services. However, VPIC does not report the cause of CO exposure therefore it is unclear how many of these calls are as a result of OFGSHs.

While there is a lack of Australian data, there is some historic evidence from the UK (where gas heaters have historically been more prevalent than in Australia) about incidences of non-fatal CO poisoning. The Allen Consulting Group noted data from 2006-07 to 2010-11 which showed there were 21.3 reported CO injuries for every CO fatality in the UK.[[94]](#footnote-95) An article in the Journal of Public health in March 2016 suggested that for each death there were 5 hospital admissions and 100 Accident and Emergency Department consultations annually.[[95]](#footnote-96) In the US, a 2016 report (itself based on some of the UK literature) estimated that accidental, non-fire related poisoning accounted for over $1.3 billion annually in societal costs each year.[[96]](#footnote-97)

Due to the generic nature of the symptoms associated with low level CO poisoning, it is likely that a significant number of individuals exposed to CO might not attend a hospital or even seek medical assistance. In cases where a medical practitioner is consulted, individuals suffering from symptoms of low-level CO exposure such as fatigue, headaches and other flu-like symptoms, may be misdiagnosed as suffering from an unrelated illness with similar symptoms. Where CO exposure is suspected, it is also possible that CO concentrations in the affected individuals’ bloodstream may have fallen to undetectable levels by the time of testing. This combination of factors makes it extremely difficult to accurately assess the true extent of accidental CO exposures not leading o fatality across the state.[[97]](#footnote-98)

Beyond the direct health effects of CO exposure, there are also indirect health impacts can also occur. Symptoms such as fatigue and vertigo typically mean those affected are more likely to become involved in accidents, injuring themselves and/or others. Furthermore, these physical symptoms can also impact individuals’ mental health.

The following case studies detail the events that led to multiple non-fatal incidents of CO exposure. In both cases the incidents provide an example of the consequences of deficient installation and maintenance practices in the gas industry.

**Serious CO poisoning incident (adult male, 2009)**

ESV investigated a CO related incident at a home in which a man suffered serious CO poisoning. The victim was then taken to hospital and released a few days later.

Investigations showed that a gasfitter had changed out a gas central heating unit (not an OFGSH) and replaced it with a new one. The ventilation was compromised during reinstallation as little consideration was taken as to the correct amount of ventilation required for the new appliance. There was also no return air duct installed.

Indoor exhaust fans were being operated at the time of the incident, creating a negative pressure environment, drawing air from outside the property down the flue, which in turn caused incomplete combustion of the heater’s burners. CO then entered the property via the return air duct location of the appliance.

Heater malfunction and maintenance deficiency were cited by ESV as the causes of this incident.

Source: Gas fatalities and injuries by open flued heater incident reports, provided to Deloitte Access Economics by DELWP

**Serious CO poisoning incident (adult female, 2010)**

An adult female was admitted to hospital and was treated for CO poisoning.

The open flued gas heater and chimney cowl at the property had recently been changed. A CO reading of 3-4 ppm was recorded after the appliance installation. This was considered to be a normal CO reading.

A male tenant who had also been living at this property also stated that he had the same symptoms.

Source: Gas fatalities and injuries by open flued heater incident reports, provided to Deloitte Access Economics by DELWP

### ESV audit data

ESV audit data shows just over 11.2 per cent of households tested in a non-random audit program[[98]](#footnote-99) (conducted following a serious non-fatal incident in August 2018) had OFGSHs which had serious levels of CO spillage, and 60 per cent had a negative pressure environment (not directly hazardous by itself but extremely hazardous if a problem occurs with the OFGSH appliance which causes spillage).[[99]](#footnote-100) While further information about actual consequences of these conditions is not available, it is reasonable to assume that some CO exposure occurred as a result of the spillage. In the absence of evidence describing the number and impact of low-level illnesses from OFGSH related CO exposure, assumptions based on these audit numbers are used in Chapter 4 to forecast benefits of avoided low level illness.[[100]](#footnote-101)

### Objective

The primary objective is to ensure the health and safety of the community by reducing the risk of CO exposure from new OFGSHs in Victoria. Other considerations are to:

* Ensure people have continued access to heating
* Maintain affordability of heating for consumers
* Maintain consumer confidence in gas
* Limit impacts on industry and support industry transition.

# Options

This chapter outlines the set of options considered in this RIS, explains how feasible options were selected, and why other options were considered infeasible.

### Options development

As part of the RIS process, it is necessary to consider a range of different options that could feasibly achieve the Victorian Government’s objectives. The *Subordinate Legislation Act 1994*, the *Subordinate Legislation Act Guidelines,*[[101]](#footnote-102) and the *Victorian Guide to Regulation* recommend that consideration be given to a range of approaches, including co-regulation and non-regulatory approaches, and those that reduce the burden imposed on business and/or the community.

### Process to develop options

As part of the Government Response to the 2018 Coronial Inquest, the Victorian Government committed to conduct a review of OFGSHs, with options such as a phase out to be assessed. The Government also committed to consider mandating the installation of CO alarms where additional safeguards are required. While this RIS focuses on phase out options to best reduce risks from OFGSHs, it is acknowledged that several other interventions could feasibly contribute to reducing the risk of CO poisoning associated with OFGSHs. To identify all options available to reduce the risk of CO poisoning associated with OFGSHs, DELWP adopted the following process:

* Preliminary engagement with industry to understand potential options to address the risk
* Seeking feedback on the problem options via an Options Paper published on Engage Victoria and provided to stakeholders
* Multiple workshops with manufacturing businesses and GAMAA to discuss options
* Seeking information on the potential costs of different options for businesses and forecast sales.

This process enabled a set of feasible options to be developed for detailed analysis in this RIS, as well as further refinement of the standards-based approach (Option 2).

### Options considered in this RIS

As part of this RIS process, two types of options have been considered:

* **Phase out options** – address the risk associated with any future installations of OFGSHs. These options are mutually exclusive, meaning that only one phase out option can be implemented at a time. Phase out options, on their own, do not address risks associated with OFGSHs that are already installed in buildings. Two phase out options are considered in detail in this RIS, as well as the Base Case. For the purpose of estimating costs and benefits, both options result in no future installations of OFGSHs over various time horizons (although they take effect at different times).
* **Transitional measures** – address the risk associated with OFGSHs that have already been installed. As such, transitional measures are intended to address the residual risk that remains after phase out options and are not intended to be implemented in isolation. CO alarms is the only transitional measure considered feasible and subject to detailed analysis.

Other options were considered but not included for detailed analysis, mainly due to potential implementation difficulties. These are discussed in section 3.3.

### Phase out options

#### Base case

Description

The Base Case is a counter-factual scenario used in a quantitative analysis to provide a common point of comparison for all options. The Base Case would maintain the current set of Victorian regulations relevant to OFGSHs, which aim to reduce the risk of CO poisoning. In the Base Case, 22 present certifications for OFGSHs will remain current and continue to facilitate the sale of OFGSHs in Victoria. The installation of CO alarms and regular servicing of gas appliances would be recommended, but not mandated.

Educational campaigns run by ESV and the VBA would continue to inform the public of the dangers associated with exposure to CO and encourage servicing of OFGSHs. The Base Case includes changes being made to the Residential Tenancies Act and the current program of removing OFGSHs in public housing by DHHS discussed in Chapter 1.

*Changes to the Residential Tenancies Act*

As outlined in Chapter 1, the RIS for the RTR examined the option of requiring mandatory safety checks for gas fixtures, fittings and appliances in all rental properties every two years. The RTAA and the supporting RTR were originally intended to commence on 1 July 2020 but have been deferred due to coronavirus (COVID-19). It is anticipated that the final RTR will commence at the same time as the RTAA, which will commence on 29 March 2021.

DELWP estimates (based on Market research commissioned by ESV in 2018) that these regulatory changes will capture around 30 per cent of currently installed OFGSHs and protect many of those at a high risk from OFGSH, as renters are less likely to have information about their heaters and associated risks, and are dependent on landlords and property managers for regular servicing.

*OFGSHs in public housing*

In the Base Case, DHHS will continue its current program to remove all OFGSHs from public housing, and to install CO alarms in all residences with gas heating appliances. This program is due to be completed in 2020. This has been taken into account in modelling presented below.

The risk of CO exposure in non-DHHS housing (i.e. owner-occupier households) would continue to be addressed primarily through ongoing public awareness campaigns. Educational materials would focus on maintaining or increasing awareness of the health impacts of CO exposure, circumstances that typically cause OFGSHs to malfunction and the importance of having all gas appliances regularly serviced by qualified gasfitters.

*Household energy efficiency package*

The Victorian Government in its FY2021 budget committed $335 million to assist consumers in replacing old wood, electric or gas fired heaters with new energy-efficient systems that are safer, cheaper to run and reduce emissions.[[102]](#footnote-103) While the full details of the program are yet to be released, it is anticipated that approximately 100,000 OFGSHs will be removed and replaced as a result of the package.

It is assumed that this household energy efficiency package will be delivered under the Base Case. However, it remains uncertain exactly how the package will affect the future stock of OFGSHs installed across Victoria. As a result, potential impacts from the package are not considered in the quantitative assessment of options in this RIS.

#### Option 1 - Restriction on future installations of OFGSHs

Description

No new or replacement installations of OFGSHs will be permitted in Victoria under amendments to the Gas Safety (Gas Installation) Regulations. This would include both new and like-for-like replacements. From the date of implementation, licensed gasfitters would no longer be able to install OFGSHs. Proposed amendments are to insert a new regulation (25A) stating that a gasfitter must not install an OFGSH in any premises, except if the gasfitter is carrying out a repair or service or if the heater is an exempt fan-assisted OFGSH with a fail-safe interlock (see draft regulation in full in Attachment D). OFGSHs already installed would not be affected by proposed regulations.

The GS Act provides the relevant Minister (the Minister for Energy, Environment and Climate Change) powers to recommend regulations to restrict the installation of OFGSHs. The GS Act also provides ESV with powers to declare the non-acceptance of OFGSHs (which means these appliances could not be certified for use in Victoria and therefore it would be an offence to sell, supply or install them), and to prohibit the sale and supply of OFGSHs.

ESV’s powers and the Minister’s powers complement each other but are distinct and require decisions to be made separately and by different persons.

It is possible that ESV may consider exercising its own powers separately to declare non- acceptance and/or prohibit sale and supply of OFGSHs. This would be a separate decision by the Director, Energy Safety, ESV, which may take into account relevant information and stakeholder feedback through this RIS process.

Given it is possible that ESV may consider exercising its own powers, assessment of Option 1 takes into account the two different scenarios under which regulations could be made. These include:

* **Scenario 1** - standalone Regulations implementing a restriction on future installations of OFGSHs
* **Scenario 2** - Regulations (Scenario 1)together with a separate decision by ESV to cease certification and/or sale and supply. Within scenario 2 there are two possibilities:
  + Regulations are made before any ESV decision (Scenario 2a);
  + Any ESV decision/s is made before the Regulations (Scenario 2b).

A restriction on the installation of OFGSHs by the Minster, or declaration by ESV of non-acceptance of OFGSHs and/or prohibition of the sale and supply of OFGSH, or a combination of both, would result in the same or similar costs and benefits occurring, however, Scenario 2a and 2b would provide a more comprehensive and consistent regulatory regime, covering acceptance, sale and supply directly in addition to the Regulations covering installation. Due to the similarity of the scenarios, the analysis presented in this RIS for Option 1 is applicable to all scenarios.

It is important to note that Option 1, like Option 2, only addresses the risks associated with future installations of OFGSHs in Victoria. Both options are not expected to reduce the risk posed by OFGSHs already installed.

Timing

Regulations would commence from 1 June 2021 (six months prior to the implementation of Option 2 a fast-tracked standards-based approach). From this date, OFGSHs would no longer be allowed to be installed in Victoria.

Compliance

Gasfitters would be required to comply with proposed regulations and would not be allowed to install OFGSHs. There would be a role for the VBA in monitoring gasfitter compliance and enforcing gasfitting installation standards under the Victorian plumbing regulatory framework. The VBA would also provide information to practitioners outlining its regulatory requirements.

Penalties for non-compliance would apply under the GS Act (40 penalty units apply in the case of a natural person and 200 penalty units apply in the case of a body corporate). ESV would also ensure retailers are aware of regulations and point of sale would be monitored to ensure retailers are aware certain heaters cannot be installed in Victoria.

If regulations are made under a scenario where ESV has also made a decision to declare non-acceptance of OFGSHs or prohibit their sale and supply, then ESV would ensure that manufacturers, retailers and suppliers are aware of the point of sale legislation. In addition, manufacturers, retailers, suppliers would not be permitted to sell or supply OFGSHs for use in Victoria, and penalties for non-compliance would apply under the GS Act(40 penalty units apply in the case of a natural person and 200 penalty units apply in the case of a body corporate).[[103]](#footnote-104)

#### Option 2 - Fast-tracked standards-based approach

Description

In Option 2 amendments would be introduced to the relevant Australian Standards (AS/NZS5263.1.3 and AS/NZS5263.1.8) to require OFGSHs and Type 2 decorative effect appliances that meet thermal efficiency requirements respectively to shut down safely in a negative pressure environment. The amended standards would apply to all Australian jurisdictions that recognise those standards, not just Victoria. Any amendments to the Australian Standard would only apply to newly manufactured appliances and would not apply to appliances already installed. Retrofitting installed appliances is out of the scope of the standards process. Any OFGSH that meets the requirements could be sold, supplied, and installed.[[104]](#footnote-105)

The amendment to the standard would require OFGSHs to shut down within 15 minutes in a negative pressure environment. The shut-down condition would be a non-volatile lockout; i.e. the appliance would not automatically restart but rather would require manual intervention with the use of a tool by a qualified practitioner in order to reset.

Option 2’s amended standard would require all new models to meet the amended certification testing standards and industry would not be able to manufacture non-compliant stock. Under this option, to assist transition, industry could sell existing OFGSHs stock after this date, however it is likely that such sales would be low because manufacturers are expected to sell down existing OFGSHs stock prior to the change, alongside already decreasing sales (discussed in detail in Chapter 5). Industry has also indicated that the Base Case forecast OFGSH sales for 2021-22 are unlikely to change if this approach is adopted. Under Option 2, they reach zero five years earlier than the Base Case and seven months later than Option 1.

Typically, amending a standard requires a proposal to be submitted to Standards Australia for consideration, and if the amendment is progressed it would usually take 18 to 24 months to amend the standard after which manufacturers would be given an additional 2 years to comply.[[105]](#footnote-106) Under Option 2 however, industry, manufacturers and regulators have already established a working group to initiate this process and Standards Australia has already developed a draft of the proposed amendments. Industry stakeholders, including those in the working group, have agreed in-principal to support the proposed amendments. These amendments would be used by conformity assessment bodies (CABs) to check whether OFGSHs shut down under negative pressure. The test would also apply to open flued Type 2 Decorative effect appliances which meet the efficiency requirements of space heaters outlined in (AS/NZS5263.1.3).

Timing

There are two timing considerations in Option 2:

* The timelines in which to establish the amended standards and
* The timeframe in which industry would be given to comply with the amendments.

In Option 2, Standards Australia has already developed a draft of the proposed amendments. It is still expected that around 12-24 months would be required to establish the amended standard implying the amendments would likely be published around 2022 or 2023, assuming Standards Australia commences this project in early 2021.

Typically, once a standard is amended manufacturers would be given two years to comply with the revised standard. In Option 2 however implementation is fast-tracked because ESV would specify a shorter implementation time frame in a GTRC Technical Guidance Bulletin. [[106]](#footnote-107) The Gas Technical Regulators of Australia scheme rules require CABs to take into account any information published in a Technical Guidance Bulletin when processing the certification of gas equipment. Technical Guidance Bulletins are the method Technical Regulators use to require the implementation of changes without waiting for standards to be amended or revised. If CABs cancel or suspend the certification of OFGSHs on the basis of the Technical Guidance Bulletin, OFGSHs manufactured from the date of suspension or cancellation of certification would being considered uncertified.

As such, the GTRC Technical Guidance Bulletin is the instrument through which Option 2’s fast-tracked standards-based approach is implemented. In Option 2, the GTRC is assumed to release a Technical Guidance Bulletin with a compliance date of 1 January 2022.[[107]](#footnote-108)

However, if the Minister is not satisfied that the Australian Standards amendments and GTRC process are progressing reasonably towards a compliance date of 1 January 2022, or if the approach appears to be unfeasible or ineffective, she will consider recommending that the regulations set out in Option 1 be implemented with a commencement date either on or before 1 January 2022. Reserving the flexibility to implement the regulations specified under Option 1 limits the potential impact that might result from uncertainty in timelines under Option 2.

It should be noted that the standards-based approach is expected to progress regardless of the Victorian Government’s decision on new regulations, but is not being assessed as part of the Base Case because it is still to be finalised and was not in progress until mid-way through the RIS process.

Compliance

Option 2 assumes that the GTRC publishes Technical Guidance Bulletin with a compliance date of 1 January 2022. By this date, CABs would be required to assess whether OFGSHs meet the revised standards and are expected to cancel or suspend the certification of any OFGSH that doesn’t comply.[[108]](#footnote-109) The cancellation or suspension of an OFGSH’s certification would classify that OFGSH as uncertified and the installation of an uncertified OFGSH is an offence under section 70(1) of the GSA 1997. An offence under section 70(1) of the GSA 1997 is punishable by a maximum penalty of $6,608.80 for a natural person and $33,044.00 for a body corporate following prosecution.[[109]](#footnote-110) In addition, affixing a certification label on an uncertified OFGSH is an offence under section 71B of the GSA 1997 punishable by a maximum penalty of $6,608.80 for a natural person or $33,044.00 for a body corporate following prosecution. However, in Option 2, any OFGSHs that are manufactured before the GTRC Technical Bulletin compliance date would be regarded as certified units which can be sold, supplied or installed.

