f-factor Incentive Scheme: Regulatory Impact Statement

October 2016

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2. Summary

The f-factor is an existing regulatory instrument under the *National Electricity (Victoria) Act 2005* which specifically provides Distribution Network Service Providers (distribution businesses) with an incentive to lower the number of fire starts on their networks in Victoria.

The Victorian Government introduced the f-factor as one of several measures in response to the 2009 Black Saturday bushfires. The objective of the f-factor is to reduce harm to human life and property by powerline-caused bushfires, without imposing additional costs on consumers. The scheme commenced 1 January 2012.

The f-factor is not intended to be the primary instrument by which the state delivers network bushfire safety improvement. Rather, it provides businesses with an incentive to enhance safety outcomes from the optimal allocation of existing resources.

The f-factor was modelled on the Service Target Performance Incentive Scheme (STPIS). The STPIS sets a five-year supply reliability benchmark for each distribution business and then rewards or penalises them according to whether they meet their benchmarks. The STPIS has created an incentive to improve reliability and distribution business performance has improved accordingly. The f-factor seeks to provide a similar incentive for businesses to lower their bushfire risk.

A change to the f-factor has been devised because of inefficiencies inherent in the current scheme, such that incentives to improve safety are equivalent for both low-risk and high-risk powerlines. That is, risk is treated as being as equal across the entire distribution network irrespective of genuine underlying risk differences.

The following regulatory impact statement has been prepared by the Department of Environment, Land, Water and Planning (DELWP). It considers policy options to revise the existing f-factor scheme with a view to improving its efficiency.

Several options have been considered, including:

- abolishing the existing f-factor and the associated data collection obligations;
- retaining the current f-factor with no changes;
- abolishing the incentive aspect of the existing f-factor but collecting more detailed ignitions information (location and recorded time of fire starts) but imposing no penalties;
- using the detailed ignitions information to weight the penalty for each network fire by its bushfire risk.

The preferred f-factor design is the fourth, and has the following features:

- it applies penalty weightings based on timing and location of powerline ignitions;

- it is based on an averaged historical four-year benchmark of distribution business network ignitions performance, making it cost neutral over the long term if network ignitions remain constant; and
- the benchmarks will be decremented at set intervals to take account of new safety measures already paid for by consumers which are expected to deliver reductions in fire starts.

The preferred option is expected to incentivise the distribution businesses to use finite existing funding to focus on ignitions occurring at times and in places of highest bushfire risk. This focus on efficient and targeted threat reduction is expected to restrict additional cost impacts on consumers. It is expected that consumers will only pay through the scheme if they get the benefit of reduced network ignitions.

1. Nature and Extent of the Problem

1.1. The problem of bushfire starts as a result of the electricity distribution network

Victoria is one of the most bushfire-prone regions of the world. This is due to its geography, which promotes seasonal growth of vegetation, followed by brief periods of intense, dry heat in summer which 'cures' this vegetation. In conditions of abundant fuel, high temperatures, low humidity and high winds, a small spark can quickly grow to a conflagration which is essentially unstoppable.

Electricity infrastructure has been linked to deadly bushfires in four years: 1969, 1977, 1983 and 2009.[1] Electricity was not widely present in the Victorian landscape before the State Electricity Commission of Victoria's (SECV) rural electrification program was completed in the 1960s, and consequently has only been a factor in bushfire ignition since that time.

Inquiries were conducted in the wake of the catastrophic bushfires in these years, which showed the link to electricity assets. In general, however, data collection on bushfires and their causes has been poor until recently. For the period for which consistent and reliable data are available, electricity assets have caused an average of 793 fires per annum, as illustrated below[2]:

Figure 1.1: Distribution network fire starts

Year	2012	2013	2014	2015	Average
Fire starts	638	925	974	635	793

These figures represent all fires in both urban and rural locations, not all of which subsequently evolve into bushfires. However, in high risk conditions (defined by weather and ground fuel),

[1] For further information on how powerline faults are linked to bushfires see: ACIL Allen Consulting, *Regulatory Impact Statement, Bushfire Mitigation Regulations Amendment*, (November 2015) 7-8; Powerline Bushfire Safety Taskforce, *Final Report* (30 September 2011) 38-44.

