ENSURING ELECTRICAL SAFETY IN VICTORIA:

EXTENDING THE PROHIBITION ON CERTAIN MODELS OF RCBOs

Regulatory Impact Statement

Energy Safe Victoria

March 2020

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EXECUTIVE SUMMARY

Since July 2018, a prohibition has been imposed on the supply into Victoria of certain models of RCBOs, a common type of electrical safety switch. This prohibition was implemented following an investigation by Energy Safe Victoria (ESV) into the August 2016 death of an apprentice electrician, who received a fatal electrical shock while working at a residential property in Victoria. This investigation identified a design vulnerability with some types of RCBO that makes them prone to failure under certain conditions.

The current prohibition is due to expire on 30 June 2020. Having considered the impact of the prohibition and a range of alternative approaches, **ESV's preferred option is to extend the prohibition by a further ten years**.

This regulatory impact statement has been prepared pursuant to the *Subordinate Legislation Act 1994* as part of an assessment process to demonstrate that a ten-year extension to the prohibition represents the best approach to addressing the electrical safety risks associated with the installation of RCBO models with the design vulnerability.

Why is ESV considering action and what objectives does it hope to achieve?

ESV has statutory obligations under two acts of Parliament to ensure electrical safety in Victoria, and administers a strong regulatory framework that governs the safety of electricity supply and use in the State. This framework appears to be effective: on a per capita basis, Victoria has been the safest jurisdiction in Australia in terms of electrical-related deaths since 2001-02, and there has been a downward trend in the number of serious injuries caused by electrical accidents. Nevertheless, there have been over 40 fatal electrical incidents in Victoria since this time, and more than 1,200 serious injuries.

Following its investigation into the August 2016 death of the apprentice electrician, ESV was compelled under its legislative mandate to intervene to address the electrical safety risks to the Victorian community being posed by the installation of those models of RCBO with the design vulnerability that makes them prone to failure. Although the size of the problem was difficult to assess, data from one major wholesaler in Victoria showed that around 80 per cent of its RCBO sales were of models with the design vulnerability.

While the likelihood of potential failure of RCBOs is considered low, the risk is not trivial – and the impacts of failure are potentially high, particularly if more lives are lost or serious injuries are caused by electrical accidents. Furthermore, the risks are increasing over time as the number of RCBOs being installed in residential properties continues to grow – it is now a mandatory requirement for safety switches to be fitted to the power and lighting circuits of all new dwellings, in all dwellings where significant electrical work is undertaken, and as part of new installations of household electrical appliances such as cook tops, hot water systems and air conditioning units.

ESV embarked on a two-tier strategy to achieve the electrical safety objectives of the *Electricity Safety Act 1998*, which include ensuring the electrical safety of electrical installations and electrical equipment:

- a preventative approach to mitigate the escalation of the risk – achieved by placing a prohibition on the further supply into Victoria of RCBO models that had the design vulnerability, which could be identified through an additional testing regime developed by

ESV (in consultation with industry). RCBO models without the design vulnerability were already readily available in the market and were comparable in price to the models that were prone to failure; and

- a longer term plan for an education and public awareness campaign to encourage householders to test safety switches that had been previously installed in their dwellings to check their functionality. Given the costs and risks involved, ESV determined this approach to be a more proportionate response to the problem than a product recall of all previously-installed RCBOs.

The prohibition was initially intended to come into effect in June 2017 but, following feedback from stakeholders, the implementation of the prohibition was delayed until July 2018 to give industry more time to transition to the new arrangements.

The current prohibition is due to expire on 30 June 2020. In the absence of any further intervention by ESV, the lifting of the prohibition would allow models of RCBO with the design vulnerability to re-enter the Victorian market, posing increased safety risks to the Victorian community.

With changes to the relevant standards unlikely in the short- to medium-term, ESV regards an extension of the prohibition as the most effective way to mitigate the electrical safety risks posed by the use of RCBOs with the design vulnerability and prevent the problem from growing.

To achieve the electrical safety objectives under the *Electricity Safety Act 1998*, ESV proposes that the RCBO prohibition be extended for a further ten years.

As part of its deliberations to extend the prohibition, ESV notes that the RCBO market appears to have made a smooth transition to the implementation of the prohibition. For example:

- there were no reported shortages of RCBOs to ESV following the initial implementation of the prohibition in July 2018;
- manufacturers and importers were able to source or re-design RCBO products to ensure compliance with ESV's additional testing requirements;
- ESV has listed over 900 models of RCBOs that meet its additional testing requirements, and these are comparable in price to models that have the design vulnerability;
- no suppliers have gone bankrupt or left the Victorian market since the prohibition has been in effect; and
- independent market research indicated that there has been no increase in average RCBO prices in Victoria following the implementation of the prohibition.

What are the expected impacts of extending the prohibition?

Before assessing the expected benefits and costs of extending the prohibition, the first step is to determine the reference point or 'base case' for the analysis in order to identify the appropriate benefits and costs associated with the regulatory intervention. The base case represents the situation that would arise if no further intervention were to take place.

Because the current RCBO prohibition is due to expire on 30 June 2020, ESV considers that the appropriate base case for assessing the costs and benefits of its preferred option of extending the prohibition is the situation that would arise if the prohibition were lifted on 1 July 2020 and not replaced.

In other words, the impact assessment involves the identification of the *additional* benefits and costs associated with extending the prohibition beyond its current term compared to the situation that would apply if the prohibition expires. Under the base case, it would be feasible that RCBOs with the design vulnerability would re-enter the Victorian market, posing increased electrical safety risks. However, it is hard to predict the numbers of 'vulnerable' RCBOs that would be installed in Victorian homes if the prohibition expired as this would depend on a host of factors, including commercial decisions made by suppliers, the price competitiveness of different RCBOs models, and RCBO customer preferences. As such, there is much uncertainty about the likely impacts.

The main potential benefits to the Victorian community that are expected to result from an extension of the prohibition are: a reduction in the number of fatalities resulting from electrical shock; a reduction in the number of electrical-related serious injuries; and a reduction in property damage arising from structural fires caused by electrical faults.

As with other forms of safety regulation, methodological challenges mean that it is difficult to quantify the size of these benefits. Nevertheless, ESV investigations into the causes of electrical-related incidents in recent years highlight the importance of RCBOs in improving safety outcomes, noting that fatalities and serious injuries have occurred in the absence of functioning RCBOs.

Better Regulation Victoria provides guidance material suggesting that the value of a statistical life is around $4.6 million (measured in 2019 dollars), which can be used as part of the impact assessment. In other words, for every life saved by the installation of a well-functioning RCBO (rather than one with the design vulnerability that failed to operate), the benefits to the Victorian community would be valued at $4.6 million.

The potential ongoing costs of extending the prohibition may be borne by: suppliers of RCBOs, who incur costs in complying with the prohibition; users of RCBOs, if the extension of the prohibition results in an increase in average RCBO prices; and ESV, which has to devote resources to education, compliance and enforcement activities to support the operation of the prohibition.

To inform its impact assessment, ESV has sought feedback from industry participants about the potential ongoing costs to RCBO suppliers of extending the prohibition. The Australian Industry Group (AIG), whose members account for approximately 90 per cent of supply to the electrical market, has provided cost information. ESV has taken AIG's data into consideration in deriving an estimate of $2.2 million per year as the ongoing costs to suppliers of extending the prohibition. ESV is seeking further clarification, however, on the size and nature of some of the cost categories included in AIG's estimates, in requesting feedback to this regulatory impact statement.

Turning to the potential costs of extending the prohibition to users of RCBO in terms of potentially higher RCBO prices, ESV commissioned independent market research that indicated that average RCBO prices in Victoria actually *fell* in the two years following the implementation of the prohibition. ESV can see no reason to expect that any extension of the prohibition will cause an increase in costs for users of RCBOs.

The costs incurred by ESV in administering and enforcing the prohibition are modest – at around $50,000 per year – because many activities related to the prohibition 'piggy-back' off business functions that are undertaken in any case as part of ESV's ongoing education and compliance/enforcement initiatives for electrical products and installations. Such costs can be absorbed within ESV's existing funding, without contributing to any increase in the cost recovery charges that are imposed on the electrical industry.

The table below summarises the cost-benefit analysis of extending the prohibition, which is presented in the form of a breakeven calculation. It indicates that the extension of the prohibition would need to contribute to a reduction of around one electrical-related fatality every two years in order to justify the ongoing costs of the prohibition (ie, demonstrate a net benefit).

Breakeven analysis of ESV's preferred option (based on costs derived from AIG cost estimates)

Ongoing costs associated with extending prohibition	
Costs incurred by RCBO suppliers ($m per annum)	*2.201*
Costs incurred by consumers	*0*
Costs incurred by ESV ($m per annum)	*0.050*
Total costs ($m per annum)	**2.251**
Statistical value of life ($m)	**4.6**
Required reduction in fatalities per annum to demonstrate net benefit	**0.49**
Average number of fatalities in last five years (2014-15 to 2018-19)	*3*

In ESV's view, this analysis is based on a *conservative* estimate of the benefits of the prohibition because it does not take into account any benefits (ie, avoided costs) arising from a reduction in serious injuries and/or structural damage from electrical fires that might be prevented by a well-functioning RCBO. Furthermore, ESV believes the cost estimates adopted in the analysis represent an upper band of the likely costs imposed on suppliers as a result of extending the prohibition given the nature of the cost included in industry estimates.[1] As such, the cost-benefit analysis presented in this RIS likely *underestimates* the actual net benefit of ESV's preferred option.

What other options have been considered?

An important element of the regulatory impact statement process is to consider and assess different courses of action to address the identified problem and achieve the stated objective of intervention.

ESV has considered the following alternatives to its preferred option of extending the prohibition by a further ten years. Some of these alternative approaches have been identified following feedback from stakeholders:

A. **No further intervention** once the current prohibition expires on 30 June 2020.

B. **Extend the prohibition for a shorter period** (eg, five years) **and then review** – if necessary, the prohibition could be changed or lifted after the review to take account of any changing circumstances over that period.

C. **Extend the prohibition for a further ten years and introduce measures to address safety risks in established dwellings** – for example, product recall on those brands and models of RCBO that do not meet ESV's additional testing requirements, which were sold before the

[1] In its March 2019 information paper, ESV's estimates of the costs on suppliers of extending the prohibition focused solely on the costs of complying with ESV's additional testing regime when new and/or redesigned RCBO models are developed. As discussed in Box 4.1 in chapter 4 of this RIS, assuming that an additional 15 tests are conducted each year to verify these new/redesigned models, the annual costs would range from $6,000 (if the tests were conducted in-house by suppliers) to $30,000 (if the tests were outsourced to external providers).

prohibition came into effect; mandatory upgrading of switchboards of domestic dwellings upon change in ownership; and a government rebate to encourage homeowners to upgrade their switchboards.

D. The prohibition is not extended after it expires on 30 June 2020, but **ESV increases its education, compliance and enforcement** activities surrounding RCBOs and their installation.

For each of the four options, the table below presents a summary of their main benefits/advantages and costs/disadvantages when compared to the expected impacts under the ESV's preferred option of extending the prohibition by ten years.

In ESV's view, the alternatives are not as cost-effective as the ten-year extension to the prohibition in managing the risks posed by the RCBOs with the design vulnerability – chiefly because of their high cost and/or because they would be less effective in reducing the electrical safety risks.

Assessment of alternatives to preferred option

Option	Benefits/Advantages*	Costs/Disadvantages*
A. No further intervention after prohibition expires *ESV maintains supplementary measures (such as education, compliance and enforcement activities) at current levels*	• Avoided ongoing costs associated with current prohibition.	• Electrical safety risks will increase, potentially leading to more fatalities, serious injuries and/or property damage from electrical fires. • May cause confusion in the market and increase community angst because RCBOs with the design vulnerability could be sold in Victoria again.
B. Extend prohibition for a shorter period (eg, five years) and then review	• Provides an automatic mechanism for a more timely adjustment of regulatory arrangements if circumstances change. • Ongoing costs associated with current prohibition are incurred for shorter period if review suggests prohibition no longer necessary.	• Less certainty in the marketplace, which may affect future planning and investment decisions by suppliers. • Higher costs associated with more frequent assessment of regulatory arrangements (eg, consultation costs, other costs of undertaking RIS).
C. Extend prohibition for ten years and introduce measures to address risks in established dwellings *(eg, product recalls, mandatory switchboard upgrades upon change of ownership)*	• More effective in managing electrical safety risks because tackles problem in both new and established dwellings.	• Very costly: – suppliers would likely have to bear the costs of recalls of prohibited RCBOs (eg, cost of advertising, cost of replacing and installing RCBOs); – those selling homes would likely bear costs of checking and upgrading switchboards – estimated in excess of $20M/year). • Increased community angst/confusion (eg, product recalls may reduce confidence in all safety switches).

Option	Benefits/Advantages*	Costs/Disadvantages*
D. Prohibition allowed to expire and ESV increases its education, compliance and enforcement activities	• Avoided ongoing costs associated with current prohibition.	• Less effective in managing safety risks potentially leading to more fatalities, serious injuries and/or property damage from electrical fires: – there are limits to effectiveness of education/public awareness campaigns; – difficult and costly to check activities of many electrical installers; – human error means mistakes will continue to happen. • Increased costs incurred by ESV (which may ultimately be passed onto industry through cost recovery arrangements).

*Note: Impacts are compared to those expected under the preferred option of extending prohibition by ten years.

How would the preferred option be implemented and evaluated?

ESV would implement an extension to the prohibition by publishing a notice in the *Government Gazette* and in a newspaper circulating generally in Victoria, pursuant to section 63(1) of the *Electricity Safety Act 1998*.

The extended prohibition would be augmented by continuing efforts by ESV to raise public awareness of electrical safety issues, and activities designed to improve compliance with, and enforcement of, electrical installation requirements. Relevant initiatives include:

- public awareness campaigns to encourage Victorian householders to test the safety switches, including the ongoing *Household wiring: Be on the right side of power safety* campaign;
- safety alerts about the extended RCBO prohibition would be emailed to all registered electrical contractors and licensed electricians, and feature in ESV's quarterly *EnergySafe Magazine;*
- encouraging registered electrical contractors and licensed electricians to report and provide to ESV all non-functioning RCBOs that they encounter during their day-to-day work; and
- checking compliance with the prohibition through ESV's regular electrical equipment safety market surveillance audits.

In addition, ESV is considering other measures to help support the safety objectives of the prohibition, including re-designing the Certificate of Electrical Safety, and supporting amendments to wiring rules to remove the current exemption for verification testing requirements of newly-installed electrical systems if no power is available on the site.