Given these regulatory mechanisms it is assumed that any uncertified OFGSHs would cease to be accepted in Victoria under Option 2. Once the revised standard is released all non-conforming OFGSHs would be phased-out across Australia. In addition, the VBA has powers under the Victorian plumbing industry framework to monitor and enforce installations by gasfitters.

### Transitional measure

#### Regulations to mandate the installation of CO alarms

Description

This measure would mandate the installation of CO alarms in buildings where OFGSHs are installed under the Building Regulations.

Currently, CO alarms are recommended, but not required. CO alarms are similar in function and appearance to smoke alarms[[110]](#footnote-111). They monitor the concentration of CO in the air, providing a visual and audible alarm where a certain concentration of CO has been detected over a specified time. By alerting building occupants to the presence of CO, occupants are given the opportunity to turn off the appliance and seek fresh air. This can reduce the likelihood of fatal or non-fatal incidents of CO exposure and other associated harms.

Timing

Regulations commencing from 1 June 2021 have been modelled for this RIS. If these regulations were implemented a transition period would need to be introduced to manage the introduction of these requirements.

Compliance

Building owners would be required to comply with these regulations. The analysis in this RIS considers the costs and benefits of mandatory installation in only rental buildings because it is considered that compliance in rental buildings is less difficult to monitor and enforce than in owner-occupied buildings.

### Options not included in this RIS

Throughout the process of developing the set of phase out options and transitional measures, a number of other options were identified and carefully considered but were determined not to be feasible because they do not meet the objectives of the reforms. The following options were considered in the discussion paper released in December 2019 but were not included in this RIS:

Table 3‑1 Summary of options not included for detailed analysis

| **Non-feasible option** | **Reason not included for further consideration** |
| --- | --- |
| **Phase out of OFGSHs through additional safety requirements prescribed in regulation**  In this option, the Victorian Government would prescribe the shut-down requirements agreed in principle by the Australian Standards committee (AG-001) and published in the GTRC Bulletin (if this has occurred) in Victorian regulation. | GTRC bulletins are interim documents with limited life spans. If a standard is published, then the bulletin would be withdrawn from the GTRC website. Therefore, legislation would refer to a document that no longer exists, making this option impractical. |
| **Removal of all OFGSHs already installed (existing heaters)**  This option would remove the existing installations of OFGSHs in households where they were already installed. This would remove the risk of CO poisoning as a result of old, poorly serviced heaters or environmental factors. | This option would be difficult to enforce, particularly in owner-occupied homes – it would need considerable enforcement resources to be committed, and there could be issues with monitoring compliance in people’s homes. It could also potentially cause affordability issues and lead to unintended consequences such as vulnerable people not having warmth in cold weather if they are not able to afford a replacement. One of the unintended consequences is the use of outdoor gas heating appliances indoors. An example was in August 2012 where a patio heater designed for outdoor use was used inside an apartment where there was no other form of heating. This resulted in the death of a 40-year-old male from CO poisoning. Where there was non-compliance, it could also mean that heaters do not get serviced and the risk is increased. |
| **Restriction on future installations  (excluding like for like replacements)** This option would restrict the installation of OFGSHs in households where they were not already installed. Installation of OFGSHs would continue to be permitted where they replace an existing OFGSHs (a “like for like replacement”). | This option would address a very small part of the problem because most new installations are “like for like replacements”. |
| **Mandatory servicing requirements**  This measure would mandate regular servicing of OFGSHs in all buildings where OFGSHs are installed. Servicing intervals will be every two years, as per ESV’s recommendations. A service has an estimated cost of $250.  Under the current regulations in Australia, servicing OFGSHs is voluntary. At present, servicing is encouraged through increased public awareness campaigns which encourage consumers to service all gas heaters once every two years.  Regular servicing of OFGSHs ensures that these appliances are in working condition and operating safely. | Mandatory servicing requirements are not considered to be feasible because they would be difficult to monitor and enforce in owner-occupied buildings.  Mandatory gas safety checks are being considered through changes to the Residential Tenancies Regulations which will address some of the risk of CO exposure from OFGSHs in rental homes.  While the mandatory measures described above in tenanted properties are appropriate and enforceable alongside other safety requirements for landlords, mandating measures in owner-occupied properties that are specific only to OFGSHs will be more challenging and difficult to enforce, particularly with regard to one class of heater such as OFGSHs. Market research indicates 50 per cent of people with gas space heaters are unsure as to whether these are open flued, and the building regulatory framework is not established to locate types of gas heaters or monitor servicing work. For these reasons a voluntary approach to servicing OFGSHs in owner-occupied properties is appropriate alongside awareness raising. |
| **Potential change to compliance certificates** Under the Building Act a certificate of compliance is required to be issued to consumers and lodged with the VBA by a licensed plumber (including gasfitters), where the total value of work is $750 as well as where a gas appliance is installed, relocated or replaced, or more as well as in other specified circumstances. In the case of the installation, relocation or replacement of a gas appliance, the lodgement of a compliance certificate is mandatory regardless of the value of the work.  In the case of servicing gas appliances, a compliance certificate is required when the total value of the work exceeds $750. To support either the Base Case or implementation of mandatory servicing, a supporting action could be investigated which could mandate compliance certificates for any maintenance and servicing works performed on gas heaters, including OFGSHs. Under this approach, servicing work would be subject to the VBA’s auditing regime, creating a level of accountability for work undertaken by gasfitters. It would also give the VBA broader oversight on the location of OFGSH, providing an opportunity to create a register and remind consumers to service their heater or to send out education materials regarding CO poisoning risks. | Any change to the requirements for compliance certificates is outside the scope of this RIS process, as implementation would require an amendment to the Building Act and would depend on Parliamentary processes and decisions. It would therefore need to be investigated as part of a separate Government process. |
| **Education**  This option would include public education on the risks of CO poisoning and measures the households could take such as servicing and installation of CO alarms. | As described in Section 1.4, ESV has delivered substantial public awareness campaigns since 2011. Continuing public education campaigns will be a part of the Base Case. Additional public education is not likely to lead to significant reduction in risks.  The VBA also plays a role in educating and informing licensed gasfitters, as well as consumers, regarding regulatory requirements relevant to OFGSHs. |

# Options analysis

### Methodology

### Two staged approach

A two staged approach to assessing options is used:

1. Assess phase out options to identify a preferred phase out option
2. Assess the option of mandatory installation of CO alarms in properties with an OFGSH, which is a transitional measure.

### Breakeven analysis

Options have been assessed using a breakeven approach. Breakeven has been chosen as the preferred analysis tool because of the nature of benefits (reduction in fatalities/injuries) combined with the uncertain and episodic nature of such incidents.

In practice, given that a large number of the benefits and costs have been quantified, the analysis is similar to a full cost-benefit analysis. However, given the uncertainty around some of the quantification (e.g. the low level illness number), it is expressed as breakeven analysis. Importantly, the findings would be the same regardless of method and terminology used.

#### Impact of coronavirus (Covid-19)

Much of the analysis in this report is based on data and analysis undertaken prior to the coronavirus (COVID-19) situation. Coronavirus (COVID-19) has the potential to impact the analysis, particularly with regard to relative energy prices (notably lower gas prices) and consumer choices. Some individuals may spend greater amounts of time at home due to coronavirus (COVID-19), increasing their use of OFGSHs as a result. This or being unable to afford servicing, may increase their likelihood of being exposed to CO and experiencing worsened health outcomes. coronavirus (COVID-19) may also lead to some individuals to experienced reductions in income, impacting their ability to service and properly maintain OFGSHs installed in their home. However, given the uncertainty around these impacts, and the extent to which they are just temporary or longer term, no changes have been made to the underlying assumptions, however sensitivity analysis has been undertaken to test the impact of changes in some key assumptions (see Appendix E).

### Estimation of costs and benefits

Costs and benefits captured in this chapter include the items that are directly relevant and attributable to the proposed phase out options.

Given the level of uncertainty around data collected for this RIS, the general approach to estimating the costs and benefits in this RIS is to report conservative estimates. Where a range of plausible values is available, we have selected the average value as a representative of the sample.

The limited availability and nature of relevant data means that some of the identified costs and benefits are difficult to quantify. However, where possible, an attempt has been made to quantify the costs and benefits expected to be realised between 2020-21 and 2029-30 (the modelling period) for each option.

In such circumstances, information within data requests, stakeholder consultations and relevant literature has been used to inform a qualitative discussion of the cost or benefit.

### Analysis of phase out options

### Cost of phase out options

Table 4‑1 describes the costs that have been quantified in this analysis. Key data and assumptions underpinning the estimation of costs are outlined in section 4.2.6.

Table 4‑1 Description of the costs for phase out options

|  |  |  |
| --- | --- | --- |
| **Cost** | **Cost category** | **Description** |
| **Change in profits for gas space heater manufacturers** | Industry cost | This is the difference in profits received from the sale of OFGSHs under the Base Case, versus the profits received from the sale of additional room sealed gas space heaters. These two impacts are assumed to be absorbed by the gas heater industry as five of the seven major OFGSH manufacturers produce a room sealed alternative (noting most of these manufacture heaters in Victoria). It is likely that manufacturers with more diversified product offerings (i.e. room sealed, reverse cycle, etc.) would be less adversely affected than those that produce only open flued appliances. Under Option 1, OFGSHs will also continue to be sold in states other than Victoria, reducing the impact on industry profits. However, it is understood that most OFGSH sales occur in Victoria. Stakeholder consultation indicated a number of manufacturers are already switching away from manufacture of OFGSHs. Note this does not address any costs associated with OFGSHs already manufactured and warehoused prior to a policy change.  Profit impacts that result from consumers switching to reverse cycle air conditioners are included in the benefits side of the analysis.  Each option is expected to impact supply and demand, and therefore prices across different heater markets. However, the exact impact is uncertain and likely to be marginal. As a result, this analysis has not sought to quantify future changes in the price of heating appliances sold in Victoria. |
| **Cost of purchasing and installing alternative heaters** | Community cost | This is the incremental cost to the community of purchasing and installing more expensive heaters as a result of OFGSHs being phased out. It is assumed that consumers that would have purchased an OFGSH under the Base Case decide to switch toward room sealed gas space heaters (50 per cent) and reverse cycle systems (50 per cent). |
| **Implementation, monitoring and enforcement costs** | Government cost | This is the cost to Government to implement, monitor and enforce the phase out options, relative to the Base Case. |

Costs that are relevant to this analysis, but have not been quantified due to a lack of data include:

* **Industry transition costs (not including the gross margin assumption noted above)** - Industry has indicated the possibility of a number of transition costs including stock write-offs and additional scrapping of components and accessories that are exclusively used in the OFGSH market.

The cost of any stock that was produced prior to a policy change, and is not expected to sell, has not been included as a cost in this RIS, as it is effectively a sunk cost. Sunk costs are treated as bygone and are not taken into consideration in the cost-benefit analysis because the costs that matter instead are expectations of future costs and future profits. It is important though to acknowledge that some manufacturers could be unable to sell stock already produced; this will depend on timing of the change and how much stock manufacturers hold. While it is difficult to estimate this impact without access to detailed operational details of individual businesses, estimates have been developed to provide an indication of this potential impact. Using industry sales forecasts of 3,802 sales of OFGSHs in 2020-21, then 2,342 in 2021-22 and 1,732 in 2022-23 (see section 4.2.6 for discussion of sales forecast assumptions), and conservatively assuming heaters are manufactured two years in advance of sales, then a restriction that comes into effect from 1 January 2022 will result in manufacturers left holding 866 OFGSHs.[[111]](#footnote-112) An estimated average sales price of $1,703 per heater means the sales value of this stock is $1,474,789. This figure assumes manufacturers aren’t able to recoup their cost by other means, such as sales into other jurisdictions. It is also considered conservative because, given stakeholder consultation with industry, manufacturers are unlikely to be producing heaters two years in advance. However not enough information is known about the production process and business decisions to undertake more robust analysis. It is worth noting even if this cost were included in the quantified costs, the large expected benefits of the options would still be expected to cover the majority of costs.

* **Broader impact on gas -** Industry has indicated that a restriction could result in negative publicity not only for gas space heaters, but also for the broader gas appliance industry. This concern is noted but has not been quantified, as are many external factors currently impacting energy and gas appliance markets.[[112]](#footnote-113) However a standards-based approach would have the smallest impact on industry and any potential consequences to consumer confidence in gas products.

Summary of quantified costs

Table 4‑2 presents the quantified dollar cost of each option. The costs are highest under the Option 1 restriction, at $6.1 million versus $4.9 million for Option 2. This partly reflects the timing of the options, with Options 1 and 3 to be introduced on 1 June 2021. The fast-tracked standards-based approach (Option 2) is assumed to come into effect on 1 January 2022 reducing the cost to consumers of purchasing more expensive heaters and lowering the impact on industry profitability.

Under the Base Case, the Victorian OFGSH market is assumed to close in 2027, reducing the number of OFGSHs sold across the state to zero. This sales trajectory is assumed to continue indefinitely (i.e. OFGSHs are no longer sold in Victoria beyond 2027). As a result, this profitability impact is not expected to extend beyond 2026 as consumers no longer purchase OFGSHs, irrespective of any intervention.

Table 4‑2 Costs of phase out options, relative to the Base Case

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Base Case** | **Option 1 Restriction  on all installations** | **Option 2 Phase out through a fast-tracked standards-based approach** |
| **Costs** | | | |
| Reduction in profits for gas space heater manufacturers | $0 | $2,099,355 | $1,622,910 |
| Cost of purchasing more expensive heaters | $0 | $3,226,734 | $2,494,433 |
| Implementation, monitoring and enforcement costs | $0 | $800,000 | $800,000 |
| **Total costs** | **$0** | **$6,126,089** | **$4,917,344** |

Note: Some totals do not sum due to rounding

### Benefits of phase out options

Benefits that have been estimated in this analysis are described in Table 4‑3.

Table 4‑3 Description of the benefits for phase out options

|  |  |  |
| --- | --- | --- |
| **Benefit** | **Benefit category** | **Description** |
| Lives saved | Safety benefit | Benefits realised from avoided fatalities under each of the options. This is measured using the global burden of disease (GBD) methodology[[113]](#footnote-114) and Value of Statistical Life Year benchmark.[[114]](#footnote-115) |
| Avoided serious non-fatal illnesses | Safety benefit | Benefits realised from avoided life-threatening CO exposures that significantly reduce victims’ physical and mental health for an extended period of time. This is evaluated using the GBD methodology. |
| Avoided low level illnesses | Safety benefit | Benefits realised from avoided minor CO exposures that reduce victims’ physical and mental health for a short period of time, with symptoms such as cold, headache and dizziness. |
| Reduced household energy costs | Energy efficiency  benefit | Reduced household energy bills from Victorians transitioning away from OFGSHs towards more energy efficient heating appliances. Alternative heaters (room-sealed or reverse cycle) also allow for better weather sealing in the home which further reduce energy consumption and costs, however this is not quantified. |
| Reduced greenhouse gas emissions | Energy efficiency  benefit | Reduced greenhouse gas (GHG) emissions from Victorians transitioning away from OFGSHs towards more energy efficient heating appliances. |
| Incremental profits to reverse cycle manufacturers | Industry benefit | Additional profits earned by the reverse cycle industry as a result of consumers switching from OFGSHs to reverse cycle systems. A small number of OFGSH manufacturers offer a diversified product range that includes reverse cycle air conditioners. |

### Breakeven analysis for phase out options

The breakeven point for each option expresses how many avoided deaths or illnesses would be required to justify the cost of the proposal.

It is important to note that a strong finding of this analysis is that benefits other than avoided deaths or illnesses are significant and have the potential to drive the results.

#### Option 1: Restriction on future installations of OFGSHs

The primary objective of the proposed Regulations is to save lives and avoid illnesses. Under Option 1 it is estimated that 0.06 deaths, 0.13 serious illness and 543 low level illnesses over 10 years could be avoided. This would result in estimated benefits of $4.1 million over 10 years, partially offsetting the cost of the option which is $6.1 million. In addition, there are significant energy efficiency benefits. Specifically, under Option 1 about $4.9 million of energy cost savings over 10 years are expected, while the avoided GHG emissions would amount to around $115,000. In addition, Option 1 is expected to generate a benefit in additional profits for the reverse cycle industry of slightly less than $1.3 million. Together, these benefits are sufficient for Option 1 to break even, with total estimated costs of $6.1 million versus total estimated benefits of $10.3 million.