Evaluating the effectiveness of the RCBO prohibition in ensuring electrical safety outcomes presents challenges – for example, because safety switches such as RCBOs presents the 'last line of defence' of a *suite* of regulated safety measures designed to minimise the risk of injury, death or property damage, and it is difficult to disentangle the contribution of individual safety measures.

Notwithstanding these challenges, ESV would evaluate the effectiveness of an extended RCBO prohibition by continuing to consider the findings of investigations into electrical-related fatalities and serious injuries, continuing to include RCBOs as part of its electrical equipment safety market surveillance audit activity, evaluations of its public awareness campaigns, and through its regular contact with industry stakeholders.

What feedback is required?

ESV invites stakeholder feedback about any aspect of the analysis included in this regulatory impact statement. Details about making submissions are provided in chapter 1 of this document.

ESV is particularly keen to get clarification and further information about the issues highlighted in the box below:

- What is the size of the RCBO market in Victoria? How many RCBOs are currently sold monthly for household or residential use?
- What information is available about the number/proportion of models of RCBOs that have already been installed in Victorian homes before the prohibition came into effect, but which are not compliant with ESV's additional testing requirements?
- What is the role of RCBOs in reducing the incidence of electrical fires? What is the evidence base linking RCBOs to a reduced incidence of electrical fires?
- To what extent would RCBO models with the design vulnerability re-enter the Victorian market if the prohibition was allowed to expire?
- Is the $2.2 million per annum estimate of the ongoing costs to suppliers used in this RIS reflective of the likely costs of extending the prohibition?
- What are the disaggregated cost categories used in industry estimates of the ongoing annual cost associated with the prohibition?
- To what extent would costs incurred by suppliers to "support the product" (eg, technical support, customer service and warranty support) be reduced or avoided in the absence of the prohibition?
- Should any costs reportedly incurred by RCBO suppliers in maintaining separate product lines as a result of the prohibition be considered as part of the cost-benefit analysis given that this appears to represent a commercial consideration, rather than a regulatory compliance issue?
- To what extent do the testing cost estimates submitted by RCBO suppliers reflect the testing associated with quality assurance processes?
- What is the nature of the ongoing education and staff training that is being undertaken by industry as a result of the prohibition, given that the prohibition has been in place since July 2018?
- Is there any evidence to suggest that extending the RCBO prohibition will result in an increase in prices to end-users in Victoria?
- Aside from those analysed in this RIS, what other costs would be incurred by the community if the RCBO prohibition were extended beyond 30 June 2020? Are there any other benefits that should be considered?

1. INTRODUCTION AND BACKGROUND

1.1 Purpose

Since 1 July 2018, a prohibition has been placed on the supply of certain brands and models of RCBOs – a type of electrical safety switch – in Victoria by Energy Safe Victoria (ESV), which is the main regulator responsible for electrical safety in the State under the auspices of the *Electricity Safety Act 1998*. This prohibition was put in place following an investigation into a fatality that found that certain types of RCBO have a design vulnerability that make them prone to failure under certain circumstances. ESV has developed an additional testing regime that identifies these types of RCBOs.

The current prohibition is due to expire on 30 June 2020. To ensure electrical safety in Victoria, ESV's preferred option is to impose a prohibition for a further ten-year period on those RCBOs that do not meet ESV's additional testing requirements.

This paper is a regulatory impact statement (RIS) that has been prepared pursuant to the *Subordinate Legislation Act 1994* as part of an assessment process to demonstrate whether the benefits to the community of extending the RCBO prohibition outweigh the costs, and whether the prohibition represents a form of intervention that is superior to alternative approaches in achieving electrical safety objectives in relation to RCBOs.

As required by the Subordinate Legislation Act, the assessment framework of this RIS:

- examines the nature and extent of the problem to be addressed;
- states the objectives of the proposed ten-year prohibition;
- outlines the effects on various stakeholders; and
- assesses the costs and benefits of the proposed ten-year prohibition, and compares its impacts to other feasible alternatives.

Stakeholder input is a critical element of the RIS process. While representatives of the electrical industry have already provided input that has informed the analysis contained in this paper, the release of this RIS represents a further opportunity for interested stakeholders to provide comment. All submissions will be considered by ESV before a final decision is made about the future of the RCBO prohibition. Details about how to provide feedback to the RIS are contained in section 1.5 below.

1.2 What is a RCBO?

A RCBO is a residual current operated circuit breaker with integral overcurrent protection. A type of electrical safety switch, the purpose of a RCBO is to prevent electrocution and other serious harm resulting from electric shocks. Such shocks may arise when a person comes into contact with mains voltage and earth. A RCBO also switches off the power when there is an 'over-current' event – for example, when too many appliances are plugged into the same circuit, or when an appliance is faulty. This can help prevent electrical fires.

In Victoria, it is a regulatory requirement for safety switches such as RCBOs to be fitted to the power and light circuits of all new dwellings and where significant electrical work is undertaken on established residential homes. In addition, new wiring rules[2] stipulate that safety switches are also

[2] AS/NZS 3000:2018 *Electrical Installations*

mandatory for all domestic and residential final sub-circuits, which means that they are now needed as part of new installations of household electrical appliances such as cook tops, hot water systems and air conditioning units.

Figure 1.1 shows a picture of typical household RCBOs, while Box 1.1 explains why RCBOs are now the most common type of electrical safety switch installed in Victorian homes.

Figure 1.1: Examples of typical RCBOs installed in residential properties

Box 1.1: RCBOs are now the most common type of electrical safety switch

In the past, there were two types of protection devices typically installed in an electrical switchboard: a residual current device (RCD) and a miniature overcurrent circuit breaker (MOCB). The RCD is designed to protect the user from being exposed to dangerous currents, while the MOCB protects the building wiring from being overloaded. Switchboards have a limited amount of space, and so the need to install two separate devices for electrical protection sometimes proved problematic.

The more recent development of RCBOs, which can perform the *dual* functions of protecting both users and the building wiring, freed up space in the switchboard because RCBOs can replace two separate devices. Overall installation time is also reduced by using RCBOs. Thus, RCBOs are now the preferred device used by electricians, instead of installing both a RCD and MOCB.

1.3 History of the RCBO prohibition

In August 2016, a third-year apprentice electrician received a fatal electric shock while apparently working on electrical wiring connections related to the installation of a smoke alarm at a residential property in Victoria. It is believed that the deceased was in the process of preparing wiring for connecting the smoke alarm to an existing lighting circuit in the roof space. The lighting circuit was connected to a RCBO in the switchboard, but the RCBO failed to prevent the electrical current running through the apprentice electrician when he came into contact with the mains voltage.

As a result of this incident, ESV undertook an investigation to determine why the RCBO had not operated as intended. This investigation was completed in December 2016. As part of this

investigation, other types of RCBOs were tested. While fully compliant with Australian standards,[3] ESV identified that some types of RCBOs had a design vulnerability that made them prone to failure under certain circumstances – namely:

- if the RCBO is wired in an orientation opposite to the supplier's instructions (line to load, and load to line) – in other words, the RCBO is installed upside down; and/or
- the active conductors from two different circuits are connected to the RCBO. This could occur due to defective wiring by the electrician or from external influences (such as overheating of the wiring, mechanical damage, rodent damage, etc).

This design vulnerability is not currently covered by the relevant Australian or international standards for RCBOs.

The ESV investigation report found that there are RCBOs available in the market that continue to operate effectively no matter which way they are installed, and if there are faults within the installation of the electrical wiring in a home.

ESV's findings were forwarded to the Coroners Court of Victoria which, at the time of preparing this RIS, has yet to release the findings of its investigation.

The ESV report recommended that the relevant Australian electrical standard for RCBOs and safety switches be reviewed, and additional tests implemented to verify that the devices would continue to provide their primary safety function even if the noted faults are simulated. To protect the safety of electrical workers and members of the public, the ESV report further recommended that a prohibition be placed on the supply of RCBOs that failed to meet the additional testing requirements specified by ESV.

The Electrical Accessories technical committee of Standards Australia[4] did not support ESV's proposed testing to be added to the standard. The sub-committee resolved that the issue instead be referred to the International Electrotechnical Commission (IEC) for further consideration. The IEC did not support the proposed changes.

Nevertheless, given the safety risks associated with the large number of RCBOs being installed in Victorian homes, many of which had the design vulnerability, ESV decided to issue a prohibition, pursuant to section 63(1) of the *Electricity Safety Act 1998*, on the supply into Victoria of those RCBOs that did not pass its additional testing requirements.

The prohibition applies to compact RCBOs that meet the criteria detailed in Box 1.2 below.[5]

[3] *AS/NZS 61009 – Residual current operated circuit-breakers with integral overcurrent protection for household and similar use (RCBOs) – General rules*.

[4] The Electrical Accessories (EL-004) committee comprises representatives from numerous industry groups, along with government bodies and consumer groups. According to the Standards Australia website (accessed 13 January 2020), the current constitution of this technical committee is: Association of Accredited Certification Bodies; Australian Chamber of Commerce and Industry; Australian Industry Group; Consumer Electronics Suppliers Association; Consumers Federation of Australia; Electrical Compliance Testing Association of Australia; Electrical Regulatory Authorities Council; Energex; Engineers Australia; International Accreditation New Zealand; Joint Accreditation System of Australia and New Zealand; National Electrical and Communications Association, New Zealand Manufacturers and Exporters Association; NSW Fair Trading; Plastic Industry Pipe Association of Victoria; Standards New Zealand; and Worksafe New Zealand.

[5] While targeted primarily at the residential housing sector, the prohibition also applies to RCBOs in a commercial or industrial installation if the RCBO meets the criteria of a compact RCBO as defined in Box 1.2.

Box 1.2: RCBOs covered by the prohibition

The prohibition applies to compact RCBOs – ie, any DIN Rail mountable RCD with integral overcurrent protection that either:

(a) meets both of the following criteria – namely:

(i) it is less than 110mm in length (excluding any external clips); and

(ii) it has a rated short circuit breaking capacity of less than 10 kilo amps;

or (b) is marked or marketed as being for household or residential use.

The prohibition applies to all compact RCBOs even if they are integrated in other electrical equipment such as preassembled switchboards.

However, the prohibition does not apply to those brands and models of compact RCBO that have passed ESV's additional testing requirements[6] and are listed on ESV's website as having complied who these additional verification requirements.[7]

This history of the RCBO prohibition is presented in Table 1.1.

Originally intended to take effect in June 2017, the implementation of the prohibition was delayed until July 2018 to provide a transition period to the new arrangements. Upon its expiry on 1 July 2019, a second prohibition notice was issued, which came into effect on 3 July 2019. This is the current prohibition, which is due to expire on 30 June 2020.

[6] The additional testing requirements can be accessed from www.esv.vic.gov.au/pdfs/additional-testing-and-verification-requirements-for-rcbos/

[7] The list of compliant RCBOs can be found at: www.esv.vic.gov.au/technical-information/electrical-appliances-and-equipment/complaint-rcbos/

Table 1.1: RCBO prohibition timeline

Date of notification	Date of effect	Date of expiry	Details
5 April 2017	**9 June 2017** *(intended, but subsequently withdrawn)*	**9 June 2018** *(intended, but subsequently withdrawn)*	A prohibition notice dated 5 April 2017 pursuant to section 63(1) of the *Electricity Safety Act 1998* for those RCBOs that did not pass ESV's additional testing requirements was originally published in the *Victorian Government Gazette* dated 7 April 2017 (No. S113). It was intended to take effect in June 2017 for a period of 12 months. However, suppliers of RCBOs requested more time to understand and transition to the additional testing requirements. This prohibition notice was subsequently withdrawn.
19 May 2017	**1 July 2018**	**1 July 2019**	A replacement prohibition dated 19 May 2017 was published in the *Victorian Government Gazette* dated 22 May 2017 (No. S160). The prohibition notice stated that the brands and models of RBCOs that passed the additional testing requirements and comply with additional verification requirements would be published on ESV's website. To provide time for transition to the new arrangements, the date of effect of this 12-month prohibition was delayed until 1 July 2018. A regulatory impact statement was not required for this prohibition. Regulation 7 of the *Subordinate Legislation (Legislative Instruments) Regulations 2011* provides an exemption from the requirement to undertake a RIS for certain legislative instruments – as specified in schedule 3 of those regulations. An exemption of 12 months for ESV's prohibition power is listed as item 37.1 in schedule 3.
1 July 2019	**3 July 2019**	**30 June 2020**	The current prohibition made pursuant to section 63(1) of the *Electricity Safety Act 1998* was dated 1 July 2019 and published in the *Victorian Government Gazette* dated 3 July 2019 (No. S283). The additional testing requirements were revised on 1 July 2019. This prohibition is due to expire on 30 June 2020.

1.4 Previous stakeholder engagement

ESV has engaged extensively with stakeholders during the design and implementation of the RCBO prohibition, and its decision-making has taken into consideration submissions received from stakeholders.

ESV wrote to the Australian Industry Group (AIG) on 1 February 2019 seeking the views of its members with respect to the anticipated costs and benefits of extending the prohibition beyond 1 July 2019.[8]

AIG submitted a response on 22 February 2019, which helped to inform the development of a public information paper that was published by ESV on its website in March 2019.[9] In May 2019, the AIG provided a submission in response to the issues raised in the public information paper. Submissions were also received from three other stakeholders. These submissions were taken into account prior to the issuing of the new prohibition for a period of 12 months.

In November 2019, ESV wrote to AIG and other key industry participants announcing its intention to prepare this RIS, with a view to making the prohibition longer term to provide industry with certainty. ESV requested information to assist with the development of this RIS, including details about:

- the market for RCBO in Victoria and the impact of the prohibition on the market;
- additional costs incurred by industry participants as a result of the prohibition;
- additional costs and benefits that would likely arise if the prohibition is extended; and
- potential alternatives to the prohibition.

ESV received individual responses from nine industry participants (comprising RCBO suppliers and wholesalers, and an electrical business that purchase RCBOs for installation),[10] as well as a submission from AIG dated 17 February 2020.

1.5 About this paper and how to provide feedback

This RIS, which draws heavily on the public information paper released in March 2019, has been prepared in accordance with the *Victorian Guide to Regulation*,[11] which provides a best practice approach to analysing any proposed regulatory intervention.

The remainder of this paper is structured as follows:

- **Chapter 2** discusses the nature and extent of the problem that justifies some form of intervention to regulate electrical safety in Victoria, and the role played by RCBOs in ensuring electrical safety.
- **Chapter 3** states the objectives of measures to ensure electrical safety, highlighting the specific objective of the current RCBO prohibition.
- **Chapter 4** presents the anticipated costs and benefits of ESV's preferred option of extending the RCBO prohibition for a further period of ten years.
- Alternative measures to achieve the stated electrical safety objectives are assessed in **chapter 5**.