**Avoided deaths and illnesses**

*Lives saved*

For statistical purposes the value of an avoided death is estimated in this report as $219,390 per year of life saved (see key assumptions in Section 4.2.6). Over the past decade, there have been two fatal incidents of CO exposure caused by OFGSHs in Victoria. These two incidents have resulted in the death of three Victorian residents. One of these incidents led to the deaths of two young boys. Their mother was also hospitalised and experiences ongoing health problems after she was also exposed to dangerous concentrations of CO. The second incident caused the death of an older woman who lived alone. Both of these incidents were discussed extensively in chapters 1 and 2. Although the number of OFGSHs installed in Victorian buildings (estimated to be approximately 287,000 at the end of 2020) has likely declined since the fatalities in 2010, to reflect the extreme uncertainty surrounding the frequency of fatal incidents, the trajectory of two fatal incidents per decade is assumed to continue into the first year of modelling (i.e. 0.2 fatal incidents are expected to occur in FY2021). It is also noted that the likelihood of an OFGSH leading to a fatal CO exposure may increase over time as it experiences wear and tear. Each fatal incident is assumed to result in the death of 2.5 Victorian residents (i.e. 0.5 fatalities are expected to occur in FY2021), consistent with the average number of residents living in Victorian households in FY2019.[[115]](#footnote-116) This estimate can be expressed in per heater terms as 1.74x10-6 fatalities per heater per year.[[116]](#footnote-117) This per heater fatality ratio is assumed to stay constant into the future, with the expected number of fatal CO exposures caused by OFGSHs declining in line with the stock of new or replacement OFGSHs in Victorian buildings. The stock of new OFGSHs in Victoria is expected to be approximately 3,800 units lower by the end of the modelling period (to 2030) under Option 1, as compared to the Base Case. As a result, it is expected that a restriction on future installations would avoid 0.06 CO related fatalities caused by OFGSHs in Victoria over 10 years.

*Avoided serious non-fatal illnesses*

For statistical purposes, the value of a single avoided serious non-fatal CO exposure is estimated to be $1,282,067 (based on key assumptions in section 4.2.6). Data provided by ESV shows that there were eight serious non-fatal CO exposures caused by OFGSHs in the 8 years between 2010-11 and 2018-19. Although the number of new or replacement OFGSHs installed in Victorian buildings has likely declined since the serious non-fatal exposure in 2010, to reflect the extreme uncertainty surrounding the frequency of fatal incidents, this rate of serious non-fatal exposures is expected to continue into the first year of modelling, with one serious exposure assumed to occur in the first year. Expressed in per heater terms, this estimate is equivalent to 3.49x10-6 serious non-fatal exposures per heater annually. Serious non-fatal CO exposures are assumed to result in symptoms resembling brain damage sequalae for a period of about 23 years. This is approximately half of the remaining life expectancy for a median aged Victorian resident. The rate at which these incidents occur is expected to decrease in line with reductions in the stock of new OFGSHs over the modelling period (to 2030). As the restriction will cause the heater stock to reduce at a faster rate than would otherwise be true under the Base Case, it is expected to reduce the number of serious non-fatal CO exposures caused by OFGSHs in Victoria by 0.13 over 10 years.

*Avoided low level illnesses*

For statistical purposes, the value of a single avoided low-level CO exposure is estimated to be $6,533 (based on key assumptions in section 4.2.6). There is no available data on the number or nature of low-level CO exposures caused by OFGSHs in Victoria. Anecdotal evidence, as discussed in the problem section indicates low level illnesses are significant – often mis-reported or mis-diagnosed because of the similarity of symptoms of CO poisoning to other illnesses such as headache, cold, cough, stomach upset. ESV audit data shows just over 11.2 per cent of households with OFGSHs tested in a non-random audit program (conducted following a serious non-fatal incident in August 2018) had OFGSHs that had serious levels of CO spillage, and 60 per cent experienced a negative pressure environment (not directly hazardous by itself but extremely hazardous if a problem occurs with an operating OFGSH appliance which causes spillage). Assuming that the population rate of CO spillage is approximately half of that observed in the audit data, and that just over 10 per cent of heaters that cause spillage lead to low level illness, it is estimated that there could be about 4,300 instances of low-level CO poisoning in the first year of the modelling period. We consider these are conservative assumptions particularly given the potential selection bias in the non-random ESV audit data. This represents 0.6 per cent of Victorian OFGSHs causing CO spillage that leads to illness in an average of 2.5 residents per household.[[117]](#footnote-118),[[118]](#footnote-119) As the restriction will result in the new heater stock reducing, it is expected to reduce the number of low level non-fatal CO exposures caused by OFGSHs in Victoria by 543 over 10 years.

**Energy efficiency benefits**

Option 1 is also expected to cause consumers to switch from OFGSHs to more energy efficient heating appliances, specifically either room sealed heaters or reverse cycle systems. This may be problematic for some consumers with limited short term cashflow, as the initial outlay required to purchase relatively energy efficient heating appliances can be greater than for OFGSHs. For example, it is estimated that purchasing and installing a 4.7 star room sealed gas space heater is, on average, approximately $950 more expensive than a OFGSHs.[[119]](#footnote-120) Due to a lack of financial information regarding those likely to purchase OFGSHs, it is unclear how many consumers would experience these cashflow concerns. Over the course of a 10 year period, however, this initial increase in purchase cost is expected to be significantly outweighed by lower operating costs.

As consumers transition to more energy efficient heating appliances household energy expenditure is expected to fall significantly. Over the course of the 10 year modelling period, reduced household energy costs under Option 1 could amount to about $4.9 million. In addition, Option 1 is expected to generate a benefit in additional profits for the reverse cycle industry of approximately $1.3 million.

**Other significant non-quantified benefits**

The likelihood that the benefits will outweigh the costs is increased when taking account of the trauma and grief avoided from death and serious injuries, as well as other avoided costs such as hospital, police and coroner’s inquest costs, which are likely to be significant but are difficult to assign a monetary value. Interruption to life and anxiety resulting from low level illnesses is also likely to occur, particularly if it is ongoing and the cause of illness is unknown but has not been measured quantitatively. It is noted that, using the VLSY method, impacts such as trauma and grief are only included in the quantification insofar as people tend to consider those things when considering personal risk.

Further benefits are also expected to arise from better room sealing generated by alternative heating appliances (e.g. room sealed gas space heaters and reverse cycle system), relative to OFGSHs, which can potentially improve health outcomes for residents. However, these benefits are difficult to quantify.

#### Option 2: Phase out through a fast-tracked standards-based approach

For a fast-tracked standards-based approach it is estimated that there would be 0.05 deaths, 0.09 serious illness and 403 low level illnesses avoided over 10 years. This would result in estimated benefits of $3.0 million over 10 years, partially offsetting the cost of the option which is $4.9 million.

If consumers switch from 1.7-star energy efficient OFGSHs to an even mix of 4.7-star energy efficient room sealed heaters and 3.8-star reverse cycle systems, reduced household energy costs under Option 2 could amount to about $3.6 million over 10 years while the avoided GHG emissions would amount to around $87,000. In addition, Option 2 is expected to generate a benefit in additional profits for the reverse cycle industry of just less than $1.0 million.

As a result, it seems reasonable to conclude that Option 2 would achieve the benefits required to break even, with total estimated benefits of $7.7 million expected to outweigh total estimated costs of $4.9 million.

It is noted that industry stakeholders have a preference for, and have been involved in, the development of the standards-based approach. A key driver for this option is concern about the potential consequence of any explicit ban on the reputation of the gas industry more broadly, particularly in terms of the potential impact on consumer preferences for gas versus other energy sources.

### Breakeven analysis summary

Table 4‑4 presents estimates of benefits associated with each option, relative to the Base Case illustrating that all phase out options are expected to breakeven given relevant cost estimates.

Benefits from switching to more energy efficiency heating appliances are significant for all options and expected to achieve benefits almost as great as the total costs of each option. These benefits are nearly $4.9 million for Option 1 and about $3.6 million for Option 2. Further, significant avoided health costs are expected for both options. These benefits are nearly $4.1 million for Option 1 and about $3 million for Option 2. Together, these benefits outweigh the estimated costs of $6.1m for Option 1 and $4.9m for Option 2.

The likelihood that the benefits will outweigh the costs for all options is increased when taking account of the trauma and grief avoided from death and serious injuries, as well as other avoided costs such as hospital, police and coroner’s inquest costs, which are likely to be significant but have not been assigned a monetary value. Interruption to life and anxiety resulting from low level illnesses is also likely to occur, particularly if it is ongoing and the cause of illness is unknown, however has also not been measured quantitatively.

Results of sensitivity testing are provided in Appendix E. Testing of key assumptions was found not to change the key findings of the analysis.

Table 4‑4 Benefits of phase out options, relative to the Base Case, over 10 years

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Base Case** | **Option 1 Restriction  on all future installations** | **Option 2 Phase out through a fast-tracked standards-based approach** |
| **Total estimated cost of options** | **$0** | **$6,126,089** | **$4,917,344** |
|  |  |  |  |
| **Avoided deaths and illnesses** | | | |
| Number of lives saved | 0 | 0.06 | 0.05 |
| Lives saved | $0 | $346,325 | $256,908 |
| Number of serious non-fatal illnesses | 0 | 0.13 | 0.09 |
| Avoided serious non-fatal illnesses | $0 | $161,715 | $119,962 |
| Number of avoided low level illnesses | 0 | 543 | 403 |
| Avoided low level illnesses | $0 | $3,546,365 | $2,630,740 |
| **Other benefits** |  |  |  |
| Incremental profits to reverse cycle manufacturers | $0 | $1,251,915 | $967,795 |
| Reduced household energy costs | $0 | $4,872,288 | $3,614,328 |
| Reduced greenhouse gas emissions | $0 | $114,667 | $86,567 |
| **Total estimated and quantified benefits** | **$0** | **$10,293,273** | **$7,676,300** |

Note: Some totals do not sum due to rounding

### Preferred phase out option

Both phase out options are expected to breakeven and achieve the primary objective of ensuring the health and safety of the community (see section 2.5). While Option 1 is estimated to avoid more deaths and illnesses than Option 2, Option 2 costs around $1.2 million less because it takes effect 7 months later. This delayed implementation allows Option 2 to better achieve other considerations on the objectives of the RIS (see section 2.5) including:

* Option 2’s implementation delay gives industry more time to prepare for the changes and transition production towards other heaters, limiting revenue reductions and potential jobs lost.
* Option 2 reduces the likelihood of intermittent stock shortages for alternative heaters, which could temporarily reduce the affordability of heating for some consumers.
* Option 2 is also expected to have lower impact on the broader gas market (i.e. impact on consumer perceptions of gas as an energy source) and therefore better maintains consumer confidence in gas.

At the same time, it needs to be recognised that:

* Because Option 2 takes effect seven months later than Option 1, it means slightly fewer deaths and illnesses avoided (estimated 0.01 deaths, 0.04 serious illness, and 140 low level illness). Option 2 also allows existing certified stock to continue to be sold even after the standard commences on 1 January 2022 – in contrast under Option 1 existing stock cannot be sold after 1 June 2021. This might mean slightly fewer avoided deaths and illnesses; however, the trade-off is that industry and the community has more time to adjust to the change. As noted above this will reduce the risk of stock shortages, job losses and negative impacts on the gas market. It is considered that this trade-off is reasonable in the circumstances.
* Option 2 might also be less effective in enforcing compliance relative to Option 1, because it does not provide as strong a compliance/enforcement framework **in Victorian legislation**. At the same time, national compliance mechanisms do exist, and they should be sufficient to ensure the integrity of the phase out.

As such, the preferred approach is the fast-tracked standards-based approach (Option 2). Overall, the fast-tracked standards-based approach is preferred due to its lower expected costs, its potentially lower impact on the broader gas market, and the relatively small difference in estimated net benefits between the options.

In the unlikely event that the fast-tracked standards-based approach cannot come into effect on 1 January 2022, or within acceptable timeframes, the Minister may proceed to introduce the proposed regulatory amendments for Option 1 either on or before 1 January 2022 to achieve its objectives. If this were to occur, it is estimated that the costs and benefits realised under this option would not change.

#### Scope considerations for the preferred option

The scope of Option 2 is to implement a standard that restricts the production and sale of OFGSHs, with the exclusion of fan-assisted OFGSHs that meet certain exemption criteria detailed in this RIS. The modelling in the break-even analysis includes forecast sales of all OFGSHs, including fan-assisted OFGSHs, as sales data on specific models of heaters was not provided during consultation with industry. There are currently six active certifications of fan-assisted OFGSHs, and it is unknown whether they meet the full definition, and therefore would be excluded from any change in standards made as part of Option 2. It is possible that at least one, if not more, of the six fan-assisted OFGSH certifications would meet the definition and therefore would not be in scope. Therefore, it is possible that the costs to industry are slightly lower than what is calculated in this RIS, due to all fan-assisted OFGSHs being included in the modelling.

Additionally, there are currently six certifications of Type 2 decorative gas appliances which partially meet the definition of an OFGSH, in that they (i) are designed to be connected to a flue system including chimneys; and (ii) the combustion air is drawn from the room or space in which it is installed. It is possible some or all of these Type 2 decorative gas appliances may fall into the definition of an OFGSH, if they do meet the thermal efficiency requirements of AS/NZS5263.1.3:2016.

These appliances have not been included in the modelling of costs to industry, however if they were to fall within the scope it is expected the cost-benefit ratio would remain the same, and benefits would still outweigh costs. This is because the cost to industry would be offset by the benefit to consumers regarding energy efficiency and savings in running costs.

### Key data and assumptions

Table 4‑5 presents the detailed assumptions underpinning the calculations of costs and benefits associated with the phase out options.