[8] According to the AIG, it represents members who are responsible for approximately 90 per cent of supply to the electrical market, as well as small online trade and fringe suppliers. AIG also represents electrical wholesalers with approximately 50 per cent of the wholesale market for RCBOs.
[9] ESV, March 2019, *Improving electrical safety in Victoria: Extending the Prohibition – Information paper* – available at: https://esv.vic.gov.au/pdfs/rcbos-information-paper-extending-prohibition/
[10] Responses were received from 1st Call Electrical Services, ABB, Arlec Australia, CBI Electric, Cubium Group, Fibian, Hager, Middy's, and Mr Eco – energy saving solutions,
[11] Commissioner for Better Regulation, 2016, *Victorian Guide to Regulation: A handbook for policy-makers in Victoria*.

- Finally, **chapter 6** outlines the proposed implementation and evaluation of ESV's preferred option.

The release of this RIS provides a further opportunity for stakeholder input regarding the future of the RCBO prohibition, and to provide feedback about the cost-benefit analysis that has been prepared. The Executive Summary highlights some specific issues where ESV is particularly keen to get further information from stakeholders.

All submissions to this RIS will be considered by ESV before a final decision is made about the future of the RCBO prohibition.

Any feedback should be submitted to ESV by **Wednesday 6 May 2020** at the latest.

ESV's contact details are as follows:

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2. NATURE AND EXTENT OF THE PROBLEM

2.1 The regulation of electricity safety in Victoria

Over the past century, electricity has become an essential product. It powers homes and workplaces, and electrical appliances have become ubiquitous in all aspects of life. However, electricity is inherently hazardous, and its extensive use is only possible because of a multi-faceted safety approach that extends from generation and transmission to the design and operation of electrical appliances. The inherent risks associated with electrical work are managed through a variety of practices and precautions, including electrical wire insulation, safety distances for aerial lines, safety depths for burying electrical cables, and the installation of safety devices.

Safety regulation emerged at the very beginning of electricity's widespread use in the community. Regulations covering electrical installations and wiring in Victoria can be traced back to 1918. While there has been a trend towards greater national uniformity in the regulatory environment governing electricity installations, and an increased reliance on the Australian and New Zealand standards as the benchmark for prescribed electrical installation standards, Victoria nevertheless maintains state-specific arrangements where these are deemed necessary.

In Victoria, the *Electricity Safety Act 1998* is the primary piece of legislation that governs the safety of electricity supply and use in the State. A number of regulations – covering safety issues in matters such as registration and licensing, installation, equipment, electric line clearances, cathodic protection, and bushfire mitigation – are made pursuant to the *Electricity Safety Act 1998*.

Energy Safe Victoria is the main regulator responsible for electricity (and gas) safety in the State. ESV was established under the *Energy Safe Victoria Act 2005*. The objectives of ESV as stated in the *Electricity Safety Act 1998* are to:[12]

- ensure the electrical safety of electrical generation, transmission and distribution systems, electrical installations and electrical equipment;
- control the electrical safety standards of electrical work carried out by electrical workers; and
- promote the prevention and mitigation of bushfire danger.

The *Electricity Safety Act 1998* also stipulates the functions of ESV, which include:[13]

- determining minimum safety standards for electrical equipment, electrical installations and electrical work;
- encouraging and monitoring the use of electricity safety management schemes;
- inspecting and testing electrical equipment, electrical installations and electrical work for compliance with the specified safety standards;
- investigating events or incidents which have implications for electricity safety; and
- advising the electricity industry and the community in relation to electricity safety.

The justification for safety regulation governing the installation and use of electricity stems from its inherently hazardous nature, which poses a high risk of injury or death, and damage to property (eg, as a result of structural fires created by electrical faults).

[12] Section 6 of the *Electricity Safety Act 1998*.
[13] See Section 7 of the *Electricity Safety Act 1998* for the full list of ESV functions.

In the absence of any government-imposed safety regime surrounding electrical installation work – which is relevant in terms of this analysis of the RCBO prohibition – two main types of 'market failure' are likely to emerge:[14]

- asymmetric information – it is difficult and costly for consumers to discover whether electrical installation work has been carried out safely. Specifically, consumers lack the specialist technical expertise to verify whether wiring has been installed safely and, in most cases, are unable to check this because wiring is behind walls or in areas that are difficult to observe; and
- externalities – builders and electrical contractors do not bear the full cost of any accidents or fires arising from electrical faults that involve future occupants or users of a building.

The concept of safety in electrical installation work has several aspects: it relates to the safety of workers and tradespeople involved in electrical installation work; the owners and users of electrical installations; and any other people who may face any direct or indirect dangers from unsafe electrical installation work.

Exposure to electricity can result in a range of injuries, including: damage to the cardiovascular system; skin injuries and burns; nervous system disruption; respiratory arrest; and head injuries, fractures and dislocations caused by being thrown due to the severe muscle contractions induced by the current. In some cases, exposure to electricity can result in death.

Faulty electrical installations and appliances can also result in electrical fires, which can damage property and endanger lives.

2.2 The number of electrical-related deaths and serious injuries in Victoria

Table 2.1 presents data on the number of deaths and serious injuries arising from electrical accidents in Victoria since 2001-02 (which is when it became mandatory for electrical safety switches to be installed to both the power and lighting circuits of new residential dwellings, and in established dwellings where significant electrical work was undertaken). To adjust for Victoria's rising population, the table also shows death and serious injuries per million people.

Over this period, there have been more than 40 deaths and over 1,200 serious injuries in Victoria. This provides a compelling case for the need for continued intervention to improve electricity safety outcomes.

While there is no apparent *trend* in the number of electrical-related fatalities since 2001-02, there has been a marked downward trend in the number of serious injuries.

[14] 'Market failure' is a term often used by economists to describe a situation where the free market (ie, the absence of any government intervention or activity) would fail to deliver the best outcome for the community.

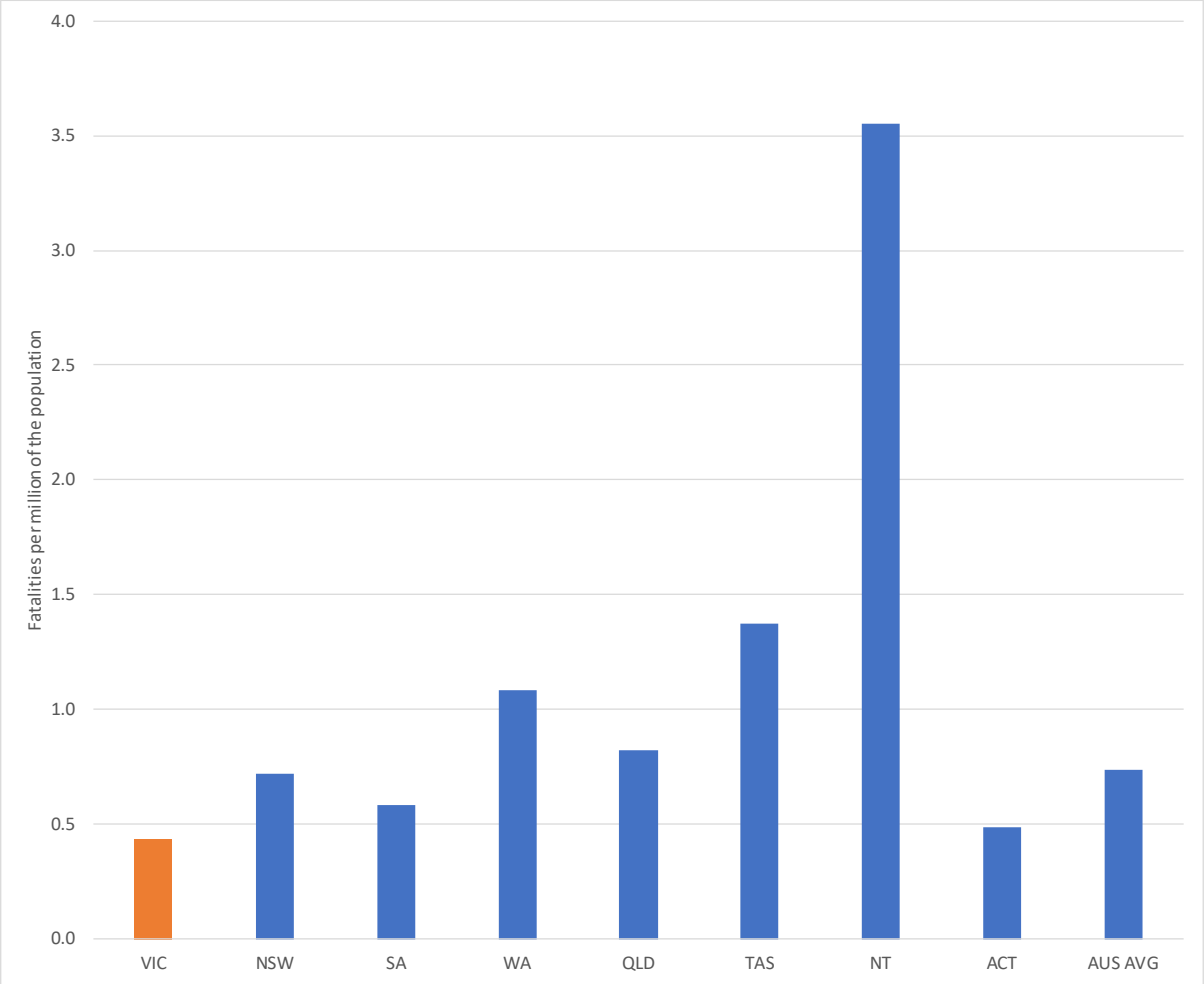
Table 2.1: Number of deaths and serious injuries arising from electrical accidents in Victoria*

	--- Total numbers ---		--- Per million of the population ---	
	Deaths	**Serious injuries**	**Deaths**	**Serious injuries**
2001-02	1	293	0.00	60.82
2002-03	0	196	0.00	40.21
2003-04	1	138	0.20	28.01
2004-05	1	156	0.20	31.27
2005-06	6	67	1.38	13.24
2006-07	2	44	0.78	8.54
2007-08	1	69	0.19	13.13
2008-09	1	56	0.19	10.42
2009-10	9	45	1.83	8.24
2010-11	4	37	0.72	6.68
2011-12	1	40	0.18	7.08
2012-13	1	38	0.17	6.58
2013-14	2	9	0.34	1.53
2014-15	1	9	0.17	1.49
2015-16	5	7	0.81	1.13
2016-17	2	7	0.32	1.11
2017-18	3	2	0.46	0.31
2018-19	4	4	0.61	0.61
Total	**45**	**1,217**		

**Note: Excludes wilful events.*
Sources: ESV, Australian Bureau of Statistics

Figure 2.1 compares the electrical safety performance of each jurisdiction in Australia, as measured by the average number of electrical fatalities per million of population from 2001-02 to 2018-19. It reveals that Victoria has the lowest rate of electrical deaths in Australia over this period.

Figure 2.1: Number of electrical fatalities per million of the population by Australian jurisdiction – Average 2001-02 to 2018-19



Sources: ESV, Electrical Regulatory Authorities Council, Australian Bureau of Statistics

2.3 The number of electrical fires

It is difficult to source a reliable time series of data about the number of house fires in Victoria that are caused by electrical accidents. In 2018, the Country Fire Authority (CFA) released figures that showed there were 1,588 preventable house fires in 2017 in the CFA Districts.[15] The cause of around a quarter of these fires (403 fires) was deemed to be electrical. The CFA stated that electrical fires were the largest cause of property loss in 2017, causing an estimated $9.8 million in damage.[16]

The Melbourne Fire Brigade (MFB), which is responsible for providing services to the inner metropolitan Melbourne area,[17] reports that there were 1,460 preventable house fires in 2018-19.[18] No breakdown about the cause of these fires is provided. However, if it assumed that the proportion

[15] The CFA protects 1.4 million homes and properties across Victoria, including those in most regional and rural areas as well as 60 per cent of metropolitan Melbourne.
[16] See https://news.cfa.vic.gov.au/-/victorian-preventable-house-fire-statistics.
[17] The MFB operates across 26 local government areas in metropolitan Melbourne, providing fire protection services to around 3 million residents, workers and visitors.
[18] See http://www.mfb.vic.gov.au/Community/Home-Safety.html.

of fires in MFB districts caused by electrical factors is similar those reported in CFA districts, then this would suggest that electrical faults resulted in around 375 fires in inner Melbourne dwellings.

2.4 The role of RCBOs in ensuring electricity safety

In Victoria, the installation of electrical safety switches (ie, residual current devices such as RCBOs) became mandatory in 1991 in power circuits in any new residential dwelling, and in existing dwellings in which significant electrical work is undertaken (eg, as part of a house renovation). From 2001, the compulsory requirement to install safety switches was extended to both power and lighting circuits of new homes and residential dwellings in which significant electrical work is undertaken. New wiring rules introduced in 2018 stipulate that safety switches are also mandatory for all domestic and residential final sub-circuits, which means that they are now needed as part of new installations of household electrical appliances such as cook tops, hot water systems and air conditioning units.

The objective of these regulatory requirements is to minimise the risks of serious injury and deaths caused by electrocution, and property damage arising from structural fires caused by electrical incidents.

Safety switches such as RCBOs represent the 'last line of defence' against electric shocks in residential dwellings (in much the same way as airbags in motor vehicles are designed as a 'last resort' to prevent injuries and deaths on the roads). There is no guarantee that RCBOs will prevent *all* electrical accidents, and RCBOs should be regarded as part of a suite of regulated safety measures designed to minimise the risk of injury, death or property damage.

Examples of other regulated safety measures include requirements relating to electrical installation work,[19] the supervision of apprentice electricians, and the mandatory use of licensed electricians to undertake electrical work in residential dwellings. Meanwhile, public awareness campaigns about electrical safety also contribute to improved safety outcomes.

Nevertheless, investigations into the cause of electrical accidents in Victoria indicate that the absence of a functioning RCBO may have contributed to a number of fatalities and serious injuries. Table 2.2 presents a summary of such incidents since 2015. The case studies in this table illustrate the role that can be played by RCBOs in ensuring electrical safety.

One of the case studies presented in Table 2.2 is the August 2016 fatality that resulted in the investigations that found the design vulnerability in some models of RCBO, which subsequently led to the current prohibition on certain models of RCBO. As discussed in chapter 1, this design vulnerability makes certain models of RCBO prone to failure if there is a defect in the wiring within the home, or if such RCBOs are incorrectly installed (eg, installed upside down). The failure of the RCBO then results in a risk of injury, death or property damage.

Box 2.1 summarises a 'real world' case study of the inappropriate installation of RCBOs with the design vulnerability, which was investigated by ESV compliance officers in May 2018. The investigation concluded that, even though the premises were seemingly protected by electrical safety switches, the configuration of these RCBOs nevertheless posed a significant risk to human life.

[19] For example, among other requirements, the *Electrical Safety (General) Regulations 2019* prescribe: the methods to be followed in carrying out electrical installation work; the quality of materials, fittings and apparatus to be used in connection with electrical installations; and standards for the design, construction, operation and maintenance of electrical installations.

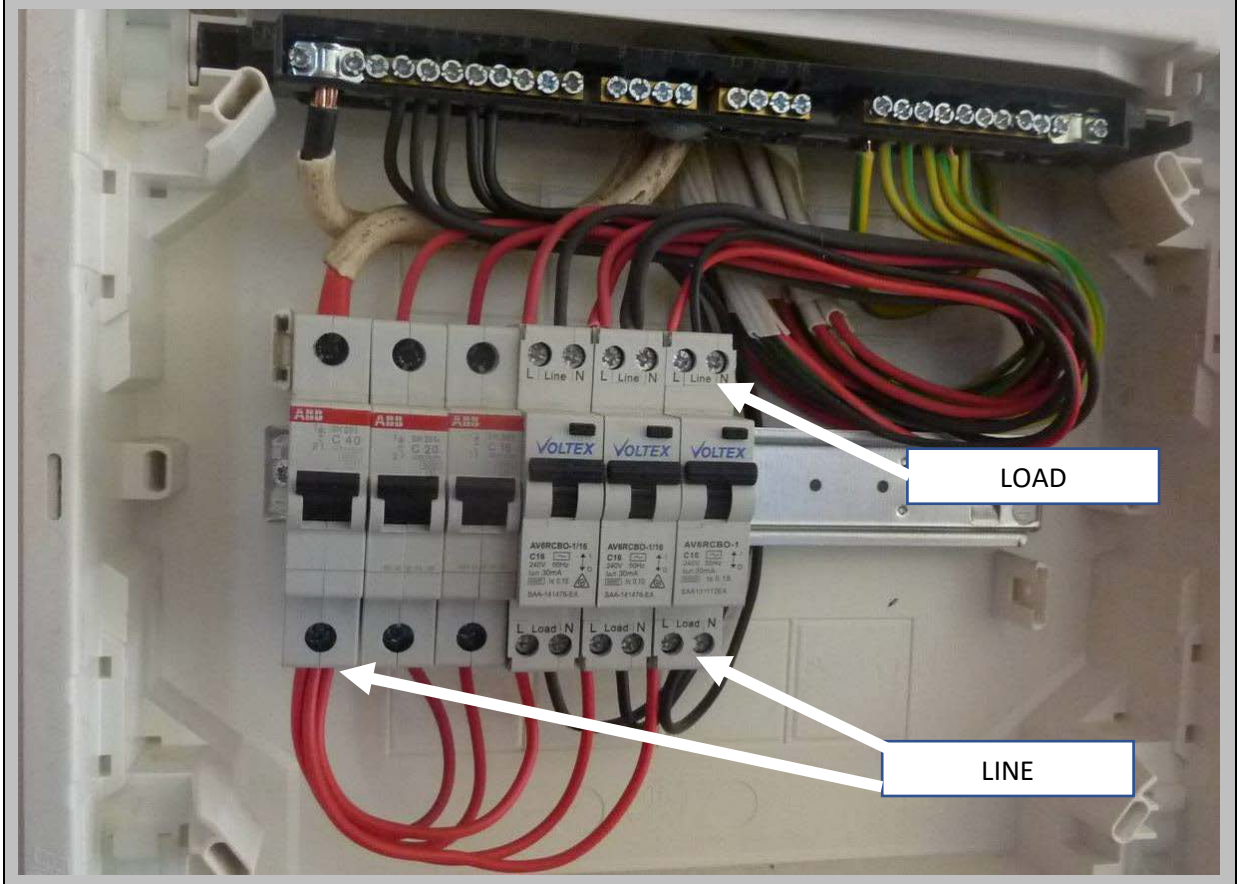
Table 2.2: Examples of incidents where a well-functioning RCBO may have helped to prevent death or serious injury since 2015

Fatalities	
January 2019	A 20-year old apprentice electrician was electrocuted while working alone on an isolation switch for an air conditioner that was mounted on the roof of a newly-built house in Melbourne's west. The investigation found a number of issues that may have contributed to the fatality, including: absence of a safety switch on the specific electrical circuit, lack of supervision, working live, and connecting equipment to supply when not licensed.
February 2017	A 39-year old male received a fatal electric shock while undertaking DIY work when he touched a live electrical cable that ran next to the other wire he had isolated working on his house wiring. Such work requires a licence and he was not a licensed electrician. The wire he cut led to the garage/shed and was not protected by a RCBO.
August 2016	A 26-year old male apprentice received a fatal electric shock when working unsupervised on electrical wiring in the roof space of a private domestic residence. The male was making electrical connections to install a smoke alarm when he received a fatal electric shock. The apprentice should not have been working unsupervised. While a RCBO was installed, it failed to operate due to a design vulnerability. It was this incident and subsequent investigations that led to the current 12-month prohibition on RCBOs that do not meet ESV's additional testing requirements.
January 2016	A 21-year old male worker received a fatal electric shock when he went to attend a submersible pump in a drainage pit of a dairy farm. It is believed that the male made contact with the metal support frame to which the pump was attached. Inspection of the electrical installation showed the cable was damaged between the switchboard and the socket outlet, most likely caused by rodents. There was a rewireable fuse that was meant to provide protection to the circuit. However, the fuse failed to blow during this incident, leaving the pump live. A functioning RCBO would have tripped.
January 2016	A 24-year old male apprentice received a fatal electric shock on a shopping centre roof while installing an external spotlight. It is believed he came in to contact with exposed live conductor at the connection point while touching the conductive light bracket or metal roof. There was no RCBO installed (not required as it was a commercial setting).
November 2015	A 25-year old refrigeration and air-conditioning worker received a fatal electric shock when he contacted a live part inside an air-conditioning unit on the roof of a building. There was no RCBO installed on the circuit (not required as it was a commercial setting).
November 2015	A 76-year old male received a fatal electric shock while working to assist plumbers to clear pipes at a farm. The male touched a metal star picket that was connected to the metal frame of a water pump via wire. The investigation found that the pump had been plugged into a socket outlet that had been wired incorrectly (suggesting unlicensed electrical work). There were no RCBOs installed on the property.
September 2015	A 21-year old male electrical apprentice died while carrying out unsupervised electrical work in the roof space of a house. The male was using pliers to strip what should have been a neutral conductor on the base of a three-pin socket. He did not notice that it had broken away from the terminal, breaking the circuit. The male received the fatal electric shock when he touched an earthed part of the house. No RCBOs were installed on the property.
Serious injuries	
April 2017	A 22-year old woman was clinically dead after receiving an electric shock in the laundry from touching the laundry trough that was livened by a faulty extension cable. She was subsequently revived and has since recovered. No RCBOs were installed on the property.
January 2017	Two children (aged 8 and 9) were in a portable swimming pool with a pump connected to the electricity via a damaged extension cord that had exposed wires near the socket. When the pump started spraying water one child tried to pull the plug out from the extension cord and received an electric shock, and the other child was similarly injured when they went to assist. The house did not have any RCBOs installed.

Box 2.1: Case study – RCBOs being installed incorrectly

In May 2018, an electrical contractor reported that a number of RCBOs on a site in Victoria had failed when the test button was pushed. The site had ten individually-owned residential townhouses that were approximately two years old. Compliance officers from ESV undertook an inspection at the site.

Each townhouse had three RCBOs protecting one lighting circuit and two power circuits. The RCBOs were marked with words “Line” and “Load”. As shown in the photo below, all the RCBOs in the inspected switchboards were wired in the opposite direction to the marking – ie, the load side was connected to the incoming 240V mains and the line side was connected to the outgoing circuits.



ESV compliance officers momentarily pressed and released the test button on one of the RCBOs. After the button was pressed, the RCBO took approximately two seconds to burn out. When the RCBO was reset and the test button was pressed again, the RCBO did not trip. Inspection and further testing of the unit confirmed that the RCD function of the RCBO was rendered inoperative.

There is a significant risk to human life in the following scenarios when this type of RCBO (or any other product that has a similar design vulnerability) is installed in this configuration. For example:

1. If an appliance that has an insulation breakdown is connected to the RCBO protected circuit, the RCBO will operate as expected. At the same time, the RCD module of the RCBO will burn out. When the RCBO is then switched back on, the user will be unaware that the RCBO no longer offers RCD protection. If the user continues to use the appliance (or any other appliance with insulation breakdown), there is a real risk of electrocution.
2. If a user (such as a small child) places a metal object into the active aperture of a power point that was protected by the RCBO, the RCBO will trip. At the same time, the RCD module of the RCBO will burn out. Once reset after the fault, the RCBO will no longer offer RCD protection. If the user where to repeat the same action, or an appliance as described in scenario 1 was used, the user would likely be electrocuted.

2.5 The size of the problem – How many RCBOs are being installed in Victoria?

The size of the 'problem' that the RCBO prohibition attempts to overcome is directly related to the number of RCBOs being installed in Victoria – specifically, the number of RCBOs that have the design vulnerability.

Without undertaking a complete audit of all existing households, it is difficult to gauge the total number of RCBOs that may have already been installed in Victorian homes (ie, the *stock* of RCBOs), let alone know the number of these that may have the design vulnerability.

Instead, before implementing the prohibition, ESV's analysis focussed on understanding the *flow* of new RCBOs being installed into Victorian dwellings (ie, based on monthly new sales of RCBOs), and then making a judgement about the proportion of devices sold that had the design vulnerability.

It is difficult to source reliable, consistent data on the total number of RCBOs being sold into the Victorian market. Instead, ESV derived a range of estimates using available evidence.

For example, in 2017, the Australian Industry Group advised ESV that the household RCBO market in Victoria was "conservatively estimated to be at least 100,000 units per month and growing".[20] This equates to the installation of at least 1.2 million RCBO units per annum.

ESV was also provided with commercial-in-confidence RCBO sales data over a five-year period from a major wholesaler of electrical supplies into the Victorian market. Based on an assumption of the market share of this wholesaler in Victoria, it was estimated that monthly RCBO sales in the State were around 21,500 units (or 258,000 units per year). It should be noted, however, that some electricians buy RCBOs directly from manufacturers rather than wholesalers, and so estimates of the overall size of the market based on wholesaler sales will be understating the actual size of the market.

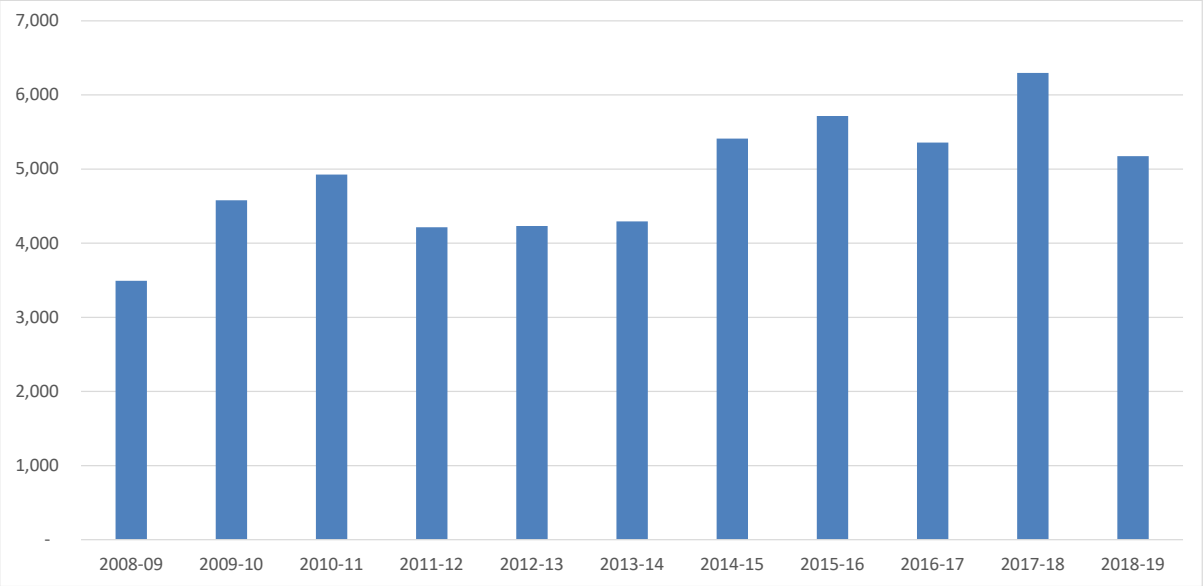
Another way to estimate the number of RCBOs being installed in Victorian residences is to examine building activity data published by the Australian Bureau of Statistics (ABS). Because it is now a regulatory requirement for safety devices to be installed when new residential dwellings are built in Victoria, the number of RCBOs installed will be related to the number of residential dwelling units constructed (although the delay between the commencement and completion of construction will affect the timing of the purchase and installation of RCBOs) .

Figure 2.2 depicts the average number of dwelling units commenced per month in Victoria over the past decade based on ABS data. It shows that the total number of dwellings commenced has exceeded 5,000 per month since 2014-15, peaking at 6,300 in 2017-18 before falling back to 5,200 in 2018-19.

From 2013-14 to 2017-18 (ie, the five-year period before the RCBO prohibition was first implemented), the number of dwellings being built averaged just over 5,400 per month. On the assumption that, on average, five RCBOs are installed in each new build, this methodology implies average monthly demand for RCBOs in Victoria was at least 27,000 units per month during the five years before the implementation of the RCBO prohibition (equivalent to almost 325,000 units per year).

[20] Letter dated 11 April 2017 from Australian Industry Group to Paul Fearon, Director of Energy Safety.

Figure 2.2: Dwelling units commenced in Victoria – monthly averages, 2009-10 to 2018-19



Source: Derived from ABS Cat.8752.0, Building approvals, Australia.

It is recognised that this methodological approach *underestimates* the actual number of RCBOs being installed in Victorian properties because it does not take into account the number of:

- RCBOs installed as a mandatory requirement when undertaking major conversions, alterations or additions to existing dwellings;[21] or
- RCBOs that are retrofitted in established residences – for example, as part of routine electrical work undertaken at existing dwellings, and/or because new wiring rules now require safety switches as part of new installations of household electrical appliances such as cook tops, hot water systems and air conditioning units.

As such, the estimates of monthly RCBO demand that are derived from the ABS data should be treated as a *conservative* assessment of the number of RCBOs being installed in Victorian homes.