Table 4‑5 Key data and assumptions – phase out options

| **Variable** | **Key data and assumptions** |
| --- | --- |
| Modelling | * Timeframe for modelling is 10 years (which would be the life of the Regulations approach). If a longer timeframe were considered, it would be expected that the benefits realised under each option would increase, however not by any significant amount. Given each of the options considered already break even, and Option 1 breaks even after halving the expected energy efficiency benefits, extending the modelling period is not expected to materially alter results. * No discount rates are applied - $ are real 2021.[[120]](#footnote-121) |
| Heater stocks and future sales of OFGSHs | * Sales estimates and forecasts provided by GAMAA for the period spanning 2015 to 2028 have been used to estimate the stock of OFGSHs. Note GAMAA estimate of future sales assumes sales of OFGSHs fall to zero by 2026-27, down from 7,333 in 2018-19. Total sales of OFGSHs over 10 years is assumed to be 10,041 units. This relatively significant decrease means the estimated safety benefits impact of the phase out options is smaller than if forecast sales in the Base Case were larger. * While estimates developed for this RIS assume the absolute number of OFGSHs installed in Victorian buildings differs from (is less than) earlier estimates commissioned by DELWP (2018), analysis does assume that the proportion of OFGSHs retired each year is consistent with the findings of that study. This varies each year but typically ranges from 7 to 8 per cent of the total OFGSH stock. Specifically, the rate of retirement increases each year, from 7.45 per cent in FY2021 to 7.78 per cent in FY2030. * Deloitte projections of the stock of OFGSHs installed in Victoria commence in 2015. The projections commence in 2015 to align with revised sales data provided by GAMAA, which also commence in that year. It is assumed that 395,003 OFGSHs were installed in buildings across Victoria in 2015. * The stock of OFGSHs in Victorian buildings is therefore projected to decline to 135,274 by the close of FY2030-31 under the Base Case. * Industry has advised that “…*All manufacturers have indicated that the*[ir] *limited development funds available will not be used to further develop new OFGSHs*.” If this is correct this means that all options will in practice lead to zero future OFGSH sales. |
| Consumer decisions | * Should installation of OFGSHs be phased out through any of the proposed options, 50 per cent of Victorian consumers that would have purchased an OFGSH under the Base Case instead choose to purchase a room sealed (RS) heater. The remaining 50 per cent choose to purchase a reverse cycle system. * This reflects broader trends of rising gas prices and a decline in the lifecycle costs associated with reverse cycle systems. * Although there is anecdotal evidence that some owners of OFGSHs already have reverse cycle system (which they use for cooling, but not heating) and hence might not incur any costs for a new heating appliance, this has not been factored into our analysis. |
| Timing of phase out options | * A restriction on the installation of OFGSHs through regulations (Option 1) will commence from 1 June 2021. * A fast-tracked standards-based approach (Option 2) implemented through amendments to AS/NZS 5263.1.3 and AS/NZS5263.1.8 would take effect on 1 January 2022. |
| Industry costs: change in profits | * Data from DELWP and ESV suggests that the retail price of an OFGSH is $1,703 excluding installation, which costs an additional $574. * Data from DELWP and ESV suggests that the retail price of a room sealed heater is $1,905 and the cost of installation is $1,329 per heater. * Similarly, the average retail price of a 3 to 8kW reverse cycle system is $1,236 excluding installation which costs a further $1,030. * The prices and installation costs of all heaters remain the same in real terms. Heaters do not increase or decrease in price as a result of more/less demand. * The gross margin on OFGSHs is assumed to be 30 per cent while the gross margin on a room sealed heater is assumed to be 20 per cent reflecting transition costs incurred by the gas heater industry. All manufacturers who currently produce OFGSHs will either shift to manufacturing alternative gas heating appliances (e.g. room sealed gas heaters) or exit the heater market. * The gross margin on reverse cycle systems is also assumed to be 30 per cent * 10,041 units of OFGSHs are expected to be sold over 10 years in Victoria (GAMAA) which declines at different rates based on the option. (see also discussion on heater stocks above). * The decline in profits for the gas heater industry is greatest under the restriction on future installations and phase out through prescribed regulations, relative to other options. |
| Community costs: cost of purchasing more expensive heaters | * Retail price OFGSHs, reverse cycle systems and RS heaters as above * The sales of OFGSHs are as per GAMAA’s estimates above, however sales decline at different rates depending on the option. * Consumers that would have purchased OFGSHs under the Base Case purchase either a reverse cycle system or a room sealed gas heater. While the reverse cycle is cheaper than a room sealed heater, the room sealed heater is able to deliver the feeling of radiant heat that a reverse cycle system cannot. * The additional cost of purchasing more expensive heaters is greatest under the restriction on all future installations and phase out through prescribed regulations. While the cost imposed on the community to purchase alternative heaters is high, the decision to purchase a more efficient heater does also produce benefits to the community (see energy efficiency). |
| Government costs: monitoring and enforcement | * DELWP indicated that in 2019 it spent $1,217,000 on educational awareness campaigns to alert the community about the dangers of CO. This includes campaigns run by ESV. * DELWP estimates its expenditure on education campaigns under the Base Case will be $483,000 p.a.[[121]](#footnote-122) * Incremental monitoring and enforcement costs for all options are assumed to be zero, relative to the Base Case. |
| Government costs: implementation | * Implementation, monitoring and enforcement costs will be up to $0.8 million for all options. |
| Safety benefits: lives saved | * This is measured using the GBD methodology and Value of Statistical Life Year benchmark. * Value of a statistical life year (in $2020) is assumed to equal $219,390.[[122]](#footnote-123) * The trend of 2 fatal incidents over the past 10 years is expected to continue into the first year of the modelling period. Each fatal incident is expected to result in 2.5 deaths, consistent with the average number of residents living in Victorian households. The number of fatal incidents is expected to decline thereafter, based on the forecast stock of OFGSHs in Victorian buildings. * Victims of fatal CO exposures are assumed to have a life expectancy of 82.33 years – the gender weighted average life expectancy in Victoria. * Victims are also assumed to be 36.00 years of age at their time of death – the median age of a Victorian resident. |
| Safety benefits: avoided non-fatal CO exposure | * This is measured using the GBD methodology. * Serious illness: It has been assumed that a single serious non-fatal CO exposure occurs in the first year of the modelling period. This serious exposure is assumed to cause symptoms that resemble brain damage sequalae for a period of 23.16 years, which is half the remaining life expectancy of a median aged Victorian resident.[[123]](#footnote-124) Brain damage sequalae have a disability weighting of 0.35.[[124]](#footnote-125) The number of similar incidents is assumed to continue at the same per heater rate over the following years. The total number of serious CO exposures, however, is expected to decline in line with the stock of OFGSHs in Victoria. * The initial assumed incidence rate of one serious non-fatal CO exposure is based on data provided by ESV – 8 serious exposures in the 8 years between 2010-11 and 2018-19. * Low level illness: Based on ESV audit data, which shows just over 11.2 per cent of households tested in a non-random audit program (conducted following a serious non-fatal incident in August 2018) had OFGSHs which had serious levels of CO spillage. It was also found that about 60 per cent of all OFGSHs considered during the audit were installed in areas where negative pressure conditions could eventuate (not directly hazardous by itself but extremely hazardous if a problem occurs with the OFGSH appliance which causes spillage). As a result, it has been assumed that there could be around 4,300 instances of low level CO poisoning in the first year of the modelling period. This represents 0.6 per cent of Victorian OFGSHs causing CO spillage that leads to illness in 2.5 residents per household.[[125]](#footnote-126) This exposure is assumed to cause symptoms such as cold, headache and dizziness for 6 months per incident (this length of time is a Deloitte estimate based on use of heater in a year).[[126]](#footnote-127) A disability weighting[[127]](#footnote-128) of 0.06 is used, which is the disability weighting for asthma.[[128]](#footnote-129) |
| Energy efficiency: reduced energy costs / reduced GHG emissions | * All OFGSHs are assumed to have a 1.7-star energy efficiency rating. All RS gas space heaters are assumed to have a 4.7-star energy efficiency rating, and reverse cycle air conditioners have a 3.8-star energy efficiency rating. Based on selected OFGSHs, RS gas space heaters and reverse cycle air conditioners, the average energy efficiency ratings observed are as follows; * OFGSH: 1.7 stars * RS gas space heaters: 4.7 stars * 3 to 8 kW reverse cycle air conditioners: 3.8 stars. * Under each of the options, half of the consumers default to purchasing RS gas space heaters (the next cheapest alternative in terms of capital and installation costs). The other half are assumed to purchase reverse cycle air conditioners (more efficient, heating and cooling capacity). * All heating units are assumed to be installed and operated in medium rooms (approx. 30m2). * Assumed running costs and greenhouse gas emissions have been estimated based on a linear extrapolation of parameters outlined by Sustainability Victoria for 3- and 5-star gas space heaters and reverse cycle air conditioners. |

### Analysis of CO alarms

Breakeven analysis is used in this section to assess potential for mandatory CO alarms in rental properties.

### Cost of CO alarms

The cost of purchasing and installing CO alarms in rental properties with an OFGSH is approximately $7.9 million.[[129]](#footnote-130)

The key assumptions are an average cost for a CO alarm of $60 and that, as per ESV advice, CO alarms should be replaced every 7 years, which means there are two CO alarm purchases over the 10 year period from 2020. Each rental household with an OFGSH throughout the 10 year period purchases one alarm, twice. The number of households that purchase the 2nd alarm after 8 years is reduced because existing OFGSHs in households is expected to decline over the period. All key data are outlined in section 4.2.6.

### Benefits of CO alarms

The following benefits will be achieved by the introduction of transitional measures:

* Lives saved
* Avoided serious non-fatal illnesses
* Avoided low level illnesses.

CO alarms alert people within a room (or dwelling) to the presence of CO. Considering that this gas is tasteless, odourless and visually undetectable, a CO alarm has the potential to save lives and prevent CO poisoning if the alarm is in good working order and functions properly, is installed in the correct locations, and people respond appropriately to the alert tone.

Broadly speaking, for a CO alarm to be effective it must be installed in the correct location, have a back-up battery (if hard-wired) and have batteries that are charged (if battery powered). The alarm should also be replaced according to the manufacturer’s advice surrounding the useful life of the device. CO alarms generally have a useful life of somewhere between 7-10 years (depending on the device) and thereafter the electrochemical sensor that detects CO begins to malfunction. It is therefore imperative that alarms are replaced accordingly. Similarly, a CO alarm cannot alert people to the dangers of CO if it is not installed correctly, or if it does not have power.

Another technical consideration is that CO travels in clusters throughout a room. As such, a CO alarm will not always alert to the presence of CO in a room if the CO is located in a different part of the room than the CO alarm. Indoor airflows may direct CO away from alarms and into other rooms. Depending on how and where the CO is produced, there may be very significant concentration gradients throughout a residence. The following comment was made by an expert consulted as part of the inquests into the deaths of Chance and Tyler Robinson (2010):

*“[The CO alarm] may be high, it may be low; it may be in the middle of the room. If you had an engineer to work that out and say, yes, this is where it needs to be placed, all you’d need to do is open a window which could change all the dynamics and you may have a room that has high contents of carbon monoxide in one corner but may not have it in another”.[[130]](#footnote-131)*

A 2011 audit conducted by the Health and Safety Executive of the UK found more than 20 per cent of the CO alarms sampled had been fitted incorrectly.[[131]](#footnote-132) This was mainly due to alarms being installed either at the wrong height, or too far away from the potential source of CO. Similarly, in Victoria, CO alarms do not need to be installed by licensed technicians and can be installed incorrectly as a result.

Even if the CO alarm is in good working order and fitted correctly, for a CO alarm to save lives or minimise illnesses from carbon monoxide exposure, any person within a dwelling who hears a CO alarm being triggered must respond appropriately by turning off all gas appliances, seeking fresh air and calling a technician to inspect the appliance (if necessary). Because CO is not an easily detectable gas people can incorrectly ignore the alert tone of the CO alarm as they cannot detect danger themselves.

Technical experts consulted as part of the RIS process (including ESV, Master Plumbers and other industry representatives) advised that due to potential for variability in factors including correct installation and location, the risk of false alarm or no alarm could be an issue with CO alarms. Therefore, the type of CO alarm and the way it is installed is critical to the efficacy of CO alarms in mitigating risks.

Given these factors, it is therefore challenging to estimate the number of avoided fatalities and illnesses attributable to CO alarms.

Analysis in the 2012 DRIS estimates an 11.31 per cent reduction in the risk of CO exposure in response to CO alarms. However, limited information was provided in the 2012 DRIS about how this percentage reduction was determined. Given the factors discussed above about the efficacy of CO alarms (also see other research in Appendix C), this RIS has taken a conservative approach and assumed a 5 per cent reduction in CO risk[[132]](#footnote-133) due to CO alarms.

The analysis considers the residual safety risk posed by OFGSHs installed in Victorian rental properties (i.e. the risk posed by OFGSHs already installed in Victorian buildings after the implementation of the preferred fast-tracked standards-based approach). This residual risk reflects the health costs expected from OFGSHs installed in rental properties, including fatal CO exposures, as well as serious and low level non-fatal CO exposures. Research commissioned by ESV suggests that approximately 32 per cent of fixed space gas heaters are installed in Victorian rental properties.[[133]](#footnote-134) It has been assumed that the same proportion of OFGSHs are installed in rental properties across Victoria. Taking this into account, the residual safety risk posed by OFGSHs installed in Victorian rental properties is estimated to be approximately $74.9 million over the next 10 years.[[134]](#footnote-135) The $75 million is calculated using the global burden of disease methodology. It is the estimated health costs incurred by those living in rental properties where OFGSHs are installed over the next 10 years, reflecting a mix of fatal and non-fatal health exposures and their resulting impact of quality of life for these individuals.

Applying an assumption that CO alarms reduce the residual safety risk in rental properties by 5 per cent to the residual safety risk of $74.9 million results in an estimated safety benefit from CO alarms of $3.7 million.

### Breakeven analysis for CO alarms

Using the GBD methodology, the cost of CO exposures caused by OFGSHs in Victorian rental properties is expected to amount to $74.9 million over the next decade. This assumes private rental properties make up 32 per cent of all buildings where OFGSHs are installed, and the risk of CO exposures is evenly spread across these buildings.

Assuming CO alarms lead to a 5 per cent reduction in the risk of CO poisoning, benefits are estimated to be $3.7 million. This is less than half the $7.9 million cost of installing CO alarms in all rental properties.

If the risk reduction is higher – using an 11.3 per cent risk reduction was used in the 2012 DRIS - then the measure would just breakeven, with $8.5 million of benefits versus costs of $7.9 million. There are also significant practical challenges with a mandatory approach, particularly if it is targeted at OFGSHs alone (as compared to risks of CO poisoning from other appliances commonly used in households). It would be difficult to support effective compliance (given consumers are unsure about whether they have an OFGSH) and it is anticipated there would be high levels of non-compliance and that effective enforcement measures would be difficult (both to identify relevant households and to audit for compliance).

For these reasons this RIS does not recommend the mandatory installation of CO alarms to address the risk of CO poisoning from OFGSHs.

It is noted that reported CO incidents have been associated with a range of products, and not just OFGSHs. CO alarms are currently mandated in some jurisdictions overseas, however not for the sole purpose of monitoring OFGSHs. Examples include: (i) in rental properties with coal or wood burning heaters in England and Wales (but not mandated for gas heaters); (ii) in all new homes in Scotland and Northern Ireland; and (iii) in all residential properties in many US states and Ontario, Canada. Given the scope of this RIS is targeted to OFGSHs, CO alarms more broadly (in line with regulations overseas) could be considered as part of a separate process. i.e. there is potential to consider the benefits of CO alarms addressing the CO risks from a range of products, not just OFGSHs. This different scope might lead to a different finding on CO alarms.

### Key data and assumptions

Key assumptions underpinning the analysis of CO alarms is outlined in Table 4‑6.

Table 4‑6 Key data and assumptions - CO alarms

| **Variable** | **Key data and assumptions** |
| --- | --- |
| Community costs: cost of purchasing CO alarms | * All consumers with an OFGSH residing in a rental property will purchase a CO alarm in FY2021 (year 1) so that they are compliant with the policy when it commences in FY2022. * DELWP has advised that rental properties with OFGSHs would require at least one CO alarm that meets either the European or US standard on CO alarms. It is therefore assumed that every OFGSH located in a rental property has at least 1 CO alarm installed in the dwelling. The cost of this requirement for rental properties would be incurred by landlords. * The average cost of a CO alarm is $60[[135]](#footnote-136) and this is unchanged over time * Under the Base Case 5 per cent of rental households with an OFGSH already have a CO alarm in FY2021. * As per ESV advice, CO alarms should be replaced every 7 years[[136]](#footnote-137) * It is assumed that every household that still owns an OFGSH purchases a new CO alarm in FY2028 i.e. there are two CO alarm purchases over the 10 year period from 2020, for those households that have an OFGSH throughout the 10 year period. The number of such households declines over time as heaters are replaced. * It is assumed that households purchase single function CO alarms only, rather than combined alarms which are used to detect both smoke and CO in their environment. Given smoke alarms are mandatory in Victoria and should already be in installed, it is not unreasonable to assume that single function CO alarms will form the vast majority of alarms purchased over the 10 year modelling period. |
| Government costs: implementation | * Government expenditure on education under the Base Case is estimated to be $0.8 million in 2020-21, and that $0.8 million is incurred annually over 10 years.[[137]](#footnote-138) * Implementation costs for CO alarms have not been modelled. |
| Government costs: monitoring and enforcement | * It is assumed that there are no additional monitoring and enforcement costs (relative to the preferred option) for any of the transitional measures. * Costs of monitoring and enforcement will be absorbed into existing funding arrangements. |
| Safety benefits: lives saved, avoided non-fatal CO exposure | * Assume that each transitional measure yields additional benefits from avoided fatalities, proportionate to the residual risk estimated to exist in rental properties after implementing the preferred phase out option. Upper and lower bounds have been used to deal with uncertainty. * Note there is extremely limited research evidence available about the effectiveness of CO alarms and mandatory servicing. Assumptions about the effectiveness of CO alarms and mandatory servicing are therefore based on findings from consultation with stakeholders. A 5 per cent reduction in risk is assumed as discussed above. * It is assumed that rates of servicing do not change into the future (consistent with a recent evaluation of the Be Sure campaign), and the per heater health risk posed by OFGSHs remains unchanged as a result. However, a scenario where the incidence of fatal and non-fatal CO exposures falls due to future education campaigns is considered as part of the sensitivity analysis presented in Appendix E. |

# Small business and competition impacts

The impact on small business and competition of the preferred option is expected to be small.

Small businesses may experience disproportionate effects from the preferred options for a range of reasons. This may include that the requirement applies mostly to small businesses, or because small businesses have limited resources to interpret compliance requirements or meet substantive compliance requirements compared to larger businesses. Small businesses may also lack the economies of scale that allow fixed regulatory costs to be spread across a large customer base.

The Victorian Guide to Regulation also requires a RIS to assess the impact of regulations on competition. Regulations can affect competition by preventing or limiting the ability of businesses and individuals to enter and compete within particular markets. In undertaking this assessment, we have considered questions such as:

* 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?
* Will it be more difficult for new firms or individuals to enter the industry after the imposition of the proposed measure?
* 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.)?
* Will the proposed measure restrict the ability of businesses to choose the price, quality, range or location of their products?
* Will the proposed measure lead to higher ongoing costs for new entrants that existing firms do not have to meet?
* Is the ability or incentive to innovate or develop new products or services likely to be affected by the proposed measure?

The preferred option determined in this RIS (a fast-tracked standards-based approach to commence 1 January 2022) is expected to have a relatively more significant impact on a small number of manufacturing businesses operating in Victoria than larger businesses in the market. The most impacted businesses will be those that are smaller and/or have a product range that is less diversified across different types of appliance, because they will experience disproportionately more change to their manufacturing process e.g. cost of changes to manufacturing plant/design). However, it is understood there are only a few such businesses at most. Industry has also indicated that the Base Case forecasted OFGSH sales for 2021-22 are unlikely to change if this approach is adopted. Under the preferred option, sales would likely reach zero five years earlier than the Base Case.

Consultation with industry indicated that several businesses in the industry are already shifting their manufacturing processes away from the manufacture of OFGSHs. As discussed in this RIS, sales of OFGSHs are declining and forecast to approach zero in 2027, reflecting a shift in consumer trends and manufacturing that is already occurring. Most manufacturers are already producing gas heaters (such as room-sealed heaters) that eliminate the risks posed by OFGSHs. OFGSHs are old technology that has already been superseded by innovation and new technology, prior to government intervention.

Extensive consultation has also been undertaken with industry over multiple years on this issue and it is therefore expected that industry would generally be anticipating change and have already adjusted their processes in anticipation or, be planning to do so. It is noted that industry has broadly supported the standards-based approach.

The preferred option might impact competition in the gas appliance manufacturing sector if small businesses that are less diversified end up exiting the industry. It is possible that the gas heating sector will become slightly more concentrated as a result, although this impact is expected by be small as impacted small businesses only comprise a small share of the sector.

In relation to new entrants, it is noted that there is already a shift away from OFGSHs towards other types of heating, with a low likelihood of new entrants in the absence of any intervention. This impact is therefore considered minimal.

Adopting the Standards-based approach means there is still opportunity to innovate solutions that partially address the CO risk (the safety outcomes of this innovation are as yet untested). One business noted this view during consultation, although consultation with industry has generally indicated that development of new OFGSHs that meet the Standard is unlikely. There was broad agreement across manufacturing businesses that technological innovation for OFGSHs was infeasible from a technology and cost perspective. Consumer and manufacturing trends show innovation is more likely to be focused on other types of heating rather than OFGSHs.

In summary, while the preferred option is expected to have some impact on small business and competition, this impact is expected to be minimal and is considered necessary to achieve government objectives, as well as the estimated benefits of the preferred option (Option 2), which outweigh the costs.

Noting that in the event the fast-tracked standards-based approach cannot come into effect on 1 January 2022, or within acceptable timeframes, DELWP will proceed to introduce the proposed regulatory amendments for Option 1 to achieve its objectives. The regulations would be expected to commence on or before 1 January 2022. If this were to occur, it is estimated that the costs and benefits realised under this option would not change.

# Implementation plan

### Path for implementation

As discussed elsewhere in this RIS, the preferred approach is for a fast-tracked approach to amending the relevant Australian Standards (AS/NZS 5263.1.3 and AS/NZS 5263.1.8) through the issuance of a GTRC Technical Guidance Bulletin. Technical Guidance Bulletins are the method Australia’s gas technical regulators (including ESV) use to require the implementation of changes without waiting for standards to be amended or revised. Technical Guidance Bulletins provide technical guidance to CABs and other stakeholders on a position by jurisdictions on specific issues. They require CABs to ensure information in Technical Guidance Bulletins is taken into account when considering whether to certify gas equipment. Importantly, CABs must withhold certification if appliances do not meet the requirements in GTRC Technical Bulletins.

The GTRC approach ensures a national approach and therefore ensures consistency between jurisdictions and removes any confusion that would occur if appliances were still accepted in other jurisdictions and displayed a certification label.

The GTRC has indicated its support for this approach.

In this case the GTRC would require OFGSHs to shut down safely in a negative pressure environment in order to be certified. More specifically, OFGSHs must shut down and not spill combustion products for more than 15 minutes in a negative pressure environment or shut down before the concentration of CO in a test room of 30 to 40m3 exceeds 150 ppm (parts per million). The appliance shut-down would be such that the appliance cannot automatically reset but rather would require intervention by a licensed practitioner to reset.

While the GTRC approach is in place, the usual process for amending the Australian Standard will proceed, however this is not expected to be implemented before 31 December 2023.

Once the amended Australian Standards have been published the GTRC Technical Guidance Bulletin will be withdrawn.

### Implementation tasks

This section provides an overview of the tasks needed to implement the proposed changes, who is responsible and the expected timing for completion.

Table 6‑1 Tasks and timing

| **Task** | **Responsibility** | **Timing** |
| --- | --- | --- |
| Industry submits project proposal to Standards Australia to amend AS/NZS 5263.1.3 and AS/NZS 5263.1.8. | Industry | February 2021 |
| Amend AS/NZS 5263.1.3 and AS/NZS 5263.1.8 to include the new requirements. | Standards Australia Committee AG-001 (including ESV, industry, Standards Australia) | March – December 2021 |
| Develop GTRC Technical Guidance Bulletin requiring the technical guidance to come into effect from 1 January 2022 until such time as AS/NZS5263.1.3 and AS/NZS 5263.1.8 are amended accordingly. | ESV | March 2021 |
| Prepare and send communication informing stakeholders and Government Departments that a fast-tracked standards-based approach will be undertaken.[[138]](#footnote-139) | DELWP | Following release of the GTRC Technical Guidance Bulletin |
| Communicate to industry and undertake engagement on any issues of concern. | DELWP and ESV | Ongoing |
| Develop and deliver high level public communications to promote awareness of the change. This will be delivered through the annual CO awareness campaign running over winter. | DELWP and ESV | April 2021 |
| Develop compliance and enforcement policy. ESV enforcement will be of the CABs where the expectation is that manufacturers have had their product assessed against the GTRC Technical Bulletin by 1 January 2022. ESV would expect and could direct CABs to suspend certificates if product is not assessed by this date. The VBA will have a role in compliance and enforcement of gasfitting installations under the Victorian plumbing regulatory framework. | ESV | Finalised policy prior to implementation – before 1 January 2022.[[139]](#footnote-140) |
| Develop new guidance materials for manufacturers, suppliers, retailers, CABs and gasfitters to support the new Standard. | ESV | Guidance materials released in the lead up to the new requirements coming into effect on 1 January 2022. |
| Develop evaluation information and data strategy. This will include a role for the VBA in providing registration and compliance certificate data | DELWP and ESV | Finalised strategy developed by implementation – before 1 January 2022. |

### Who will be doing it?

Under the current regulatory framework, ESV and the VBA both have separate responsibilities to enforce compliance under the GS Act and regulations.

ESV will be primarily responsible for implementation of the proposed changes through the GTRC Technical Guidance Bulletin, including monitoring compliance through the CAB assessment process.

DELWP will lead key strategic policy development and stakeholder communications.

ESV will take appropriate enforcement action where any standards or any regulations under the GS Act are found to have been breached.

### Who will monitor implementation?

Monitoring of overall implementation, including identification and management of implementation risks, will be undertaken by DELWP, with support from ESV. ESV will monitor the implementation of its own actions and report to DELWP.

DELWP and ESV will assess the implementation status of the approach described above throughout 2021, noting that it is ultimately out of the Victorian Government’s control.

It is unlikely but possible that not all members of the GTRC (i.e. every state in Australia) may agree to the GTRC Bulletin (although advice from ESV is that all members agree at the present time). In the event that the process is not proceeding as expected by the second half of 2021 then:

* ESV can release a Victoria-specific bulletin if necessary or consider using its statutory powers under the GS Actto affect certification, sale and supply of OFGSHs
* DELWP will give consideration to implementing a restriction on the installation of OFGSHs through amendments to the Gas Safety (Gas Installation) Regulations. Draft amendments to the Regulations are set out in Appendix D.

# Evaluation strategy

### Purpose

This evaluation strategy has been developed to evaluate the effectiveness and efficiency of the preferred option, which is the fast-tracked standards-based approach.

As per the *Victorian Guide to Regulation*[[140]](#footnote-141) the key elements of the evaluation strategy are as follows:

* What will be evaluated?
* How it will be done?
* Who will do it?
* When it will be done?

### What will be evaluated

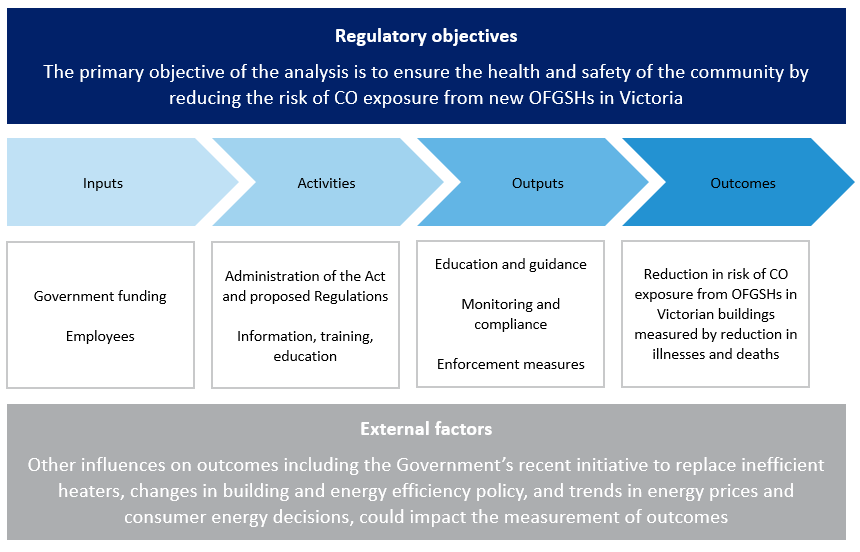
The evaluation will measure whether the preferred option meets its objectives and achieves their desired outcomes.

As set out in section 2.3, the primary objective of the phase out of OFGSHs is to ensure the health safety of the community by reducing the risk of CO exposure from new OFGSHs in Victoria.

An evaluation logic map highlighting the activities, outputs and outcomes underpinning these objectives is set out in Figure 7.1. The logic map defines the objectives and the strategies or activities that will be used to achieve those objectives.

The effectiveness of the preferred option will be measured by reduction in illnesses and deaths as a result of CO poisoning from OFGSHs. Given some data issues (discussed further in section 7.3.4), effectiveness of the preferred option will also be measured by outputs such as number of OFGSHs sold and enforcement activities.

Figure 7.1 Evaluation logic map



Source: Deloitte Access Economics

### How it will be done

### Design

The design of the evaluation comprises information collection before and after the introduction of the preferred option to assess how and whether change has occurred, and in what direction. Measure of “Before” the introduction of the preferred option is the baseline measure of outcomes.

The evaluation will adopt a mix of both qualitative and quantitative methods.

Qualitative evaluation methods will draw on stakeholder consultation (such as interview and surveys) with organisations and individuals that are impacted by the change:

* DELWP, ESV, DHHS, CAV and other Victorian Government Departments and agencies as appropriate
* CABs, retailers, suppliers, manufacturing businesses and industry groups
* Health professionals.

This will enable the collection of information regarding, for example:

* Issues encountered by ESV regarding administration, compliance and enforcement
* Stakeholders’ understanding of the proposed standards-based approach, costs of compliance and changes in behaviour brought about by the change
* Any health impacts.

The quantitative method of evaluation will involve assessment of baseline data against data collected after the introduction of the preferred option. Specific methodologies for the collection and analysis of data will vary depending on the indicator in question.

### Establishing a baseline

The proposed baseline is the 2020-21 financial year, which is the final complete year of the status quo. However, regard will also be had to deaths and illnesses since 2010 when improved information began to be collected about deaths and illnesses. The evaluation will have to closely analyse and judge the impact of the preferred option against external impacts, including notably the Government’s plan to spend $335 million to replace inefficient heaters (including OFGSHs), full details of which are yet to be released but which are expected to result in 100,000 OFGSHs being removed. This reduction is significantly greater than the number of new OFGSHs that will now not be installed as a result of the preferred option in this RIS (estimated to be just over 5,000 appliances).

The current available data sources as outlined above will be the main data sources used to establish the baseline for comparison.

### Data sources

The evaluation will largely use currently available data sources to assess the **outcomes** of the preferred option, including:

* Number of illnesses from CO poisoning, from DHHS/hospital data
* Number of serious illnesses and deaths from CO poisoning, from DHHS/hospital data
* The number of CO incidents reported to and investigated by ESV.

As discussed in the analysis, the number of low level illnesses from CO poisoning is understood to be significant, but there is a high level of uncertainty about this number, and the analysis undertaken is based on an estimate. There are also data issues around the serious illnesses reported. The potential to improve these data issues is discussed below.

### Data improvement

As part of the implementation process, DELWP and ESV will undertake a review of existing data sources to assess gaps in data and identify areas and strategies for improvement. This will include considering whether new types of data/information need to be collected to better understand the effects of the new approach.

The objective will be to ensure that adequate data is available to enable effective evaluation of the preferred option. Depending on the outcomes of this review, quantitative data sources will be developed to ensure that appropriate data is collected, and managed or alternative processes considered, such as additional stakeholder consultation.

An obvious data issue is lack of information on low level illnesses, as noted above. This is not an easy information gap to address, because low level illnesses are often misdiagnosed at the doctor level. Data on serious illnesses from OFGSHs poisoning is also problematic as poisoning cases are sometimes bundled together with cases of CO poisoning from other sources at the hospital level. These data issues would require significant work and collaboration to address and would need to be considered as part of a separate process.

An important output is the number of OFGSHs in buildings, however only rough survey data is available to support this. Surveys, such as market research commissioned by ESV or existing annual reports which track Victorian consumers’ primary heating source could be used to track the types of heaters in households over time.

### Who will do it

Responsibility for the evaluation will be shared between DELWP and ESV as the agencies with prime responsibility for gas safety. Integrated and coordinated delivery of the evaluation will provide for the clearest lines for meeting the evaluation objectives and ensure learning and improvement can occur at both the departmental (legislative) and regulator levels.

ESV is responsible for ongoing monitoring and will play a significant role in data collection and management activities. DELWP will be responsible for the whole of government policy evaluation. The VBA will support the evaluation, including by provision of data on installations.

### When it will be done

Table 7‑1 outlines a high-level overview of when evaluation activities will occur.

Table 7‑1 Timeline for evaluation

| **Activity** | **Timing** |
| --- | --- |
| Establish baseline | Prior to preferred option being introduced. This RIS forms a substantial part of the work in establishing a baseline. |
| Data collection | From introduction of preferred option. |
| Data monitoring and reporting | From introduction of preferred option. Review of data and outcomes will be continuous. |
| Early evaluation that assesses short term outcomes and identifies potential improvements | Third year of operation of the preferred option. |
| Evaluation of effectiveness and efficiency of preferred option | After 10 years. |

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Appendix A - Stakeholder consultation

**Who was consulted?**

Consultation was undertaken with:

* Department of Jobs, Precincts and Regions
* Department of Health and Human Services Victoria
* Department of Justice and Community Safety
* Department of Treasury and Finance
* Department of Premier and Cabinet
* Department of Education and Training
* Eight manufacturing businesses: Climate Technologies, Fireplace Products Australia, Glen Dimplex Australia, Illusion Australia, Jetmaster Australia, Seeley International - group consult
* GAMAA – one-on-one consult plus group consult
* Australian Gas Association – group consult
* International Association of Plumbing and Mechanical Officials – group consult
* British Standards Institution – group consult
* SAI Global – group consult
* Global Mark – group consult
* Joint Accreditation System of Australia and New Zealand – group consult
* Community Housing Industry Association of Victoria – group consult
* Victorian Council of Social Service – group consult
* Brotherhood of Saint Laurence – group consult
* Victoria’s Public Tenants Association – group consult

In addition, ESV and the VBA were engaged with by DELWP to supply ongoing technical advice in relation to the options, and information on the industry.

In addition to direct stakeholder engagement, DELWP and Deloitte also prepared a Discussion Paper, which was posted on the EngageVic [website](https://engage.vic.gov.au) on 4 December 2019 and emailed to key stakeholders that had expressed their interest in the RIS. Additionally, an Addendum to the Discussion Paper was posted on the EngageVic website on 23 December 2019 and emailed to key stakeholders. Responses to the Discussion Paper and Addendum closed on 31 January 2020. DELWP received a total of 44 responses to the Discussion Paper and Addendum, which have contributed to options development.

## How were they consulted?

Stakeholders were consulted in one of three ways:

* Discussion paper
* Semi-structured one-on-one interviews
* Semi-structured group interviews.

## What information was collected?

Stakeholders were asked about the underlying problem of CO poisoning and OFGSHs, potential options to address the problem, costs and feasibility of potential options, and benefits of different options.

## How information collected has been incorporated into the RIS?

The information collected has been incorporated into the RIS primarily to inform the analysis of the costs and benefits associated with each of the options.

## Key themes by topic

A number of key themes emerged from the stakeholder consultations as set out in the following table.

Consultation themes

| **Theme** | **Key discussion points** |
| --- | --- |
| Risk/problem | Broadly there is consensus that there is a problem that needs addressing.  Some manufacturers indicated there has been improvement in the situation, with an increase in servicing requests.  Manufactures noted that the conversations between retailers and customers have changed. Customers now ask about the appropriateness of OFGSHs for their homes and discuss ventilation. But in many cases the retailers initiate the conversation because of nervousness about selling OFGSHs.  Manufacturers noted that there has already been a major impact on their turnover through a dramatic shift away from flued appliances. Service calls have increased, but sales of flued devices have fallen significantly. This is due not just to safety concerns, but the trend towards reverse-cycle air conditioning.  Manufacturers observed that another death is unlikely given the positive changes that have already taken place, but that in any case the real risk is from the 350,000 heaters that are already installed, not from those being installed while the RIS is being prepared. |
| Risk from environmental factors | Manufacturers questioned whether too much emphasis is being placed on OFGSHs as the source of the risk rather than acknowledging the part played by modern house design and construction technologies. Manufacturers discussed the balance of responsibility between malfunctioning heaters and lack of ventilation.  Concern was expressed by manufacturers that there is no trigger for builders renovating or otherwise modifying a home to consider the presence of a flued appliance and how its safety might be compromised. There was also concern about the trend towards building sealed homes and the failure to recognise the full safety implications of doing so. |
| Broader gas industry impacts of a ban | GAMAA and manufacturers expressed concerns around the potential ‘contagion effect’ that could cause damage to the reputation of the broader gas industry. A ban could have unintended consequences for the whole gas industry e.g. if the message was over-simplified in media reports and there is a perception in the community that all gas heaters are banned. |
| Effectiveness of CO alarms | Stakeholders noted issues and risks associated with CO alarms, such as lack of effectiveness if they are not located correctly or maintained properly, the type of CO alarm that should be mandated/recommended, and that there is a potential risk if households become too reliant on CO alarms at the expense of servicing. However, some stakeholders also noted it is better to have CO alarms than not. |
| Servicing | Servicing is generally seen by stakeholders as more effective than CO alarms.  It was noted by stakeholders that there had been a debate about the possibility of mandating servicing every two years for private homeowners. The conclusion was that you couldn’t tell people what to do in their own homes, but that it could potentially be mandated for landlords as part of their duty of care to the tenant. Some manufacturers indicated there has been increase in service requests, reflecting how effective the promotion of regular servicing has been. |
| Standards approach to phasing out OFGSHs | GAMAA and manufacturers advocated a standards-based approach to phasing out OFGSHs to avoid negative perceptions about the gas industry as a whole. This approach is seen as helping differentiate OFGSHs from other gas heaters and allowing the industry to keep promoting their strengths as a heating solution in well-ventilated homes.  Some stakeholders also preferred a standards-based approach to ensure consistency at a national level. |