In making a judgement about the proportion of total RCBO sales that had the design vulnerability, ESV relied on sales data provided by a major Victorian wholesaler (covering five years from 2013-17), which allowed some disaggregation to identify which RCBO models met ESV's additional testing requirements, and those models which did not. This analysis suggested that around 80 per cent of the RCBO models sold into the Victorian market by the wholesaler had the design vulnerability.

If it is assumed that this proportion is indicative of other distributors and wholesalers of RCBO to the Victorian market – and it is applied to the estimate of total number of household RCBOs sold in Victoria derived using the ABS building activity data – it is estimated that, during the five years before the prohibition first came into effect, an average of over 21,600 units with the design vulnerability were being installed in Victorian homes each month (or nearly 260,000 units per year).[22]

[21] An analysis of ABS building approvals data suggests that the number of major additions, alternations and conversions is a tiny fraction of the number of new dwellings approved (typically less than 1 per cent).
[22] This estimate should be treated with some caution as the 80 per cent estimate of the proportion of RCBOs with the design shortcoming is based on the product mix of a single wholesaler, which may not be indicative of other suppliers to the market – however, it was the best estimate that the ESV had on which to base its decision making.

While ESV recognises that the risk of a particular RCBO device failing is low, the impact of failure can be severe, particularly if lives are lost or serious injuries are caused by electrical accidents. Furthermore, the risks are increasing over time as the number of RCBOs being installed in residential properties continues to grow.

3. OBJECTIVES OF REGULATORY INTERVENTION

ESV is required by legislation to ensure electrical safety in Victoria. Under section 6(a) of the *Electricity Safety Act 1998*, ESV must ensure the electrical safety of electrical generation, transmission and distribution systems, electrical installations and electrical equipment.

ESV's primary objective in implementing the current prohibition on RCBOs is to ensure electrical safety in Victoria, which is consistent with its roles as stipulated in the *Electricity Safety Act 1998*. By banning the sale of those models of RCBO that are prone to failure under certain conditions, the prohibition is designed to reduce the risk of serious injury and death associated with electrical shock in Victorian homes, and property damage caused by structural fires arising from electrical faults.

As discussed in chapter 1, while ESV has pushed for changes to the Australian standards governing RCBOs so that devices with the design vulnerability are excluded entirely from the Australian market, there seems little prospect that the standards will be amended in the near term – and certainly not before Victoria's current prohibition expires on 30 June 2020. In the absence of any further intervention – such as extending the prohibition (which is ESV's preferred option) – there is a risk that RCBO models with the design vulnerability will re-enter the Victorian market and be installed in Victorian homes, potentially leading to more fatalities, serious injuries, or property damage.

A secondary objective of extending the prohibition would be to provide certainty to industry about the types of RCBOs that can be sold into the Victorian market going forward, informing future decisions about RCBO design features, and ensuring that suppliers source appropriate models from manufacturers.

4. WHAT ARE THE EXPECTED IMPACTS OF EXTENDING THE PROHIBITION BY TEN YEARS?

4.1 Introduction

Best practice government policy-making dictates that policy proposals be scrutinised to examine their impact on the community in terms of expected benefits and costs. This principle extends to proposed regulatory interventions such as a ten-year extension of the RCBO prohibition, which is ESV's preferred option to achieve its objectives in relation to electrical safety.

Before assessing the expected benefits and costs of extending the prohibition, the first step is to determine the reference point or 'base case' for the analysis in order to identify the appropriate benefits and costs associated with the regulatory intervention. The base case represents the situation that would arise if no further intervention were to take place.

Because the current RCBO prohibition is due to expire on 30 June 2020, the appropriate base case for assessing the extension of the RCBO prohibition is the situation that would arise if the prohibition were lifted on 1 July 2020 and not replaced. In other words, the impact assessment involves the identification of the *additional* benefits and costs associated with extending the prohibition beyond its current 12-month term compared to the 'base case' situation that would apply if the prohibition expires. Under the base case, it would be feasible that RCBOs with the design vulnerability that are prone to failure would once again enter the Victorian market.

It is difficult to predict the behaviour of the product suppliers or electricians purchasing the RCBOs, and how different businesses and individuals would respond the end of the prohibition. Suppliers may, or may not, increase or decrease their product ranges and re-introduce RCBOs with the design vulnerability.[23] No specific and relevant information has been provided to ESV in this regard. Electricians may have preferred products or suppliers and, depending on whether there are changes to the products, are likely to consider procurement options at that time, and could become confused about what is changing and why.

4.2 Expected benefits

As discussed in chapter 3, ESV's primary objective in implementing the current prohibition on RCBOs was to improve electrical safety, thereby reducing the risk of death and serious injury associated with electrical shock in Victorian homes, and property damage caused by structural fires arising from electrical faults. Because the extension of the prohibition on RCBOs with the design vulnerability should prevent the installation of devices that are prone to failure, the benefits that may be expected to arise are:

- a reduction in the number of fatalities resulting from electrical shock;
- a reduction in the number of serious injuries; and
- a reduction in property damage arising from structural fires caused by electrical faults.

[23] Nevertheless, it seems reasonable to assume that some RCBOs models with the design vulnerability would re-enter the Victorian market and present a safety risk. This is because, as discussed in section 4.3, some suppliers state they incur additional costs by maintaining two product lines – one for Victoria (where products have to meet ESV's additional testing requirements), and another for the rest of Australia (where models with the design vulnerability can still be sold). If the prohibition was lifted, any such costs could presumably be avoided by maintaining a single product line of RCBOs with the design vulnerability.

Assigning monetary values to these expected benefits is difficult for a number of reasons. For example:

- Any quantification of the benefits would need to rely on estimates of the number of RCBOs being installed that have the design vulnerability, but it is difficult to predict how many models with the design vulnerability would re-enter the Victorian market if the prohibition were lifted. This would depend on a number of factors, including commercial decisions made by suppliers about the models of RCBO to release into the market, the price competitiveness of different RCBOs models, and whether RCBO customers are prepared to buy products with the design vulnerability knowing that they were previously prohibited on safety grounds.
- There is no guarantee that even the best functioning RCBOs will save lives or prevent injury or structural fires – outcomes will depend on the specific circumstances of the incident.
- There is no easy way of gathering empirical evidence about the number of lives saved, serious injuries avoided, and/or electrical fires prevented because of the effective operation of a RCBO – rather, it is only failings of the products that lead to accidents that tend to be reported and investigated.
- As discussed in section 2.2, there is no apparent trend in the number of electrical-related fatalities in Victoria. Arguably, this is unsurprising given the relatively small absolute number of deaths involved, but it does mean it is difficult to specify a reliable, quantifiable relationship between RCBO installation and a reduction in the incidence of electrical deaths. Similarly, given that the RCBO prohibition has been in place for less than two years, it is far too early to establish any meaningful link between the prohibition and improved safety outcomes.
- In the case of serious injuries, while there has been a marked downward trend in the number of incidents since the turn of the century (section 2.2), it is difficult to disentangle the contribution of RCBOs to this outcome from other safety measures (eg, appropriate supervision of apprentice electricians, increased enforcement of electrical installation requirements, and greater awareness of the need to use licensed electricians to undertake electrical work in residential dwellings).

While quantification may be difficult, the summary of case studies presented in Table 2.2 provides examples where investigations have concluded that lives might have been saved if a functioning RCBO had been installed in a dwelling.

Studies exist that attempt to assign a value to a statistical life for the purposes of the cost-benefit analysis of regulatory proposals. Based on such studies, Better Regulation Victoria (BRV) has published guidance material for estimating the value of lives saved when undertaking regulatory assessment. The current guidance on the BRV's website suggests that the estimated value of a statistical life is around $4.6 million (when measured in 2019 dollars).[24] In other words, for every life saved by the installation of a well-functioning RCBO (rather than one with the design vulnerability that failed to operate), the benefit to the Victorian community would be $4.6 million.

[24] Commissioner for Better Regulation, *Suggested Value of a Statistical Life in RISs and LIAs* – which can be found at: http://www.betterregulation.vic.gov.au/Guidance-and-Resources. BRV's estimate of $4.3 million is based on June 2016 dollars. This has been indexed to December 2019 dollars using the all groups Consumer Price Index for Australia as published by the ABS (Cat.no 6401.0) to arrive at the figure of $4.6 million. (This indexation was not undertaken in ESV's March 2019 information paper.)

As discussed in section 2.3, the CFA estimated that electrical fires caused $9.8 million in property damage in 2017. While this provides some indication of the size of the expected benefits of extending the RCBO prohibition, the usefulness of this figure is limited because:

- it only relates to CFA districts and is not indicative of Victoria as a whole (ie, the state-wide figure would be higher than $9.8 million);
- there is uncertainty about the effectiveness of safety switches in reducing the incidence of structural fires; and
- a single data point is not a reliable methodological basis on which to estimate expected benefits because it may not be indicative of what would happen in an 'average' year.

While there are limits to the quantification of the expected monetised benefit estimates of extending the RCBO prohibition, it is nevertheless possible to identity the *nature* of some of the benefits in a qualitative fashion. For example, Table 4.1 summarises the different types of direct and indirect costs that might be incurred if a worker sustains injuries from an electrical fault. To the extent that a functioning RCBO prevents such injuries, benefits arise in terms of the avoidance of such costs – although the magnitude of these benefits is highly uncertain and unpredictable because the nature and duration of any electrical injuries can vary widely depending on the circumstances of the accident and the individuals involved.

Table 4.1: Examples of costs incurred following a work-related injury

Direct costs	Indirect costs
• Medical and rehabilitation costs • Cost of workers' compensation • Insurance costs (and possibly higher premiums) for employer • Disruption to business and associated loss in productivity • Legal costs and any fines imposed following investigation of accident • Loss of income for worker (net of any compensation), and possible costs of retraining for a different role	• Cost of investigations following the incident • Cost of retraining • Possible recruitment for replacement worker • Reputation risk for employer • Lower workforce morale, increased absenteeism • Human cost for injured worker and his/her family – eg, pain and suffering, loss of quality of life and general welfare • Poorer long-term work employability because of the injury

Source: Based on Australian Government, Australian Safety and Compensation Council (2007), Guidance on Preparing a Simple OHS Business Case

4.3 Expected costs

The main potential costs of extending the RCBO prohibition are borne by three groups:

- suppliers of RCBOs, whose products have to meet the additional testing and verification requirements required by ESV before they can be approved for use in Victoria (ie, be exempt from the prohibition);
- users of RCBOs, who could potentially face higher prices for RCBOs than would be the case in the absence of the prohibition; and
- ESV, which must devote staff time and other resources to administer the prohibition and ensure compliance.

These categories of costs are discussed, in turn, below.

Costs incurred by RCBO suppliers

In response to ESV's requests for information (see section 1.4), RCBO industry stakeholders have provided estimates about the size and nature of the costs imposed on RCBO suppliers as a result of the prohibition. AIG, a peak industry body whose members represent around 90 per cent of supply to the electrical market, has submitted data on both:

- the 'one-off' costs borne by the industry to adjust to the initial implementation of the RCBO prohibition; and
- the ongoing annual costs imposed by the prohibition, which would likely be incurred if the prohibition is extended beyond 30 June 2020.

AIG estimates, in its 17 February 2020 response to ESV, that the 'one-off' costs to its members of implementing the prohibition were approximately $5.99 million.[25] While no breakdown between the different cost categories has been provided, AIG states that this cost estimate covers:

- sourcing of RCBOs to comply with ESV's additional testing requirements;
- re-design of products;
- dealing with unsold stock;
- re-training of staff;
- assisting ESV with the development of the additional testing regime;
- liaison with, and education of, the market;
- liaison with the regulator;
- professional advice; and
- input into the discussion of the relevant committee of Standards Australia.

In measuring applicable costs for this RIS, ESV does not consider these 'one-off' implementation costs to be relevant, given that they have already been incurred when the initial prohibition was introduced. As such, the 'one-off' implementation costs are considered to be 'sunk costs' and not relevant in assessing any *continuation* of the prohibition.

Rather, the impact assessment contained in this RIS focuses on the expected *ongoing costs* were the prohibition to be extended. As discussed in section 4.1, this is because the impact assessment requires identification of the *additional* (ie, ongoing) costs associated with extending the prohibition compared to the base case situation that would apply if the prohibition is allowed to expire.

In its 17 February 2020 submission, AIG estimates that the "ongoing direct and indirect costs" to its members associated with the prohibition are around $1.981 million per year,[26] which comprise the following categories of cost:

- ongoing compliance with ESV's additional testing regime;
- resources required to support the product, including technical support, customer service and warranty support;

[25] This figure is 25 per cent higher than the estimate provided by AIG in its February 2019 submission to the ESV, when costs were estimated as $4.8 million.
[26] This represents a 60 per cent increase over the estimate of $1.25 million per year which was submitted by AIG in February 2019.

- higher costs of the manufactured product;
- storage of the product;
- additional product identification;
- additional promotions and marketing costs;
- continuing education of the market; and
- continuing training of staff to support customers.

While the AIG has not provided a breakdown of the global $1.981 million figure between the different cost categories listed above, some members of the AIG have presented more detailed information in their individual submissions to ESV.

Some industry stakeholders have also argued that the prohibition is stifling product innovation. AIG reports that one of its members has stopped or delayed research and development on additional safety features for its products because of the costs and uncertainty created by the prohibition.

AIG's estimate of the ongoing costs of the prohibition to suppliers is much higher than the estimates presented by ESV in its March 2019 information paper, which focused solely on the costs to suppliers of complying with the ESV additional testing regime for RCBOs, and is summarised in Box 4.1

Box 4.1: ESV estimate of the costs of complying with the additional testing regime

In its March 2019 information paper, ESV presented a methodology to estimate the cost to RCBOs suppliers of complying with ESV's additional testing and verification requirements, [27] which are designed so that the RCBO models with the design vulnerability (and which are therefore prone to failure under certain circumstances) can be excluded from the Victorian market.

This methodology based on the time taken by appropriately-qualified engineers to undertake the test and undertake the required reporting and verification processes, and considered scenarios of the testing being conducted in-house, and if testing were outsourced to a third-party provider of testing services.

A new testing regime came into effect on 1 July 2019 and all models on the ESV's list of approved RCBOs were re-tested under the revised regime. Going forward, ESV additional testing requirements only apply to new and/or redesigned RCBO models. Thus, if the prohibition were to be extended, the *ongoing* costs of complying with ESV's additional testing regime would depend upon the number of new/redesigned RCBO products developed by suppliers in any one year.

It is important to note that one test report may cover a 'family' of different RCBO models (ie, devices that have similar design specifications), and so the number of tests that will need to be undertaken will be far lower than the number of individual types of RCBO on the market. (For example, one supplier that currently has over 150 different models of RCBO on ESV's approved list was able to demonstrate their conformance to ESV's requirements by undertaking just four separate tests.)

The table below presents a sensitivity analysis for the ongoing annual costs associated with different numbers of tests that may be required each year to verify the safety of new/re-designed RCBOs. Costs estimated for both in-house testing by suppliers, and where the testing is outsourced to a third-party provider of testing services.

Estimated ongoing annual testing costs for new and re-designed RCBO models – sensitivity analysis

No. of new tests required annually	**In-house testing**			**Outsourced testing**
	Cost of test time[1]	Cost of report[2]	**Total in-house cost**	**Total outsourced cost[3]**
5	1,500	500	2,000	10,000

[27] ESV's additional testing regime can be found on the ESV website at: https://esv.vic.gov.au/technical-information/electrical-appliances-and-equipment/rcbo-prohibition/#additional-testing-requirements

10	3,000	1,000	4,000	20,000
15	4,500	1,500	6,000	30,000
20	6,000	2,000	8,000	40,000
50	15,000	5,000	20,000	100,000

Notes:
1. Assumes each test takes 6 hours and wage of engineer undertaking the test is $50 per hour.
2. Assumes each test report takes 2 hours to prepare and submit, and wage of engineer preparing the report is $50 per hour.
3. Based on a quote of $2,000 per test, which covers both testing and preparation of the report.

For example, if it is assumed that an additional 15 tests are required per year (which ESV considers to be a generous assumption given the current rate at which new/redesigned models are released onto the market), this would imply total additional annual testing costs of between $6,000 (if all testing is conducted in-house by suppliers) and $30,000 (if all testing is outsourced to an external provider).

There is clearly a large discrepancy between ESV's estimate of the ongoing costs to suppliers of extending the prohibition (which is limited to the costs of complying the additional testing regime), and AIG's cost estimate, which includes a greater range of costs.

Through feedback to this RIS, ESV is keen to learn more about the size and nature of the ongoing costs on industry because it is concerned that some of the costs being attributed to ongoing compliance with the prohibition by suppliers may instead represent 'business-as-usual' activity that is unrelated to the prohibition, and/or a reflect commercial decisions. For example:

- AIG includes costs associated with resources to "**support the product**" (citing technical support, customer service and warranty support as examples of this) – to what extent would such costs be reduced or avoided in the absence of the prohibition given that these activities appear to represent business-as-usual for any electrical product sold?

  Moreover, a greater understanding is needed about how product support costs would change if the prohibition was allowed to expire and RCBOs with the design vulnerability re-entered the Victorian market – for example, would electricians (and householders) need additional reassurance and support before purchasing products that were previously prohibited?

- Some RCBO suppliers argue that they incur additional costs (eg, arising from storage, product identification, promotion and marketing) because of the **need to maintain two product lines** – one for Victoria (where products have to meet ESV's additional testing requirements), and another for the rest of Australia (where there are no similar RCBO prohibitions in effect). ESV notes that RCBOs that are compliant in Victoria can be – and are – supplied to the whole of Australia, and therefore believes that any decision to maintain two separate product lines represents a commercial consideration, rather than a regulatory compliance issue.

- Estimates provided by individual suppliers of the **cost of complying with ESV's additional testing regime** for RCBOs are far higher than the cost estimates provided by ESV (see Box 4.1). In their submissions, RCBO suppliers appear to indicate that approvals or certifications based on a test of a single sample of a product are inadequate, and note that manufacturers typically undertake hundreds of tests on a product prior to certification and production to ensure confidence and reliability.

ESV understands the need for more extensive testing for products to ensure they adhere to mandatory quality assurance standards, but argues that the additional testing requirements associated with the RCBO prohibition are much less intensive in nature because they are specifically targeted at identifying a particular design feature (rather than testing product reliability). As such, ESV is keen to ensure that the testing cost estimates being provided by industry do not reflect quality assurance tests that are required under other regulations and standards that are unrelated to the prohibition. What was the methodology used by RCBO suppliers in calculating these costs?

- ESV is also keen to understand more about the **ongoing education and staff training costs** being imposed on suppliers as a direct result of the prohibition, particularly given the regulator's own responsibilities and activities in relation to educating the market, and given that the prohibition has been in place since July 2018.

Notwithstanding ESV's reservations with some of the cost estimates provided by suppliers, which may be over-estimating the cost impact of the prohibition on the industry, this RIS bases its estimate of the ongoing cost of extending the prohibition on the $1.981 million per year figure provided by AIG, noting that this likely represents an upper band of the actual costs likely to be imposed on suppliers.

Given that AIG states its members represent 90 per cent of the supply to the electrical market, a pro-rata adjustment has been made to AIG's estimate to derive a total ongoing cost figure of $2.201 million per annum for Victoria as a whole. [28]

Cost to consumers – impact of the prohibition on RCBO prices

One of the risks of implementing the prohibition was the possibility of supply shortages of RCBOs once those models with the design vulnerability were excluded from the Victorian market from 1 July 2018. Other things being equal, this would be expected to have an upward impact on prices of RCBOs, thereby imposing a burden on consumers. Higher overall prices may also result if the prohibition caused a change in consumption patterns away from low-priced RCBOs to more expensive models. Any such burden could feasibly continue if the prohibition were to be extended, resulting in higher prices than would be the case if the prohibition expired.

One way of considering this potential cost to the Victorian community is to examine the extent to which the implementation of the current prohibition may have resulted in higher RCBO prices.

To assess the impact of the prohibition on RCBO prices, ESV commissioned independent market research to survey major wholesalers and distributors of RCBOs in the Victorian market. Price data were provided for 2016-17, 2017-18 and the first half of the 2018-19 financial year. The data were provided to the market research organisation on a commercial-in-confidence basis, and on the understanding that ESV was only provided with aggregated, volume-weighted average RCBO prices for each of the financial years.[29]

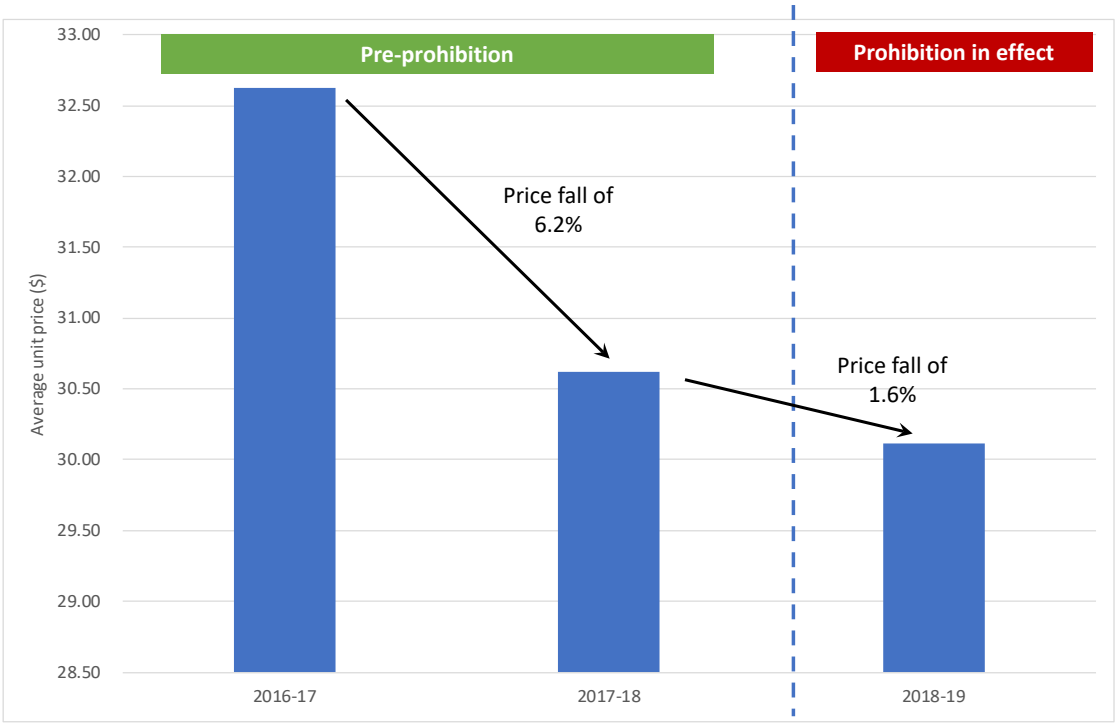
Figure 4.1 summarises the results of the market research into RCBO prices. The data reveal that average RCBO prices fell by close to 6 per cent between 2016-17 and 2017-18, before the

[28] ESV notes that this exceeds the $2 million per annum threshold to trigger the need to prepare a RIS. The *Victorian Guide to Regulation* indicates that only proposals with an impact of over $2 million per year on the community are required to undertake a RIS process.

[29] As such, it has not been possible to provide any breakdown of price difference between RCBOs with and without the design vulnerability.

implementation of the prohibition on 1 July 2018. Data for the first half of the 2018-19, when the prohibition was in effect, indicated that average RCBO prices continued to decline, although at a slower rate. Average RCBOs prices during the first half of 2018-19 were around $0.50 lower per unit than during 2017-18.

Figure 4.1: Average prices of RCBOs in Victoria, pre- and post-implementation of the prohibition



Source: Based on independent market research commissioned by ESV
Note: 2018-19 data represent prices from July to December 2018.

While it is difficult to draw any definitive conclusions – because many factors can influence prices, and because there are limitations in comparing prices from year-to-year[30] – there is no evidence that the implementation of the prohibition has resulted in an increased burden to RCBO users in the form of higher prices. Indeed, average RCBO prices appear to be *falling*.

Feedback from stakeholders about the nature of the RCBO market since the announcement of the prohibition appears to confirm this observation about falling prices. Some argue that the announcement in 2017 of the forthcoming prohibition caused some suppliers to lower prices of non-compliant RCBO models in order to clear stocks ahead of the actual imposition of the prohibition in July 2018.

It is further argued by some industry stakeholders that the listing of approved models of RCBO on ESV's website created an opportunity for 'second tier' suppliers to enter the Victorian market,

[30] It is difficult to compare year-on-year prices of RCBOs because the availability of models and design specifications of devices can change over time, and the weighted average price will vary according to different consumption trends over time. Moreover, there were also some data gaps in the market research (eg, not all the suppliers provided complete price data for each of the financial years covered by the survey). Fluctuations in prices over time can also reflect factors that are independent of the prohibition, including the cost of the inputs used in the manufacture of the RCBOs (which can be affected by exchange rate fluctuations), the balance of supply and demand, and the degree of competition between suppliers in the marketplace.

offering cheap, lower quality products. This could help to explain the further softening of RCBO prices in 2018-19.

However, it is not clear that there is any causality between the implementation of the RCBO prohibition and the entry of cheaper products into the Victorian market. ESV has worked with the electrical supply industry to ensure that its listing of approved RCBOs on its website (ie, those models that have passed ESV's additional testing requirements) is not taken as product endorsement. The ESV website states that "compliance with the additional testing and verification requirements and the consequent listing on this website does not give any indication of the quality of the product. It is not to be taken as a product endorsement by ESV or a confirmation that the product meets all requirements of the *Electricity Safety Act 1998*, the *Electricity Safety (Equipment) Regulations 2009* or any associated Australian standards".

The primary mechanism for RCBO products to enter the Victorian market is through a 'type test certification' scheme with or without complying with ESV's additional testing requirements. Under this scheme, products are tested to prescribed standards and then independently certified to verify they comply with the standard. ESV's additional testing requirements associated with the RCBO prohibition are entirely separate to this scheme.

While acknowledging that a number of factors influencing RCBO prices may be in play, the conclusion of this analysis is that the imposition of the prohibition has not resulted in rising average prices to consumers. Furthermore, ESV sees no reason to expect that any extension of the prohibition will cause an increase in costs for users of RCBOs through higher prices.

Costs incurred by ESV

The ongoing operation of the RCBO prohibition means that ESV must devote staff time and other resources to activities such as education and raising awareness, compliance and enforcement. Table 4.2 presents a breakdown of the ongoing costs associated with the prohibition, which are estimated to be close to $50,000 per year.

With the exception of administering the additional testing regime that identifies those models of RCBO that are approved on ESV's website, most other activities related to the prohibition 'piggy-back' off business functions that are undertaken in any case as part of ESV's ongoing education and compliance/enforcement initiatives associated with electrical products and installation (and represent a small component of these initiatives). As such, the additional costs incurred by ESV as a result of the ongoing operation of the prohibition are either modest or non-material.

Table 4.2: Estimated ongoing costs incurred by ESV associated with the RCBO prohibition

Nature of cost	Annual cost
Cost of administering the additional testing regime *(see note a)*	$3,740
Costs of undertaking audits to ensure non-compliant RCBOs are not being sold in Victoria *(see note b)*	$29,160
Cost of other compliance and enforcement activity *(see note c)*	$17,200
Costs of education and raising awareness about RCBO prohibition *(see note d)*	Negligible
TOTAL COST	**$50,100**

Notes:

a. Includes the costs of undertaking the test (eg, salary costs of the staff performing the test, annual depreciation of testing equipment), maintaining the relevant documentation, and issuing acknowledgment letters. The estimate is based on the scenario that a test report is required for each 'family' of different RCBO models (ie, devices from the same manufacturer that have similar design specifications), and 15 model 'families' are tested per year.

b. The auditing of RCBOs takes place as a component of ESV's regular market surveillance audit program. It is estimated that the auditing of RCBOs represents around 10 per cent of this auditing activity.

c. Includes costs associated with investigating breaches, preparing a brief of evidence and other prosecution costs.

d. ESV engages in extensive education activity, which includes regular information sessions, presentations and training courses to industry representatives, trainers, and apprentice electricians. Details about the RCBO prohibition is a regular agenda items at such sessions. However, because this education activity would be undertaken in any case – and information about the RCBO prohibition represents a tiny component of the sessions – no additional costs are incurred by ESV in providing this RCBO education. Similarly, no additional costs are incurred by ESV in providing information about the prohibition in its free, quarterly EnergySafe Magazine, which is targeted at electrical and gas installation practitioners, and which includes articles on key electrical safety issues, safety alerts, and reminders about installation compliance requirements. This magazine and all safety alerts are emailed to all registered electrical contractors and licensed electricians on ESV's register.

Source: ESV estimates

While these costs may be considered as internal to government, ESV is funded on a full cost recovery basis, raising its revenue from industry levies and fees from the provision of licences and other services. Thus, there is a link between ESV's costs and fees/levies paid by industry participants. In theory at least, a significant increase in ESV's cost base arising from the RCBO prohibition could be borne by industry participants.

In practice, however, the modest ongoing costs incurred by ESV in administering the prohibition can be absorbed within ESV's existing budget, and have not contributed to any changes in cost recovery arrangements.