Appendix B: Existing Regulations

Regulatory bodies

The following tables illustrates the role of ESV and the VBA in the regulation of OFGSHs.

|  |  |  |
| --- | --- | --- |
| **Agency** | **Description of their function/role** | **Comments** |
| Energy Safe Victoria | The functions of Energy Safe Victoria under this Act are—  (a) to issue guidelines specifying minimum safety standards for appliances, gas equipment, gas components, gas installations, gas related services and the conveyance, sale, supply, measurement, control and use of gas;  (b) to issue guidelines in relation to the preparation of safety cases;  (c) to monitor compliance of appliances, gas equipment, gas components, gas installations, gas related services and the conveyance, sale, supply, measurement, control and use of gas with the specified safety standards;  (d) to monitor compliance of gas companies with accepted safety cases;  (e) to audit accepted safety cases to determine the adequacy and effectiveness of those safety cases;  (f) to administer the prescribed minimum standards for energy efficiency of gas installations, appliances and components;  (g) to inspect and test gas installations, appliances and components for compliance with the specified minimum standards for energy efficiency;  (h) to investigate events or incidents which have implications for gas safety;  (i) to provide advisory and consultative services in relation to gas safety;  (j) to consult with and advise industry and the community in relation to gas safety;  (k) such other functions as are conferred on Energy Safe Victoria by or under this Act or the regulations under this Act.[[141]](#footnote-142) | Functions of Energy Safe Victoria as described in GS Act, section 10 |
| Victorian Building Authority | The VBA regulates Victoria’s plumbers and plumbing work through:   * **The Building Act–** Part 12A of the Building Act sets out the legal framework for the regulation of plumbing work and plumbing practitioners. This includes setting out the requirements for the licensing and registration of plumbing practitioners (including gasfitters, establishing the compliance certificate scheme * **Plumbing Regulations 2018** – the regulations define eligibility criteria to become a licensed or registered plumber, define the scopes of work for the classes of plumbing work in Victoria.   The two (main) classes of gasfitting provided for in the Plumbing Regulations 2018 are: Gasfitting work and Type B gasfitting work. The three specialised classes (which require registration in the main class of gasfitting) are Type A appliance conversion work, Type A appliance servicing work and Type B gasfitting advanced work.   * **National Construction Code (Volume 3 – Plumbing Code of Australia).** – Gasfitting work is not provided for in the Plumbing Code of Australia. It is regulated by the states and territories. * **Gas Safety Act 1997 –** the GS Act is adopted into the Building Act as part of the “plumbing laws” insofar as it provides the carrying out of plumbing (gasfitting) work on standard gas installations. Section 72 of the GS Act (via the *Gas Safety (Gas Installation) Regulations 2018*) currently prescribe AS/NZS 5601.1 and AS/NZS 5601.2 as standards for carrying out gasfitting work. | The VBA registers and licenses all plumbing practitioners in Victoria, including gasfitters. |

Legislation and Regulations pertaining to OFGSHs

The following table summarises the main regulations pertaining to OFGSHs in Victoria.

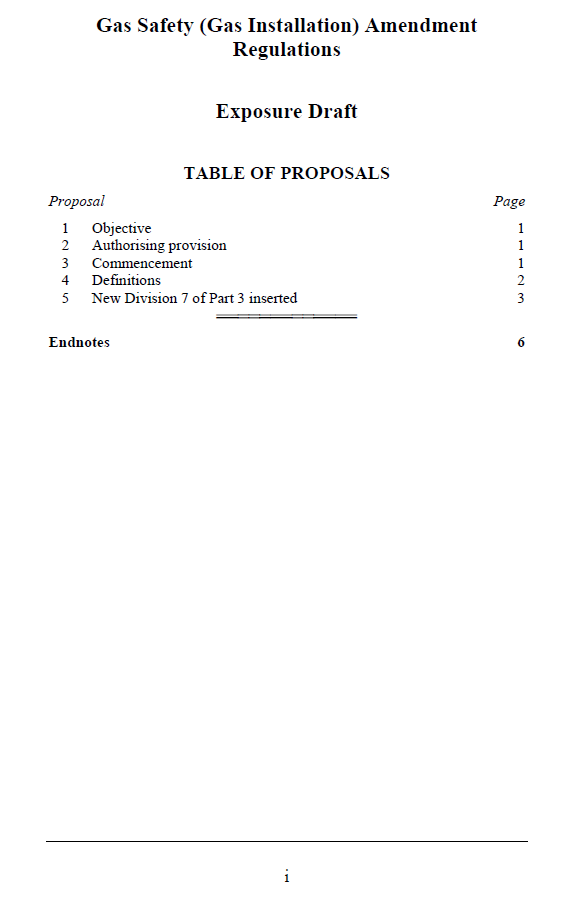
|  |  |  |
| --- | --- | --- |
| **Regulation** | **Description** | **Comments** |
| GS Act section 3 | "Type A appliance" means— (a) an appliance (including a second-hand appliance) for which an acceptance scheme has been authorised by Energy Safe Victoria in accordance with section 68; or (b) an appliance which has been accepted under section 69; | An OFGSHs is classified as a Type A appliance |
| GS Act section 36 | (2) A gas company must report to Energy Safe Victoria in accordance with the regulations any gas incident of which it is aware, and which occurs in relation to a gas installation to which it supplies or sells gas. Penalty: In the case of a natural person, 2 penalty units; In the case of a body corporate, 10 penalty units.  (3) The Fire Rescue Commissioner of Fire Rescue Victoria and the Chief Officer under the Country Fire Authority Act 1958 must report to [Energy](http://classic.austlii.edu.au/au/legis/vic/consol_act/gsa1997115/s3.html#energy_safe_victoria) [Safe Victoria](http://classic.austlii.edu.au/au/legis/vic/consol_act/gsa1997115/s3.html#energy_safe_victoria) any fire or explosion in which he or she suspects gas was a cause or contributing factor. . | Mandatory reporting of gas incidents |
| GS Act section 69 | (1) Energy Safe Victoria, on the application of any person, may accept an appliance or class of appliances for the purposes of this Act. | ESV must accept an appliance before it can legally be sold (section 70) |
| GS Act section 70 | (1) A person must not knowingly install a Type A appliance unless the appliance has — (a) been accepted under an acceptance scheme authorised under this Division or accepted by Energy Safe Victoria under this Division; and (b) an ESV approved label affixed to it.  Penalty: In the case of a natural person, 40 penalty units; In the case of a body corporate, 200 penalty units. | It is an offence to install certain Type A appliances |
| GS Act section 71 | (1) A person must not supply or offer to supply or sell or offer to sell a Type A appliance unless the appliance has — (a) been accepted under an acceptance scheme authorised under this Division or accepted by Energy Safe Victoria under this Division; and (b) an ESV approved label affixed to it.  Penalty: In the case of a natural person, 40 penalty units; In the case of a body corporate, 200 penalty units. | It is an offence to supply or sell unaccepted Type A appliances |
| GS Act section 71B | A person must not, in connection with the supply or possible supply or sale of a Type A appliance, affix or cause to be affixed a label or compliance plate to the appliance that falsely represents that the appliance has been, and continues to be— (a) accepted under an acceptance scheme authorised under this Division; or (b) accepted by Energy Safe Victoria under this Division.  Penalty: In the case of a natural person, 40 penalty units; In the case of a body corporate 200 penalty units. | A person must not falsely label Type A appliances |
| GS Act section 71C | (1) A person must not knowingly, recklessly or negligently make a modification to a Type A appliance that would make the appliance unsafe to use if the appliance were used for its intended purpose. Penalty: In the case of a natural person, 40 penalty units; In the case of a body corporate, 200 penalty units. | A person must not make unsafe modifications to Type A appliances |
| GS Act Section 72 | (1) A person carrying out gasfitting work must ensure that that work complies with—  (a) the prescribed standards and requirements in relation to that work; or  (b) the standards determined by Energy Safe Victoria under the regulations in relation to that work. | A person carrying out gasfitting work must comply with prescribed standards relating to that work. |
| GS Act, section 3 | "standard gas installation" means—  (a) a gas installation— (i) which contains only Type A appliances; and (ii) which is located in residential premises of a prescribed class or on land associated with such premises | OFGSHs are subject to any regulations surrounding standard gas installations |
| Plumbing Regulations 2018  Regulation 19 | (1) Gasfitting work is the construction, installation, replacement, repair, alteration, maintenance, testing or commissioning of any pipe, appliance, flue, fitting, apparatus, control or other item that is involved with the supply or use of gas and that is fitted downstream of the gas supply point and includes— (a) any gas appliance in, or on, a caravan or a vessel; and (b) any roof sheeting and roof flashing that is necessary for the purpose of any work described in this subregulation; and (c) any design work that is incidental to, or associated with, any work described in this subregulation. |  |
| Plumbing Regulations 2018  Regulation 37 | Type A appliance servicing work is the internal cleaning, maintenance and adjusting of a Type A appliance and includes the adjustment, repair or replacement of a component of the Type A appliance. | Defines the scope of work of Type A appliance servicing work |
| Plumbing Regulations, Division 3  Schedule 4,  Cl 1 | (1) The qualifications required to be able to be licensed to carry out gasfitting work under section 221M(1)(b)(i) of the Act are the successful completion of— (a) the approved competency units for gasfitting work; and (b) the Authority's examination of licensing competencies for gasfitting work.  (2) The experience required to be able to be licensed to carry out gasfitting work under section 221M(1)(b)(i) of the Act is— (a) at least 2 years of practical experience in gasfitting work and the successful completion of an apprenticeship under the supervision of a plumber who is licensed in gasfitting work; or (b) at least 6 years of practical experience in gasfitting work. | Describes the qualifications and experience required to work on Type A gas appliances. |

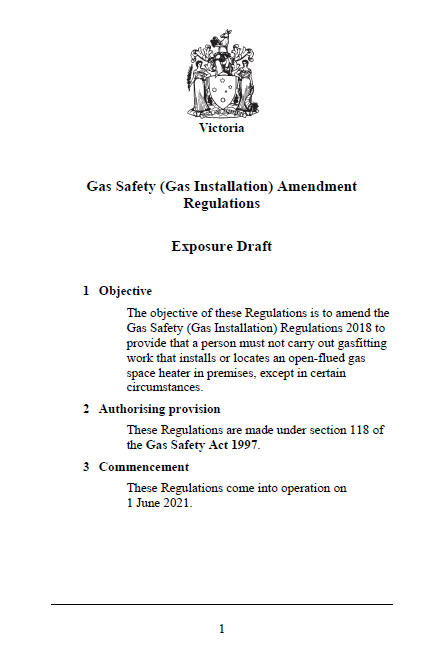
Appendix C – Research on CO alarms

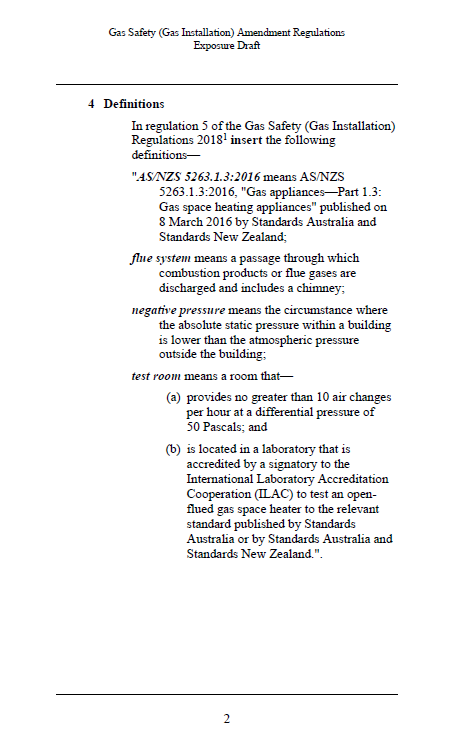
Quantifying the benefits of CO alarms – supporting research

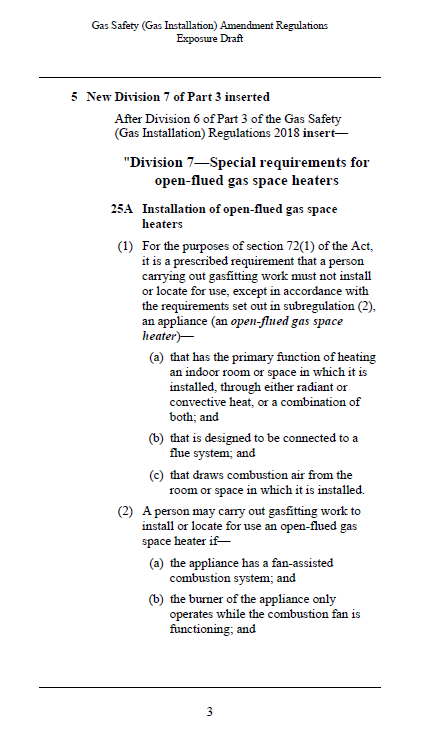
* **ESV** – ESV has advised the public that CO alarm performance can be affected by excessive spillage or reverse flueing of gas appliances caused by: (i) wind, including high gusts of wind (ii) heavy air in the flue (such as cold or humid air) (iii) negative pressure differentials within a room, resulting from the use of exhaust fans (iv) simultaneous operation of several gas appliances without also increasing the ventilation or (v) extended operation of flueless gas appliances.[[142]](#footnote-143)
* **ESV** - There is no standard in Australia that covers the design, manufacture, installation or servicing of CO alarms for domestic premises. ESV suggests consumers choose a CO alarm that complies with EN50291 (the European standard) or UL2034 (the US standard).[[143]](#footnote-144)
* **Ryan, T and Arnold, K (2011) p.e15** - Tested 30 residential carbon monoxide detectors installed in the United States, finding that more than half failed to function properly, alarming too early or too late. Forty per cent of detectors failed to alarm in hazardous concentrations, despite outward indications that they were operating as intended. The study determined a statistically significant unsafe failure rate of 40 per cent i.e. for every 5 homes sampled, 2 were in fact not protected by the installed CO detector.
* **Wheeler-Martin, K, et al. (2015) P1628** - Observed compliance with the alarm law to be high in 2009 (83 per cent), especially considering that a portion of New York residences were exempt from the law. However, the study also estimated that only half of the residents lived in households with CO alarms that had been tested or had their batteries replaced in the recommended 6-month time frame, which indicated that alarm maintenance is an area of needed improvement. Note: Deloitte has assumed a 100 per cent compliance rate, which is unlikely to occur with zero incremental monitoring and enforcement costs per annum.
* **Wheeler-Martin, K, et al. (2015) P1628** – Found that, despite their utility, the effectiveness of CO alarms, is limited by human awareness of the appropriate actions to take when an alarm sounds. A mortality review in New Mexico postulated that 58 of 136 unintentional, nonfire-related CO deaths might not have been prevented even if an audible CO alarm had been present because of mobility limitations, intoxication, or otherwise impaired judgment. Even without impairment, taking action when a CO alarm activates can seem counterintuitive when nothing appears to be out of the ordinary (unlike smoke alarms where the ability to see and smell smoke is a key difference), because of the odourless and colourless nature of CO.
* **Ryan, T and Arnold, K (2011) p.e15** – Found that the “push to test” buttons of various CO alarms only determine whether power is reaching the detector or whether the audible alarm operates and not whether the CO sensor is functioning as intended.

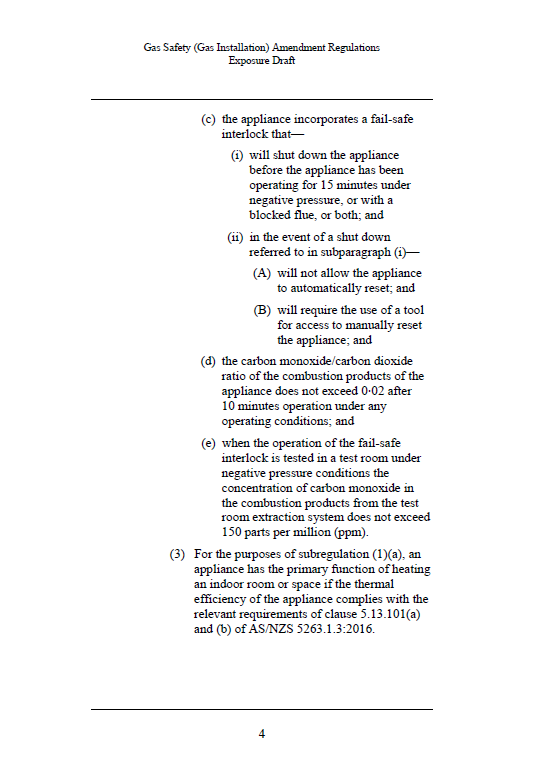
Appendix D – Draft Regulations for a restriction on future installation of OFGSHs

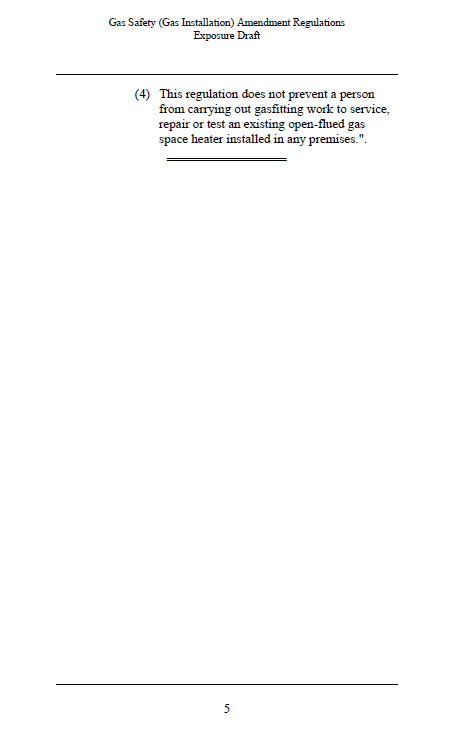


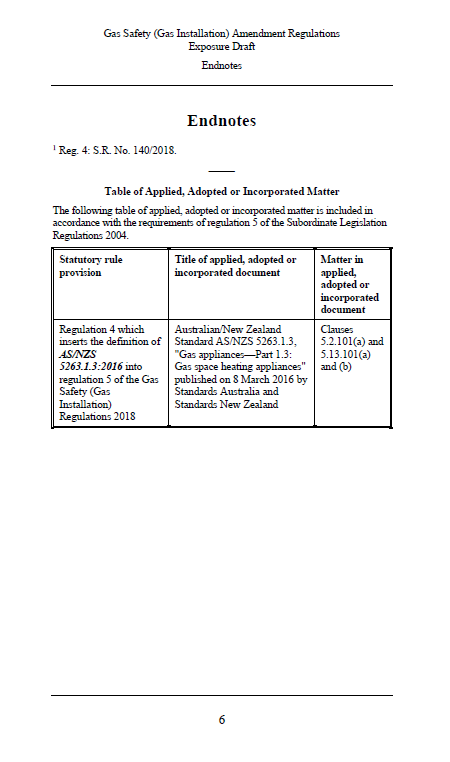












Appendix E – Sensitivity testing of options

Sensitivity testing of key assumptions for the preferred phase out option shows that the findings are robust. Large variations to key assumptions do not change the key findings of the analysis.

The sensitivity analysis was undertaken for all options but only the results of the analysis for the preferred option are presented here. Benefits broke even with costs for all scenarios tested, for all options. A summary table of results is provided below.

Sensitivity analysis of Option 2 – summary results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Standard  assumption** | **Sensitivity  assumption** | **Total estimated costs under sensitivity** | **Total estimated benefits under sensitivity** |
| **Increased uptake of RS heating appliances** | 50% room sealed  50% reverse  cycle | 75% room  sealed  25% reverse  cycle | $5,614,219 | $6,497,021 |
| **Size of rooms heating appliances are installed in** | Medium rooms  (approx. 30 m2) | Small rooms (approx. 12 m2) | $4,917,344 | $5,605,697 |
| **Timing of implementation** | 1 January 2022 | 1 January 2023 | $3,262,445 | $4,275,799 |
| **Reduced risk from greater provision of servicing due to the Be Sure campaign** | No reduction in rate of CO exposures (fatal and non-fatal) | 20% reduction in rate of CO exposures (fatal and non-fatal) | $4,917,344 | $7,074,778 |
|  |  |  | **Total estimated costs for  option 2** | **Total estimated benefits for  option 2** |
| **Estimated costs and benefits for Option 2 from core analysis**  **(for comparison)** | N/A | N/A | $4,917,344 | $7,676,300 |

Source: Deloitte Access Economics

Increased uptake of Room Sealed heating appliances

The analysis in section 4.2 assumes that 50 per cent of consumers that would purchase an OFGSH under the Base Case instead choose to purchase a 4.7-star room sealed (RS) heater under Option 2. The remaining 50 per cent choose to purchase a 3.8-star reverse cycle system. This assumption is based on the trend towards reverse cycle heaters and away from gas heaters, but also reflects some uncertainty, with the assumptions chosen because of a lack of more detailed information to support anything else.

If instead it is assumed that 75 per cent of these consumers choose to purchase a 4.7-star RS heater and only 25 per cent switch to 3.8-star reverse cycle systems, Option 2 would need to be responsible for avoiding 0.05 deaths, 0.06 serious illness and 273 low level illnesses over 10 years to break even.

As it is estimated that Option 2 would avoid 0.05 deaths, 0.09 serious illness and 403 low level illnesses over 10 years in this scenario, Option 2 is expected to break even under this scenario.

Size of rooms heating appliances are installed in

The analysis assumes that all OFGSH, RS space heaters and reverse cycle air conditioners are installed in medium sized rooms of (approx. 30 m2).

If instead it is assumed that all heating appliances are installed in small rooms (approx. 12 m2), Option 2 would need to be responsible for avoiding 0.05 deaths, 0.07 serious illness and 302 low level illnesses over 10 years to break even.

As it is estimated that Option 2 would avoid 0.05 deaths, 0.09 serious illness and 403 low level illnesses over 10 years in this scenario, Option 2 is expected to break even under this scenario.

Timing of implementation

The analysis assumes that Option 2 comes into effect from 1 January 2022.

If instead it was assumed that Option 2 came into effect a year later on 1 January 2023, Option 2 would need to be responsible for avoiding 0.03 deaths, 0.01 serious illness and 64 low level illnesses over 10 years to break even.

It is estimated that Option 2 would avoid 0.03 deaths, 0.05 serious illness and 222 low level illnesses over 10 years in this scenario. As a result, Option 2 is still expected to break even under this scenario.

Reduced risk from greater provision of servicing due to the Be Sure campaign

The analysis assumes that for every 100,000 OFGSHs installed in Victorian buildings annually, approximately 0.17 deaths, 0.35 serious illness and 1,500 low level illness will occur.

If instead it was assumed that an increase in the provision of servicing for OFGSHs caused the rate of death and illness to fall by 20 per cent (i.e. 0.14 deaths, 0.28 serious illness and 1,200 low level illness for every 100,000 OFGSHs annually), Option 2 would need to be responsible for avoiding 0.04 deaths, 0.01 serious illness and 64 low level illnesses over 10 years to break even.

It is estimated that Option 2 would avoid 0.04 deaths, 0.07 serious illness and 322 low level illnesses over 10 years in this scenario. As a result, Option 2 is still expected to break even under this scenario.

Limitation of our work

**General use restriction**

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|  |
| --- |
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1. The Australian Standard AS/NZS5263.0 defines an open flued appliance as an *“indoor appliance designed to be connected to a flue system, its combustion air being drawn from the room or space in which it is installed*.” There is currently no definition in the Australian Standards for a space heater. In this RIS, the term ‘open flued gas space heater’ or ‘OFGSH’ refers to an appliance—

   the function of which is to heat an indoor room or space in which it is installed (through either radiant or convective heat or a combination of both) and which is demonstrated through conformance with the applicable thermal efficiency requirements of AS/NZS5263.1.3; and

   which is designed to be connected to a flue system including chimneys; and

   where the combustion air is drawn from the room or space in which it is installed.

   Furthermore, fan assisted open flued gas space heaters with all the following attributes are exempt from the scope of the definition and not the subject of this RIS.

   1. The burner shall only operate while the combustion fan is functioning; and
   2. The appliance incorporates a fail-safe interlock that will:
   3. shut down the appliance before the appliance has been operating for 15 minutes under either negative pressure or blocked flue conditions or both.
   4. in the event of a shut-down, not allow the appliance to automatically reset and any manual reset shall only be accessed by the use of a tool; and
   5. The CO/CO2 ratio of carbon monoxide to carbon dioxide in the combustion products does not exceed 0.02 after 10 minutes of operation under any operating condition; and
   6. When testing for operation of the fail-safe interlock under negative pressure conditions the CO concentration in the test room or extraction system does not exceed 150ppm.

   Other open flued appliances, such as ducted heaters, decorative effect appliances (where only decorative) and water heaters are also not included. [↑](#footnote-ref-2)
2. Negative pressure arises when the indoor atmospheric pressure is lower than the outside atmospheric pressure. This can cause toxic combustion by-products (including CO) to be drawn into the home, rather than expelled through the flue as intended. [↑](#footnote-ref-3)
3. The Department is not aware of any deaths attributable to this cause, which occurred prior to 2010. [↑](#footnote-ref-4)
4. For more information please refer to the following sources: Coroners Court of Victoria. (2013). *Inquest into the death of Chase Robinson* (File no. COR 2010/2037), *Inquest into the death of Tyler Robinson* (File no. COR 2010/2038), & Coroners Court of Victoria. (2018). *Inquest into the death of Sonia Sofianopoulos* (File no. COR 2017/3566). [↑](#footnote-ref-5)
5. Coroners Court of Victoria. (2018). *Inquest into the death of Sonia Sofianopoulos* (File no. COR 2017/3566). [↑](#footnote-ref-6)
6. Lily D’Ambrosio. (2020). Helping Victorians Pay Their Power Bills. Accessed at: <https://www.lilydambrosio.com.au/media-releases/helping-victorians-pay-their-power-bills/> [↑](#footnote-ref-7)
7. As at 4 September 2020. [↑](#footnote-ref-8)
8. Industry has indicated it is unlikely any new OFGSHs would be developed under the revised standards. [↑](#footnote-ref-9)
9. The normal timeline standards-based approach is discussed further in Chapter 3 as an option considered but not progressed. [↑](#footnote-ref-10)
10. Note industry has made a strong commitment to the process and ESV has provided its support for issuing a GTRC Technical Guidance Bulletin. In fact, industry is expected to progress the development of amended standards regardless of the Victorian Government’s decision on new regulations. However, this is not being assessed as part of the Base Case as it is still to be finalised and was not in progress until mid-way through the RIS process. [↑](#footnote-ref-11)
11. Like smoke alarms, CO alarms may either be hard-wired to the mains electricity supply or battery operated, with some models incorporating a 10-year lithium battery. [↑](#footnote-ref-12)
12. A compliance certificate must be given for:

    any plumbing work with a total value of $750 or more (includes labour and parts);

    the installation, relocation or replacement of any gas-using appliance;

    the conversion of a gas-using appliance for use with a different gaseous fuel;

    the installation, modification or relocation of consumer gas piping (other than work that is carried out on consumer gas piping by, or on behalf of, a gas company and that is incidental to the modification of the gas company's assets under the provisions of an accepted safety case under the GS Act);

    the construction, installation or alteration of any below ground sanitary drain or associated gullies; and

    the construction, installation, alteration, relocation or replacement of a cooling tower or of any other part of a cooling tower system (including the installation or replacement of any associated device or equipment). [↑](#footnote-ref-13)
13. These include maintaining the affordability of heating for consumers, maintaining consumer confidence in gas and limiting the impacts on industry and better supporting industry transition. [↑](#footnote-ref-14)
14. Defined as avoided fatal CO exposures caused by OFGSHs over the course of the modelling period (i.e. 10 years). [↑](#footnote-ref-15)
15. CO exposure resulting in serious health effects with some health consequences that do not resolve completely and leave residual non-reversible health impacts. [↑](#footnote-ref-16)
16. Defined as CO exposure resulting in health effects that generally resolve after exposure ceases. [↑](#footnote-ref-17)
17. Neither Option 1 nor Option 2 affect OFGSHs that have already been installed in Victoria. [↑](#footnote-ref-18)
18. In 2012, a National Decision RIS (DRIS) was prepared by the Allen Consulting Group for the Commonwealth Government to consider a number of approaches to manage the risk of CO poisoning from gas appliances. [↑](#footnote-ref-19)
19. Note the VBA will provide information to practitioners on the new requirements through its communications channels, and the VBA will monitor and enforce that only appropriately gas certified gas space heaters are installed. [↑](#footnote-ref-20)
20. Coroners Court of Victoria. (2013). *Inquest into the death of: Chase Robinson* (File no. COR 2010/2037). [↑](#footnote-ref-21)
21. It is likely the Coroner meant ‘inhalation’ rather than ‘ingestion’. [↑](#footnote-ref-22)
22. Coroners Court of Victoria. (2013). *Inquest into the death of: Chase Robinson* (File no. COR 2010/2037). [↑](#footnote-ref-23)
23. Coroners Court of Victoria. (2018). *Inquest into the death of Sonia Sofianopoulos* (File no. COR 2017/3566). [↑](#footnote-ref-24)
24. Ibid. [↑](#footnote-ref-25)
25. Commissioner for Better Regulation (2016). *Victorian Guide to Regulation: A handbook for policy-makers in Victoria*. Accessed at: <http://www.betterregulation.vic.gov.au/Guidance-and-Resources> [↑](#footnote-ref-26)
26. Ibid. [↑](#footnote-ref-27)
27. Section 69A. [↑](#footnote-ref-28)
28. Section 76. [↑](#footnote-ref-29)
29. Standards Australia aims for a balance of industry, regulatory and community representation on the committees. [↑](#footnote-ref-30)
30. Regulation 18, Gas Safety (Gas Installation) Regulations 2018. [↑](#footnote-ref-31)
31. Energy Safe Victoria (ESV). (2020). *Is your gas heater safe?* Accessed at: <https://esv.vic.gov.au/campaigns/carbon-monoxide/> [↑](#footnote-ref-32)
32. Health and Safety Executive. (2018). Safety in the installation and use of gas systems and appliances. [↑](#footnote-ref-33)
33. ESV, Gas information sheet 36: Carbon monoxide alarms for domestic use. [↑](#footnote-ref-34)
34. ESV (2020) Gas information sheet 36: Carbon monoxide alarms for domestic use. [↑](#footnote-ref-35)
35. 2012 DRIS. [↑](#footnote-ref-36)
36. 2012 DRIS, p.47. [↑](#footnote-ref-37)
37. 2012 DRIS. [↑](#footnote-ref-38)
38. ESV (2020) Gas information sheet 36: Carbon monoxide alarms for domestic use. [↑](#footnote-ref-39)
39. The Smoke and Carbon Monoxide Alarm (England) Regulations 2015. [↑](#footnote-ref-40)
40. Scottish Government Statutory Guidance (2015) *Carbon Monoxide alarms in private rented properties: guidance.* [↑](#footnote-ref-41)
41. Health and Safety Executive for Northern Ireland (2020) *Carbon Monoxide Alarms* Accessed at: <https://www.hseni.gov.uk/articles/carbon-monoxide-alarms> [↑](#footnote-ref-42)
42. Scottish Government (2020). *Fire and smoke alarms: changes to the law.* Accessed at: <https://www.gov.scot/publications/fire-and-smoke-alarms-in-scottish-homes/> [↑](#footnote-ref-43)
43. Health and Safety Executive. (2011). *Domestic carbon monoxide alarms: Long-term reliability and use scoping study*. Accessed at: <http://www.hse.gov.uk/research/rrpdf/rr847.pdf> [↑](#footnote-ref-44)
44. First Alert. (2019). *First Safety Laws and Legislation by State.* Accessed at:<https://www.firstalert.com/community/legislation/> [↑](#footnote-ref-45)
45. Ontario Ministry of the Solicitor General. (2016). Accessed at: <https://www.mcscs.jus.gov.on.ca/english/FireMarshal/CarbonMonoxideAlarms/QuestionsandAnswers/OFM_COAlarms_QandA.html#P59_4811> [↑](#footnote-ref-46)
46. Milbur Consulting Ltd. (2008). Proposed Gas Safety (Gas Installation) Regulations 2008:

    Regulatory Impact Statement. [↑](#footnote-ref-47)
47. Milbur Consulting Ltd. (2008). Proposed Gas Safety (Gas Installation) Regulations 2008:

    Regulatory Impact Statement, chapter 9.4. [↑](#footnote-ref-48)
48. *Gas Safety (Gas Installation) Regulations 2018.* A person may replace an existing flueless space heater in residential premises with a new flueless space heater (the new heater) if— (a) the heater being replaced operated on LP Gas; and (b) the new heater operates on LP Gas; and (c) the emission of oxides of nitrogen from the new heater does not exceed 2⋅5 ng/J; and (d) the carbon monoxide/carbon dioxide ratio of the new heater does not exceed 0⋅002. [↑](#footnote-ref-49)
49. The safety alert is available at this link - <https://www.esv.vic.gov.au/safety-alerts/gas-open-flued-gas-heaters/> [↑](#footnote-ref-50)
50. Information provided by DHHS (meeting 24 September 2019). [↑](#footnote-ref-51)
51. Consumer Affairs Victoria (2020) ’Renting a home: a guide for tenants’ Accessed at: <https://www.consumer.vic.gov.au/housing/renting/renting-guide> [↑](#footnote-ref-52)
52. Quantum Market Research, Energy Safe Victoria Gas Heaters Research, July 2018. [↑](#footnote-ref-53)
53. J. Rose et al. (2017). *Carbon Monoxide Poisoning: Pathogenesis, Management, and Future Directions of Therapy.* American Journal of Respiratory and Critical Care Medicine. [↑](#footnote-ref-54)
54. JH Lange and Albert V Condello III (2016) *Neurological Impacts from Carbon Monoxide Poisoning*, <https://www.researchgate.net/publication/310837870_Neurological_Impacts_from_Carbon_Monoxide_Poisoning> [↑](#footnote-ref-55)
55. It is also important to note that not all consumers are aware of what type of gas heater they have and as such may not be able to respond to this deign risk appropriately. Market research indicates 50 per cent of people with gas space heaters are unsure as to whether these are open flued. [↑](#footnote-ref-56)
56. DELWP. (2019). Background on OFGSHs – phase out and complementary actions. [↑](#footnote-ref-57)
57. Coroners Court of Victoria. (2018). *Inquest into the death of Sonia Sofianopoulos.* (File no. COR 2017/3566). [↑](#footnote-ref-58)
58. Ibid. [↑](#footnote-ref-59)
59. This certification enables the legal sale of these appliances. [↑](#footnote-ref-60)
60. In fan assisted appliances the combustion fan typically can only operate while the burner is in operation. In other words, the consumer cannot turn off the combustion fan. [↑](#footnote-ref-61)
61. A flue is a passage through which combustion products generated by a gas appliance are expelled to the outside of a building. [↑](#footnote-ref-62)
62. There are two types of decorative effect appliances:

    * Type 1 decorative effect appliances: are open flame appliances which can be installed in a masonry chimney.
    * Type 2 decorative effect appliances, which can be open flame or glass fronted appliances, and which must be installed with a full metal flue. As decorative effect appliances are not space heaters, they must conform to a different standard than OFGSHs (AS/NZS 5263.1.8 - Gas Appliances - Decorative Effect Gas Appliances). Unlike OFGSH, decorative effect heaters must be installed with permanent ventilation, regardless of room size.