4.4 Conclusion

This chapter has outlined the expected ongoing benefits and costs as a result of extending the RCBO prohibition.

Benefits would likely emerge in the form of a reduction in electrical-related deaths and serious injuries, and from a reduction in property damage caused by fires arising from electrical faults, over a period of time. However, as with other forms of safety regulation, it is very difficult to quantify the benefits of extending the prohibition – for example, because:

- the counter-factual is difficult to define – there is uncertainty about what would happen in the absence of the prohibition. For example, it is not known to what extent RCBO models

with the design vulnerability would re-enter the Victorian market if the prohibition was allowed to expire; and

- the effectiveness and contribution of a well-functioning RCBO in the prevention of electrical related death, serious injury and/or electrical fires in properties is not known with certainty, although ESV investigations into the causes of electrical-related incidents in recent years highlight the importance of RCBOs in improving safety outcomes, noting that fatalities and serious injuries have occurred in the absence of functioning RCBOs (see Table 2.2).

On the cost side of the equation, these will be borne by RCBO suppliers in complying with the prohibition, and by ESV in administering and enforcing the prohibition. There is no evidence to suggest the prohibition has had (or will have) any cost impact on consumers of RCBOs in terms of higher prices.

Notwithstanding concerns about the size and nature of cost estimates provided by industry, ESV has derived a $2.2 million per year estimate of the ongoing costs borne by RCBO suppliers as a result of extending the prohibition from data provided by AIG.

The expected cost impact on ESV is modest – primarily because many activities related to the prohibition 'piggy-back' off ESV's 'business-as-usual' functions, and represent a small component of these functions.

Given the methodological challenges surrounding the quantification of benefits associated with the RCBO prohibition, the results of the cost-benefit analysis in this RIS are presented in terms of the reduction in the number of fatalities that would need to occur in order to demonstrate a net benefit to the Victorian community (ie, for the benefits in terms of lives saved – where lives are valued at $4.6 million – to outweigh the ongoing costs of the prohibition). This is referred to as 'breakeven analysis', and the calculation is presented in Table 4.3.

Table 4.3: Breakeven analysis of extending the prohibition

Ongoing costs associated with extending prohibition	
Costs incurred by RCBO suppliers ($m per annum)	*2.201*
Costs incurred by consumers	*0*
Costs incurred by ESV ($m per annum)	*0.050*
Total costs ($m per annum)	**2.251**
Statistical value of life ($m)	**4.6**
Required reduction in fatalities per annum to demonstrate net benefit	**0.49**
Average number of fatalities in last five years (2014-15 to 2018-19)	*3*

The analysis presented in Table 4.3 indicates that the extension of the prohibition would need to contribute to a reduction of around one electrical-related fatality every two years[31] in order for benefits to equal the ongoing costs of the prohibition (ie, demonstrate a net benefit to the community).

[31] More precisely, it would take almost 25 months for the accumulated costs of the prohibition to reach the $4.6 million value of a single life saved.

ESV considers that this analysis is based on a *conservative* estimate of the benefits of the prohibition because it does not take into account any benefits (ie, avoided costs) arising from a reduction in serious injuries and/or structural damage from electrical fires that might be prevented by a well-functioning RCBO. Meanwhile, as discussed in section 4.3, ESV believes the cost estimates adopted in the analysis represent an upper band of the likely costs imposed on suppliers as a result of extending the prohibition. As such, the cost-benefit analysis presented in this RIS likely *underestimates* the actual net benefit of ESV's preferred option.

5. ASSESSMENT OF OTHER OPTIONS TO ACHIEVE THE OBJECTIVES

5.1 Options considered

An important element of the RIS process is to consider and assess different courses of action to address the identified problem and achieve the stated objective of intervention. The preferred option should represent the approach that delivers the highest net benefits that maximise community wellbeing.

This chapter considers alternatives to ESV's preferred option of extending the prohibition for a further ten years. Some of these options have been identified by stakeholders in response to ESV's request for information.

The options considered in this RIS are:

A. **No further intervention** once the current prohibition expires on 30 June 2020.

B. **Extend the prohibition for a shorter period** (eg, five years) **and then review** – if necessary, the prohibition could be changed or lifted after the review to take account of any changing circumstances over that period.

C. **Extend the prohibition for a further ten years and introduce measures to address safety risks in established dwellings** – for example, product recall on those brands and models of RCBO that do not meet ESV's additional testing requirements, which were sold before the prohibition came into effect; mandatory upgrading of switchboards of domestic dwellings upon change in ownership; and a government rebate to encourage homeowners to upgrade their switchboards.

D. **The prohibition is not extended** after it expires on 30 June 2020, but **ESV increases its education, compliance and enforcement** activities surrounding RCBOs and their installation.

The benefits and costs of these alternative approaches are outlined below, noting that the analysis is largely qualitative in nature because it is not always possible or appropriate to assign monetary values to some of the impacts.

Option A: No further intervention once the current prohibition expires

Description

Under this approach, no action would be taken after the current RCBO prohibition expires on 30 June 2020. After this date, models of RCBO that do not meet ESV's current additional testing requirements could be made available for sale in the Victorian market. (Indeed, once the prohibition is lifted, the additional testing regime would become redundant.)

Under this option, it is assumed that ESV's education, compliance and enforcement activities would remain at 'business-as-usual' levels.

As discussed in chapter 4, this option represents the base case for the purposes of conducting the cost-benefit assessments of intervention.

Benefits/advantages

The main benefit of allowing the prohibition to expire would be the avoided costs associated with the prohibition. The analysis in chapter 4 suggests these costs could be as high as $2.25 million per year, with the bulk of these costs borne by RCBO suppliers (see section 4.3).

Costs/disadvantages

The lifting of the prohibition would mean that models of RCBO with the design vulnerability could once again be supplied into the Victorian market. Such devices are prone to failure if they are installed incorrectly, or if there is a defect in the wiring within the residence where the RCBO is installed. This will result in increased electrical safety risks, potentially leading to more fatalities, serious injuries and/or property damage arising from electrical fires. However, it is difficult to quantify these costs because:

- there is no way of estimating the number or proportion of RCBOs with the design vulnerability that would be sold in Victoria following the lifting of the prohibition; and
- there are methodological challenges in assigning monetary values to the safety benefits of RCBOs (as discussed in section 4.2).

Given that the prohibition has been in place since July 2018 and the RCBO market appears to have made a smooth adjustment to its implementation, the lifting of the prohibition may cause some confusion in the market, and/or give rise to 'community angst' because previously non-compliant RCBOs could be installed in Victorian homes.

Preliminary conclusion

ESV has a legislative objective under the *Electricity Safety Act 1998* to ensure the safety of electrical equipment in Victoria. While ESV recognises that the risk of RCBO failure is low, the impacts of *any* failure are potentially high (particularly when failure results in the loss of life). In ESV's view, the growing number of RCBOs with the design vulnerability that were being installed in Victorian homes before the prohibition came into effect represented an unacceptable risk to the community. Thus, taking no further action after the current prohibition expires on 30 June 2020, would be inconsistent with ESV's legislative mandate to ensure electrical safety.

Option B: Extend the prohibition, but for a shorter period

Description

Rather than extend the prohibition for ten years, which is ESV's preferred option, this approach would keep the prohibition in place, but it would be in effect for a shorter period – say, five years. The continuing need for the prohibition – or to make adjustments to the prohibition – would then be re-assessed before expiry (for example, through another RIS process), which would consider the circumstances prevailing at that time.

Benefits/advantages

It could be argued that another potential benefit of this option is that it provides greater flexibility to re-assess the continuing the need for the prohibition in the light of changing circumstances or market developments. For instance, there would be an automatic mechanism to reassess the appropriate regulatory regime at the end of a shorter (eg, 5-year) period than would be the case under a ten-year extension of the prohibition. It should be noted, however, that prohibition notices issued by ESV can be revoked at any time, when deemed necessary, so flexibility does exist even

under a longer term prohibition (although such revocation is not automatic in nature, but rather is more likely to be in response to specific events).

While any extension of the prohibition would impose ongoing annual costs on the community (borne chiefly by RCBO suppliers), these costs would be incurred for a shorter period under this option if the review determines that the prohibition should be lifted (compared to ESV's preferred option of extending the prohibition for ten years).

Costs/disadvantages

Greater uncertainty could be introduced into the marketplace if the term of the prohibition was shortened, as suppliers and users of RCBOs would be unsure of the regulatory arrangements that would be in effect after the expiry of the prohibition, which would be in the near term rather than the longer term. This might affect future planning and investment decisions, and have a negative impact on research and development.

Before expiry of the prohibition, ESV would need to consult extensively with stakeholders as part of its reassessment of the appropriate regulatory regime for RCBOs (which may involve the need for another RIS process). Engaging with ESV and preparing submissions for regulatory review impose costs on industry participants, and these costs would be borne at more frequent intervals were the term of the prohibition to be reduced.

Preliminary conclusion

The primary difference between this option and ESV's preferred option of extending the prohibition by a further ten years is that that the main benefits and costs associated with the prohibition (discussed in chapter 4) would accrue over a shorter period in the case of option B. While a shorter term prohibition offers an automatic mechanism for a more timely adjustment of regulatory arrangements if circumstances change, it provides less certainty than a longer term prohibition, and imposes higher costs in terms of the more frequent need to reassess regulatory arrangements.

Option C: Extend the prohibition for a further ten years and introduce measures to address safety risks in established dwellings

Description

The current prohibition represents a preventative approach to mitigate the escalation of the risks to electrical safety by inhibiting the further supply (ie, new sales) into Victoria of those models of RCBO with the design vulnerability. The main impact of the prohibition is to ensure electrical safety in newly-constructed homes, and in residences where significant electrical work is undertaken or certain electrical appliances are installed because of mandatory rules regarding the fitting of safety switches to power and lighting circuits.

Under this option, the ten-year extension of the prohibition would be augmented by measures to address electrical safety risks in *established* dwellings. For example, such measures might include:

- a product recall of vulnerable models of RCBO (ie, those that do not meet ESV's additional testing requirements), which were previously been installed in Victorian homes before the prohibition took effect;
- a mandatory requirement for electrical switchboards in residential dwellings to be upgraded before a transfer of ownership can take place; and/or
- a Victorian Government rebate scheme to incentivise homeowners to upgrade their

switchboards (akin to the scheme to encourage the installation of solar panels).

Benefits/advantages

This option would be more effective than the preferred option in managing electrical safety risks in Victoria because it would tackle the problem (ie, the installation of RCBOs with the design vulnerability in Victorian homes) in both new and established dwellings.

As highlighted by some stakeholders in their submissions to ESV, because the current prohibition is placed on sales of new RCBOs, which are primarily installed in new residential dwellings, it tends to be less effective in addressing electrical safety risks in older dwellings, which may not have any safety switches installed (because they were built before the mandatory rules came into effect), and/or which have RCBOs installed incorrectly.[32]

According to the 2016 Census, there are over 2 million private dwellings in Victoria, many of which may be at risk because of the absence of well-functioning safety switches. Measures designed to encourage the installation of RCBOs that do not have the design vulnerability in *all* dwellings would ensure electrical safety to a greater cohort of the Victorian community.

Costs/disadvantages

Given the large number of residential dwellings in Victoria, the implementation of initiatives to address safety risks posed by the lack of well-functioning safety switches in many Victorian homes would likely be significant.

There are a number of measures that could feasibly be introduced.

For example, ESV could instigate a **product recall** on all models of RCBOs that do not meet its additional testing requirements (ie, they have the design vulnerability), which were sold and installed in Victorian households prior to the implementation of the prohibition. The onus would likely be placed on suppliers to identify these RCBOs (eg, through extensive advertising campaigns), and to fund a comprehensive RCBO replacement program, which would include the cost of electricians installing new, ESV-approved RCBOs into all properties affected.

A product recall may result in increased community angst and confusion (eg, given the technical nature of the product, there may be uncertainty among householders about which RCBOs are covered by the recall), which may reduce confidence in the effectiveness of *all* safety switches.

In the absence of information about the number of RCBOs with the design vulnerability that have been previously installed in Victorian dwellings, it is not possible to quantify the cost of this measure, but it is likely to be substantial.

Another measure that has been proposed through ESV's stakeholder consultation is the introduction of new rules that require electrical **switchboards to be upgraded upon transfer of home ownership**. This approach is discussed in Box 5.1, where estimates have been provided on the likely monetary costs under different scenarios of the proportion of transfers where switchboard upgrades are required. Even under conservative assumptions, the estimated costs are high – many times greater than the ongoing costs associated with the prohibition – which means that the initiative would need to result in dramatic improvements in safety outcomes (eg, reduced fatalities) to justify the cost.

[32] There may, however, be some retrofitting of new RCBOs in established home where significant electrical work is undertaken and/or where new, certain electrical appliances are installed (eg, cook tops, hot water systems and air conditioning units).

Box 5.1: Estimated cost of inspecting and upgrading switchboards upon transfer of home ownership

One of the proposals submitted by the AIG, in response to ESV's request for suggestions for alternatives to the extension of the RCBO prohibition, is the upgrading of switchboards of domestic dwellings upon sale. AIG suggests that such an arrangement would improve electrical safety by reducing the number of homes without safety switches, and ensuring that any safety switches that are installed are operational.

Other jurisdictions have similar regimes. For example, in Queensland, it is mandatory for the switchboard to be upgraded whenever a property changes ownership. In Western Australia, it is a requirement that a minimum of two safety switches protecting all power and lighting circuits are fitted in all residential properties before they can be sold or rented under a tenancy agreement.

The cost of implementing such an arrangement in Victoria would depend on the design of the mandatory scheme. For the purposes of estimating a cost for the purpose of this RIS, it is assumed:

- Before they can be sold, the switchboards of all residential properties would need to be inspected by a licensed electrician to ensure they have functioning and compliant RCBOs to protect all power and lighting circuits. The cost of such an inspection is conservatively estimated at $150 per property.
- Where is a switchboard needs to be upgraded because it does not have functioning/compliant RCBOs, an additional cost of $300 would be incurred per property transferred.
- The average number of properties sold per year in Victoria is based on the average number of property transfers over the period 2009 to 2018 as reported by the ABS *(Cat. No. 6416 Residential Property Price Indexes*). This is approximately 112,800 properties per year.

The total cost of the scheme to sellers of properties in Victoria will depend on the proportion of switchboards that require upgrading, which is uncertain. Accordingly, the table below presents a sensitivity analysis of the total cost at different proportions of upgrade (ranging from 10 to 100 per cent).