    [↑](#footnote-ref-63)
63. Note that any definition subsequently adopted for amendments to the relevant Australian Standards (AS/NZS5263.1.3 and AS/NZS5263.1.8) under the preferred option may differ from this definition. [↑](#footnote-ref-64)
64. Uncontrolled ventilation or infiltration refers to air movement through gaps in the building shell that is dependent on wind speeds and temperature differences between the outside and the inside and cannot be controlled by the occupant. [↑](#footnote-ref-65)
65. Sustainability Victoria (2020) Energy ratings, construction codes and standards. Accessed at: <https://www.sustainability.vic.gov.au/You-and-Your-Home/Building-and-renovating/Planning-and-design/Energy-ratings-construction-codes-and-standards> [↑](#footnote-ref-66)
66. Sustainability Victoria (2020) Energy ratings, construction codes and standards, Accessed at: <https://www.sustainability.vic.gov.au/You-and-your-home/Building-and-renovating/Planning-and-design/Energy-ratings-construction-codes-and-standards> [↑](#footnote-ref-67)
67. Nationwide House Energy Rating Scheme (2020) Home energy star ratings, Accessed at: <https://www.nathers.gov.au/owners-and-builders/home-energy-star-ratings> [↑](#footnote-ref-68)
68. Victorian State Government (2020) ’Information on doorknocking, telemarketing and other advertising practices,’ Accessed at: <https://www.victorianenergysaver.vic.gov.au/__data/assets/pdf_file/0022/428017/VEU-doorknocking-and-telesales-info.pdf> [↑](#footnote-ref-69)
69. Sustainability Victoria (2020) Victorian Healthy Homes Program Accessed at: <https://www.sustainability.vic.gov.au/Grants-and-funding/Victorian-Healthy-Homes-Program> [↑](#footnote-ref-70)
70. Molloy, S.B., Cheng, M., Galbally I.E., Keywood, M.D., Lawson, S.J. Powell, J.C., Gillett, R., Dunne, E., Selleck, P.W. (2012). Indoor air quality in typical temperate zone Australian dwellings. Elsevier: Atmospheric Environment 54(2012) p400-407. [↑](#footnote-ref-71)
71. Sustainability Victoria (2015). Energy Efficiency Upgrade Potential of Existing Victorian Houses [↑](#footnote-ref-72)
72. Quantum Market Research. *Energy Safe Victoria Gas Heaters Research (July 2018)*. [↑](#footnote-ref-73)
73. ESV. (2019). *Victorians need to ‘Be Sure’ their gas heaters are safe ahead of winter.* Accessed at: https://esv.vic.gov.au/news/be-sure-co-launch/ [↑](#footnote-ref-74)
74. Quantum Market Research. (2018, July). *Energy Safe Victoria Gas Heaters Research.* [↑](#footnote-ref-75)
75. ESV. (2019). *FAQs – Open-flued gas heaters*.Accessed at:<https://esv.vic.gov.au/safety-education/gas-safety-at-home/heating-your-home-with-gas/open-flued-heaters-faqs/> [↑](#footnote-ref-76)
76. Ibid. [↑](#footnote-ref-77)
77. Note that the Cold Feet campaign did not specifically target OFGSHs and it is unclear how many survey respondents had OFGSHs. [↑](#footnote-ref-78)
78. Quantum Market Research. (2018, July). *Energy Safe Victoria Gas Heaters Research.* [↑](#footnote-ref-79)
79. Essence (2019, August), *Energy Safe Victoria’s ‘Be Sure’ Campaign Evaluation Campaign Evaluation Report.* [↑](#footnote-ref-80)
80. Quantum Market Research. (2018, July). *Energy Safe Victoria Gas Heaters Research.* [↑](#footnote-ref-81)
81. Coroners Court of Victoria. (2013). *Inquest into the death of Tyler Robinson* (File no. COR 2010/2037. [↑](#footnote-ref-82)
82. Energy Safe Victoria (2019). Landlords and tenancy. Accessed at: <https://esv.vic.gov.au/safety-education/choosing-and-using-a-tradesperson/making-a-complaint-about-a-tradesperson/landlords-and-tenancy/> [↑](#footnote-ref-83)
83. *Residential Tenancies Act 1997.* [↑](#footnote-ref-84)
84. Department of Environment, Land, Water and Planning. (2019). *Background on OFGSHs*. [↑](#footnote-ref-85)
85. Victorian Building Association. (n.d.). *Negative air pressure and carbon monoxide spillage training video.* Accessed at: https://www.chaseandtyler.org.au/information-for-professsionals/gasfitters-and-plumbers/ [↑](#footnote-ref-86)
86. Essence. (2018). Energy Safe Victoria’s ‘Be SURE’ campaign. [↑](#footnote-ref-87)
87. Coroners Court of Victoria. (2013). *Inquest into the death of Tyler Robinson* (File no. COR 2010/2037). [↑](#footnote-ref-88)
88. Ibid. [↑](#footnote-ref-89)
89. Energy Efficient Strategies Pty. Ltd. (2018). *Victorian Housing Stock Open Flued Space Heater Estimates.*  [↑](#footnote-ref-90)
90. Ibid. [↑](#footnote-ref-91)
91. Victorian Admitted Episode Dataset, T58 ‘Toxic effect of carbon monoxide’. (2018). *Victorian Carbon Monoxide Admission Analysis* (provided by DHHS). [↑](#footnote-ref-92)
92. Ibid. [↑](#footnote-ref-93)
93. Austin Health (2020) Victorian Poisons Information Centre. Accessed at: <https://www.austin.org.au/poisons> [↑](#footnote-ref-94)
94. Allen Consulting Group, *The risk of carbon monoxide poisoning from domestic gas appliances*, Decision RIS prepared for the Department of Resources, Energy and Tourism, 2012, p. 10. [↑](#footnote-ref-95)
95. # *Analysis of hospital admissions due to accidental non-fire-related carbon monoxide poisoning in England, between 2001 and 2010* , [Rebecca E. Ghosh](javascript:;), [Rebecca Close](javascript:;), [Lucy J. McCann](javascript:;), [Helen Crabbe](javascript:;), [Kevin Garwood](javascript:;), [Anna L. Hansell](javascript:;), [Giovanni Leonardi](javascript:;), Journal of Public Health, Volume 38, Issue 1, March 2016, pp. 76–83.

    [↑](#footnote-ref-96)
96. *Cost of accidental carbon monoxide poisoning: A preventable expense*, Neil B Hampson, Preventative Medicine Reports, Volume 3, June 2016, pp. 21-24. [↑](#footnote-ref-97)
97. Advice from DHHS. [↑](#footnote-ref-98)
98. Note that it is unclear exactly how households were selected to take part in this non-random audit program. [↑](#footnote-ref-99)
99. ESV audit data. [↑](#footnote-ref-100)
100. In undertaking this analysis, it is noted there could be selection bias because the audit program was non-random, which means these numbers could represent an upper bound of CO exposure and illness. Note that neither the 11.2 per cent nor 60 per cent figures are directly used as modelling inputs. Further assumptions (described in Chapter 4) have been made to ensure estimates of avoided low level CO exposures remain conservative. [↑](#footnote-ref-101)
101. Office of the Chief Parliamentary Counsel, *Subordinate Legislation Act Guidelines*. [↑](#footnote-ref-102)
102. Lily D’Ambrosio (2020) ’Helping Victorians Pay Their Power Bills.’ Accessed at: <https://www.lilydambrosio.com.au/media-releases/helping-victorians-pay-their-power-bills/> [↑](#footnote-ref-103)
103. It is the VBA’s responsibility to enforce this. [↑](#footnote-ref-104)
104. Industry has indicated it is unlikely any new OFGSHs would be developed under the revised standards. [↑](#footnote-ref-105)
105. The normal timeline standards-based approach is discussed further in Chapter 3 as an option considered but not progressed. [↑](#footnote-ref-106)
106. Note a Technical Guidance Bulletin is defined by the Gas Technical Regulators of Australia scheme rules as “*A document issued by the Technical Regulators acting as technical guidance to the CABs and other relevant stakeholders on a position by jurisdictions on specific issues*.” GTRC Technical Guidance Bulletins have previously been used to address other safety issues. [↑](#footnote-ref-107)
107. Note industry has made a strong commitment to the process and ESV has provided its support for issuing a GTRC Technical Guidance Bulletin. In fact, industry is expected to progress the development of amended standards regardless of the Victorian Government’s decision on new regulations, but is not being assessed as part of the Base Case because it is still to be finalised and was also not in progress until mid-way through the RIS process. [↑](#footnote-ref-108)
108. In the event that a CAB chooses not to take into account a Technical Guidance Bulletin when processing a certification, ESV may cease to authorise an acceptance scheme or part of an acceptance scheme under section 68 of the Gas Safety Act 1997 (GSA). [↑](#footnote-ref-109)
109. Note the sale or supply of an uncertified gas appliance is an offence under section 71(1) of the GSA 1997 which carries a maximum penalty following prosecution of $6,608.80 for a natural person and $33,044.00 for a body corporate. ESV may also issue an infringement notice at 10 per cent of the maximum). [↑](#footnote-ref-110)
110. Like smoke alarms, CO alarms may either be hard-wired to the mains electricity supply or battery operated, with some models incorporating a 10-year lithium battery. [↑](#footnote-ref-111)
111. Assuming equal distribution of sales throughout the year, which is potentially a simplification given seasonal sales, but is used in the absence of more accurate data. [↑](#footnote-ref-112)
112. See for example Figure 5 on p.21 of Sustainability Victoria’s report *Comprehensive Energy Efficiency Retrofits to Existing Victorian Houses* which shows a switch towards the use of reverse cycle air conditioning in Victorian homes over the period 2014 to 2020, away from room gas heating. [↑](#footnote-ref-113)
113. Murray, Christopher J. L, Lopez, Alan D. *The Global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020.* World Health Organization, World Bank & Harvard School of Public Health. (‎1996)‎. [↑](#footnote-ref-114)
114. The Australian Government’s *Best Practice Regulation Guidance Note: Value of statistical life (*August 2019) recommended that a statistical life year be valued at $213,000 in 2019 dollars. [↑](#footnote-ref-115)
115. Many OFGSHs are installed in low income households. Low income households are typically smaller in size and house greater numbers of people (i.e. they are characterised by higher density living arrangements). As a result, the estimated total of 2.5 residents per household is likely conservative for households where OFGSHs are installed. Due to the uncertainty in exactly which individuals within a household might be impacted by CO exposure as a result of an OFGSH, it is assumed that all residents suffer to the same extent. [↑](#footnote-ref-116)
116. All OFGSHs installed in Victorian buildings (including future installations) are assumed to pose the same health risk. Negative pressure environments can cause all OFGSHs (both old and new) to release CO into their environment. As a result, newly installed models have been assumed to pose the same safety risk as their older counterparts. [↑](#footnote-ref-117)
117. To put this into context, 0.6% is equivalent to assuming the population failure rate is half that of the 11.2% failure rate observed in the audit, and that 10% of OFGSHs that fail testing then result in CO spillage that could cause low level illness (i.e. 11.2% x 50% x 10% = 0.56% ≈ 0.6%. This has been rounded to one decimal place due to the inherent uncertainty in the estimate). The 50% and 10% adjustments are best estimates based on internal discussions as well as information made available through sources including consultations. It should be noted that these assumptions are uncertain given the lack of actual data on low level illnesses. [↑](#footnote-ref-118)
118. Based on the seven months of data collected, [Nest](https://storage.googleapis.com/nest-public-downloads/press/documents/co-white-paper.pdf) modelled a projection of the annual exposure level. Taking seasonality into account, this projection shows that approximately 0.9% of households are exposed to high CO levels, or about 1.4 million households across the US, Canada, and the UK. [↑](#footnote-ref-119)
119. Based on analysis of product information by DELWP and Deloitte. [↑](#footnote-ref-120)
120. A discount rate has not been applied due to the uncertainty surrounding the timing of outcomes realised over the 10-year modelling period. [↑](#footnote-ref-121)
121. Educational costs under the Base Case are lower than historical estimates because much of the educational material has already been developed and the campaign under the Base Case will remind people annually about the importance of servicing gas heaters. [↑](#footnote-ref-122)
122. Victorian Government value of a statistical life year inflated by 3% p.a. This is consistent with the discount rate used in guidance from the Commissioner for Better Regulation regarding the suggested value of a statistical life in RISs and LIAs. Accessed at: <https://www.vic.gov.au/sites/default/files/2019-10/Suggested-Value-of-a-Statistical-Life-in-RISs-and-LIAs-2017-Word.docx> [↑](#footnote-ref-123)
123. Many of those who survive severe CO poisoning go on to experience later neurological problems (Rose et al, 2017). Due to the uncertainty in the timing and onset of these symptoms, it has been assumed that affected individuals experience them for half of their estimated remaining life (i.e. 23.16 years). [↑](#footnote-ref-124)
124. Murray and Lopez (1996). [↑](#footnote-ref-125)
125. As noted earlier, 0.6% is equivalent to assuming the population failure rate is half that of the 11.2% failure rate observed in the audit, and that 10% of OFGSHs that fail testing then result in CO spillage that could cause low level illness (i.e. 11.2% x 50% x 10% = 0.56% ≈ 0.6%. This has been rounded to one decimal place due to the inherent uncertainty in the estimate). The 50% and 10% adjustments are best estimates based on internal discussions as well as information available through other sources such as consultations. It should be noted that these assumptions are uncertain given the lack of actual data on low level illnesses. [↑](#footnote-ref-126)
126. In the absence of better information, it is assumed that affected individuals experience these symptoms for 6 months based on elevated heater usage during colder months. [↑](#footnote-ref-127)
127. A disability weight is a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (equivalent to death). Accessed at: <https://www.who.int/healthinfo/global_burden_disease/daly_disability_weight/en/> [↑](#footnote-ref-128)
128. Asthma was selected as a close proxy to the cold and flu like symptoms typically experienced during low level CO exposures. [↑](#footnote-ref-129)
129. The cost of mandatory installations of CO alarms for all buildings with OFGSHs, not just rental buildings, would be approximately $18 million. [↑](#footnote-ref-130)
130. Coroners Court of Victoria (2013). *Inquest into the death of Tyler Robinson* (File No. COR 2010/2038). [↑](#footnote-ref-131)
131. Gas Appliance (Carbon Monoxide) Safety Strategy. [↑](#footnote-ref-132)
132. Risk in terms of deaths and illnesses. [↑](#footnote-ref-133)
133. Deloitte analysis of Quantum Market Research, *Energy Safe Victoria Gas Heaters Research (*2018). [↑](#footnote-ref-134)
134. Residual safety risk is estimated as the health cost incurred due to fatal and non-fatal CO exposures caused by OFGSHs in rental properties, after the preferred option has been implemented. [↑](#footnote-ref-135)
135. Based on data from DELWP. [↑](#footnote-ref-136)
136. Electrochemical sensor CO alarms: have a limited life span of around 2 to 7 years, but their life expectancy and effectiveness will vary depending on their environment (and the relative heat, humidity, and dust), battery condition, and the level of exposure to CO. [↑](#footnote-ref-137)
137. Data provided by DELWP. [↑](#footnote-ref-138)
138. The VBA will support ESV and DELWP in communicating and informing registered/licenced practitioners on these changes and other implementation matters. [↑](#footnote-ref-139)
139. The VBA has a role in compliance and enforcement of standard gasfitting installations under Victorian plumbing regulatory framework. [↑](#footnote-ref-140)
140. Office of the Commissioner for Better Regulation. (2016). *Victorian Guide to Regulation: A handbook for policy-makers in Victoria*. Melbourne, Australia. Accessed at: [http://www.betterregulation.vic.gov.au/files/98181269-905c-4893-bff3- a6bb009df93c/Victorian-Guide-to-Regulation-PDF-final.pdf](http://www.betterregulation.vic.gov.au/files/98181269-905c-4893-bff3-%20a6bb009df93c/Victorian-Guide-to-Regulation-PDF-final.pdf) [↑](#footnote-ref-141)
141. *Gas Safety Act 1997.* Accessed at:<http://www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/LTObject_Store/LTObjSt2.nsf/DDE300B846EED9C7CA257616000A3571/8CBF51BFAC2DD3CBCA25776100216E9B/$FILE/97-99a025.pdf> [↑](#footnote-ref-142)
142. ESV (2018). *Gas information sheet 36: Carbon Monoxide Alarms for Domestic Use.* Accessed at: <https://esv.vic.gov.au/wp-content/uploads/2018/06/Gas_information_sheet_36.pdf> [↑](#footnote-ref-143)
143. Ibid. [↑](#footnote-ref-144)