Cost of inspection (applies to all transfers)	$150					
Additional cost of switchboard upgrade	$300					
Proportion of switchboards requiring upgrade	10%	20%	25%	50%	80%	100%
Number of annual transfers	112,800					
Total cost of inspection and upgrade per year[a]	**$20.3M**	**$23.7M**	**$25.4M**	**$33.8M**	**$44.0M**	**$50.8M**
Required reduction in fatalities per year for benefits to equal costs[b]	*4.4*	*5.1*	*5.5*	*7.4*	*9.6*	*11.0*

Notes:
*a. Calculated as: (number of transfers*cost of inspection) + (percentage of transfers requiring upgrade*number of transfers*additional cost).*
b. Assumes the statistical value of life is $4.6 million.

Based on the assumptions outlined above, ESV estimates that the annual cost of inspecting and upgrading switchboards upon the transfer of ownership of residential dwellings in Victoria would range from approximately $20.3 million (if 10 per cent of switchboards require upgrading) to $50.8 million (if all switchboards require upgrading). This would require the initiative to reduce the number of fatalities by 4.4 to 11 per year to demonstrate a net benefit.

Another suggestion offered by AIG is the introduction of a **rebate scheme** by the Victorian Government that would target households that do not currently have safety switches to upgrade their electrical switchboards. AIG points to the Victorian Government's rebate scheme to encourage the uptake of PV solar systems as a similar example of using taxpayer funds to incentivise behaviour by homeowners.

The cost of such a measure – which would be borne by the Victorian taxpayer – would depend on the number of households that take advantage of such a scheme, and the size of the rebate provided under the scheme, but it is likely to be significant, which may present difficulties in securing funding.

Preliminary conclusion

Before implementing the current prohibition, ESV gave extensive consideration to the introduction of complementary mandatory measures, such as a product recall, that would address safety risks in older, established dwellings. However, given the low (but not trivial) risks involved, and the high costs associated with the complementary mandatory measures, ESV determined that the most cost-effective and proportionate response to the risk of RCBO failure was a preventative approach to mitigate the *escalation* of the risk, achieved by placing the prohibition on the further supply into Victoria of RCBO models that had the design vulnerability. ESV maintains this view.

ESV notes that the prohibition is already supported by a suite of relatively low-cost initiatives that assist in addressing the safety risks in established dwellings, including an education and public awareness campaign to encourage householders to test safety switches that have been previously installed in their dwellings to check their functionality. As discussed in chapter 6, these initiatives would be continued and potentially enhanced under the implementation of ESV's preferred option.

Option D: The prohibition is not extended but ESV increases its education, compliance and enforcement activities

Description

Under this option, the current prohibition would not be replaced when it expires on 30 June 2020. After this date, models of RCBO that do not meet ESV's current additional testing requirements could be made available for sale in the Victorian market.

To ensure electrical safety in the absence of the prohibition, ESV would need to devote more resources to its education and communications campaigns to raise the level of safety awareness among electrical installers and householders, and strengthen its compliance and enforcement regime surrounding the regulations governing electrical installations to reduce safety risks.

Benefits/advantages

As with option A, the lifting of the prohibition would mean that the ongoing costs associated with the prohibition (estimated in chapter 4 to be $2.25 million per year) would be avoided. This would represent a benefit to RCBO suppliers, who currently bear most of this cost burden.

Costs/disadvantages

Stakeholder feedback suggests that many RCBO suppliers believe that a stronger compliance and enforcement regime surrounding the regulations governing electrical installations – augmented by greater expenditure on education and communications campaigns to raise the level of safety awareness amongst electrical installers and householders – represents the most appropriate response to the safety risks posed by RCBOs with the design vulnerability.

ESV does not support this view, and believes that this option would be less effective in managing electrical safety risks than maintaining a prohibition, potentially leading to more fatalities, serious injuries and/or property damage arising from electrical fires.

As indicated by Table 5.1, ESV already has a comprehensive compliance and enforcement regime, which includes a large component of education, and is not convinced that a significant increase in expenditure on this regime will be cost-effective in terms of generating improved safety outcomes. There are limits (or 'diminishing returns') in terms of improved safety outcomes from devoting further resources to education, compliance and enforcement activities, noting that it not reasonable to expect 100 per cent compliance under *any* regulatory regime, particularly when human error is at play. For example, even the most qualified and experienced electrical installers are prone to make mistakes from time to time.

Table 5.1: ESV education, compliance and enforcement activity – selected measures

	2014-15	2015-16	2016-17	2017-18	2018-19	Annual average
Public relations and advertising spend* ($ million)	1.79	2.56	2.19	2.17	1.93	2.13
No. of education sessions – electrical installation safety & compliance	173	129	202	175	110	158
Electrical equipment safety market surveillance audits (no. of stores)	101	130	170	117	183	140
No. of licensed electrical inspector assessments	100	113	150	128	140	126
No. of warning letters issued – electrical installations	38	30	176	115	139	100

* *Note: This represents total spend on the full range of ESV's activities – ie, it covers both electrical and gas safety initiatives.*
Source: ESV Annual Reports 2017-18 and 2018-19, and additional advice from ESV.

ESV already engages in extensive education with the electrical installation sector, including regular information sessions, presentations and attendance at training courses to industry representatives, trainers, and apprentice electricians. The appropriate testing of safety switches is a regular agenda item at such sessions, and is always mentioned at presentations by ESV to apprentices because it is one of the mandatory tests of an installation that an electrician is required to complete.[33] ESV officers report that most apprentices attending such information sessions are already aware of the current RCBO prohibition and understand it.

In addition to these face-to-face interactions, ESV produces the free, quarterly *EnergySafe Magazine*, which is targeted at electrical and gas installation practitioners, and which includes articles on key electrical safety issues, safety alerts, and reminders about installation compliance requirements. This magazine and all safety alerts are emailed to all registered electrical contractors and licensed electricians on ESV's register.

In practice, there are limits to the safety risks that can be mitigated through education and public awareness campaigns alone. Market research undertaken by ESV which assesses the effectiveness of advertising and other safety awareness campaigns indicates that even the most expensive and well-

[33] Apprentices must carry out the testing of a RCD as part of their mandatory tests during the Licensed Electricians Practical assessment.

targeted campaigns will never reach all the intended audience, and the ability of people to recall the messages of energy safety campaigns is typically less than 50 per cent.

The effectiveness of safety awareness campaigns targeted to those responsible for undertaking electrical installations may be particularly limited where English is a second language. Moreover, there is a danger of overwhelming practitioners with *too much* information to the point where they cannot possibly absorb *all* the safety guidance that is being sent to them.

The costs associated with greater scrutiny of the work undertaken by over 47,000 electricians that are currently licensed in Victoria – and/or inspecting all of the large number of new electrical installations that take place annually across the State to ensure compliance with electrical installation regulations – would be substantial. Furthermore, such an approach would not identify unsafe electrical installations undertaken in the past, and/or unsafe work performed by unlicensed persons – nor would it address the safety risks arising from householders using faulty electrical appliances or interfering with electrical installations in an unsafe manner. (On the other hand, a functioning RCBO would help to mitigate the safety risks associated with such scenarios).

Because ESV is funded through cost recovery arrangements, any substantial increase in expenditure on its education, compliance and enforcement activities would have to be recouped from industry participants through increased fees and levies – notably through higher fees for Certificates of Electrical Safety,[34] which would impose an increased cost burden on the electrical installation sector (which might, in turn, ultimately be passed onto householders through higher fees for the provision of electrical services).

Preliminary conclusion

ESV notes that many RCBO suppliers are supportive of this option. However, while ESC agrees that strong education, compliance and education frameworks play an important role in managing electrical safety risks, it does not believe that these frameworks alone are sufficient to manage the problems posed by allowing the sale of RCBOs that prone to failure because of the identified design vulnerability. Market research confirms that there are limits to the effectiveness of safety awareness campaigns, and even well-qualified, experienced electrical installers are prone to human error and may make mistakes from time-to-time.

5.2 Summary of the alternative options

For each of the four options considered in this chapter, Table 5.2 presents a summary of their main benefits/advantages and costs/disadvantages when compared to the expected impacts under ESV's preferred option of extending the prohibition by ten years.

[34] The *Electricity Safety Act 1998* and *Electricity Safety (General) Regulations 2019* require a Certificate of Electrical Safety (COES) to be issued for all electrical installation work. Only a registered electrical contractor or licensed electrician can issue a COES, which confirms the electrical work carried out has been tested and complies with the relevant legislation.

Table 5.2: Assessment of alternatives to preferred option

Option	Benefits/Advantages*	Costs/Disadvantages*
A. No further intervention after prohibition expires *ESV maintains supplementary measures (such as education, compliance and enforcement activities) at current levels*	• Avoided ongoing costs associated with current prohibition.	• Electrical safety risks will increase, potentially leading to more fatalities, serious injuries and/or property damage from electrical fires. • May cause confusion in the market and increase community angst because RCBOs with the design vulnerability could be sold in Victoria again.
B. Extend prohibition for a shorter period (eg, five years) and then review	• Provides an automatic mechanism for a more timely adjustment of regulatory arrangements if circumstances change. • Ongoing costs associated with current prohibition are incurred for shorter period if review suggests prohibition no longer necessary.	• Less certainty in the marketplace, which may affect future planning and investment decisions by suppliers. • Higher costs associated with more frequent assessment of regulatory arrangements (eg, consultation costs, other costs of undertaking RIS).
C. Extend prohibition for ten years and introduce measures to address risks in established dwellings *(eg, product recalls, mandatory switchboard upgrades upon change of ownership)*	• More effective in managing electrical safety risks because tackles problem in both new and established dwellings.	• Very costly: – suppliers would likely have to bear the costs of recalls of prohibited RCBOs (eg, cost of advertising, cost of replacing and installing RCBOs); – those selling homes would likely bear costs of checking and upgrading switchboards – estimated in excess of $20M/year). • Increased community angst/confusion (eg, product recalls may reduce confidence in all safety switches).
D. Prohibition allowed to expire and ESV increases its education, compliance and enforcement activities	• Avoided ongoing costs associated with current prohibition.	• Less effective in managing safety risks potentially leading to more fatalities, serious injuries and/or property damage from electrical fires: – there are limits to effectiveness of education/public awareness campaigns; – difficult and costly to check activities of many electrical installers; – human error means mistakes will continue to happen. • Increased costs incurred by ESV (which may ultimately be passed onto industry through cost recovery arrangements).

*Note: Impacts are compared to those expected under the preferred option of extending prohibition by ten years.

6. IMPLEMENTATION AND EVALUATION OF THE PREFERRED OPTION

6.1 Implementation of an extended prohibition

ESV considers that extending the current RCBO prohibition by a further ten years is the preferred regulatory option to meet its electrical safety objectives in relation to the risks posed by RCBOs with the design vulnerability.

Pursuant to section 63(1) of the *Electricity Safety Act 1998*, ESV would implement such an extension by publishing a new prohibition notice in the *Government Gazette* and in a newspaper circulating generally in Victoria.

Since the prohibition has been in place since July 2018, and the RCBO market appears to have made a smooth transition to the prohibition, ESV does not expect that an extension will cause any further disruption or adjustment to the market, but will nevertheless continue to consult with industry to understand the impacts of the prohibition.

The extended prohibition would be augmented by continuing efforts by ESV to raise public awareness of electrical safety issues, and activities designed to improve compliance with, and enforcement of, electrical installation requirements. Relevant initiatives include:

- public awareness campaigns to encourage Victorian householders to test the safety switches that are currently installed on their premises. These include ESV's ongoing *Household wiring: Be on the right side of power safety* advertising campaign, which encourages householders to get their wiring checked by licensed electricians (particularly for older properties), and highlights the benefits of safety switches and the importance of testing these switches regularly;
- safety alerts about the extended RCBO prohibition would be emailed to all registered electrical contractors and licensed electricians, and feature in ESV's quarterly *EnergySafe Magazine;*
- encouraging registered electrical contractors and licensed electricians to report and provide to ESV all non-functioning RCBOs that they encounter during their day-to-day work; and
- checking compliance with the prohibition through ESV's regular electrical equipment safety market surveillance audits.

In addition, ESV is currently considering other measures to help support the safety objectives of the prohibition, including:

- re-designing the Certificate of Electrical Safety so that it prompts registered electrical contractors and licensed electricians to check and test RCBOs when they undertake electrical work;
- supporting amendments to the AS/NZS 3000 wiring rules to remove the current exemption for verification testing requirements of newly-installed electrical systems if no power is

available on the site. AIG members claim that this exemption is being used by contractors in Victoria, resulting in a high rate of installation errors;[35] and

- excluding from any extension to the prohibition some classes of Portable Residual Current Devices (PRCDs) – a plug-in device – because they are designed and manufactured in a way so that the RCBO component is embedded in the product and installed in a manner that cannot be tampered with. This means that RCBOs fitted in PRCDs are not prone to failure.

6.2 Evaluation strategy

As discussed in chapter 4, evaluating the effectiveness of the RCBO prohibition in ensuring electrical safety outcomes presents challenges because safety switches such as RCBOs presents the 'last line of defence' of a *suite* of regulated safety measures designed to minimise the risk of injury, death or property damage. Isolating the individual contributions made by different safety measures is methodologically difficult. As with other forms of safety regulation, the counter-factual is difficult to define – ie, what outcomes would be achieved in the absence of the regulation?

It is impossible to determine how many lives may have been saved – or serious injuries avoided – if RCBOs are functioning well, thereby preventing electrical accidents from happening. And the role of RCBOs in preventing electrical fires is still subject to some debate.

Despite these challenges, ESV will evaluate the effectiveness of an extended RCBO prohibition through the following means:

- continuing to monitor data on electrical-related fatalities and serious injuries, and undertaking investigations to identify the causes of these accidents, including examining the role played by safety switches such as RCBOs;
- considering the findings of any Coronial inquests into electrical-related fatalities;
- continuing to include RCBOs as part of its electrical equipment safety market surveillance audit activity, which helps to assess the effectiveness of the prohibition in removing non-compliant devices from being sold in the Victorian market;
- evaluations of its public awareness advertising campaigns; and
- using its regular education sessions to gauge awareness of the prohibition among the electrical installation sector.

In addition, ESV will continue to receive and consider stakeholder feedback about the prohibition through its regular ESV industry forums and meetings with individual industry participants.

[35] While ESV sees merit in removing the exemption, it does not believe this, on its own, would be sufficient to address the problems caused by RCBOs with the design vulnerability. For example, human error means that some of the tests might not be conducted properly. Moreover, ESV contends that if the RCBO is (inadvertently) installed back to front and the test is undertaken with a RCD tester at the power point, a RCBO with the design vulnerability would operate and pass the test. However, during this test, the RCD function would be damaged and no longer be operational – although there would be no physical indication that the RCBO is damaged, and the RCBO would be left in the installation.