[2] Australian Energy Regulator, *Draft determination and explanatory statement: f-factor amount determinations for Victorian electricity distribution network service providers' 2014 fire start outcomes* (June 2015) 3. Fire start data for 2015 is available at https://www.aer.gov.au/networks-pipelines/network-performance/victorian-electricity-distribution-businesses%E2%80%99-public-fire-start-reports-2015.

these fires have the potential to evolve into bushfires. Further, among those high consequence bushfires (i.e. those which cause fatalities), electricity assets are disproportionately represented as a cause[3].

Following the 7 February 2009 Black Saturday bushfires, the Victorian Bushfires Royal Commission (VBRC) identified powerlines as being the cause of five of the major fires that day, and responsible for 119 deaths. A sixth fire (Murrindindi) was not investigated by the VBRC as it was then under investigation by Victoria Police on suspicion of arson. Victoria Police subsequently concluded that arson was not the cause, and referred the matter to the Coroners Court for inquiry. On 27 November 2015, the Coroners Court found that this fire was also caused by electricity distribution assets, adding the loss of a further 40 lives to the total attributable to electricity distribution assets.[4]

1.2. Legal and Legislative mechanisms to reduce electricity network bushfire risk

A range of mechanisms exist to deal with the general problem of bushfire starts from electricity networks. These are:

1.2.1. Common and Statute Law

As corporate bodies operating within the State of Victoria, the distribution businesses are subject to common and statute law. Accordingly, bushfires started by networks may be the subject of criminal and civil legal actions and in recent years one distribution business been the subject of civil action.[5]

1.2.2. Improved network protection assets

The commencement of the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016* has imposed an additional obligation on distribution businesses operating in Victoria to install network fault detection and suppression devices and undertake powerline replacement in areas of greatest bushfire risk through the application of mandated operational performance standards and end-of-life asset replacement.

1.2.3. Further distributor safety obligations under Legislation

Electricity distributors have regulated obligations to operate safe networks under the Electricity Distribution Code, the *Electricity Safety Act 1998*, and subordinate legislation (see **Appendix 1**).

[3] Victorian Bushfires Royal Commission, *Final Report* (2010) 148-150; The *Final Report* of the Powerline Bushfire Safety Taskforce details on the link to powerlines and bushfires including electrical arcing and debris, this work was confirmed by the Powerline Bushfire Safety Program test program into Rapid Earth Fault Current Limiter technology and the energy levels sufficient for ignition in worst case Black Saturday temperatures and conditions. See http://www.energyandresources.vic.gov.au/energy/safety-and-emergencies/powerline-bushfire-safety-program/r-and-d/rapid-earth-fault-current-limiter

[4] Victorian Coroners Court, *Finding into Fire Without Inquest – Murrindindi* (27 Nov 2015), Court Ref 2009/1498

[5] The company changed its name from SP AusNet in 2014 following a major change in shareholders. See AusNet Services: ASX & SGX-ST release 4 August 2014.

1.2.4. Electricity Safety Management Schemes and Bushfire Mitigation Plans

Under section 113A of the *Electricity Safety Act 1998*, distribution businesses must provide Bushfire Mitigation Plans (BMPs) in which they set out how they will manage the bushfire risk presented by their networks. These plans, and the broader Electricity Safety Management Schemes (ESMS) of which BMPs are a part, must be accepted by Energy Safe Victoria (ESV) as a condition of network operation.

1.3. Bushfires starting on electricity assets remain a problem

The above mechanisms to impose legal and legislative obligations on distribution businesses to maintain a safe system. Together they provide the primary means by which the bulk of network-related bushfire risk reduction may be achieved in Victoria. Despite these mechanisms, however, there are a range of reasons why electricity assets continue to present a bushfire risk. These reasons are detailed below.

1.3.1. Exogenous variables

The operators of distribution networks in Victoria face an inherent risk that vegetation and fauna interaction or extreme weather may interact with the network to start bushfires. Legislation cannot eliminate this risk.

1.3.2. Prohibitive costs of network fire elimination

The risk of exogenous variables, asset faults and operational limitations could be virtually eliminated by undergrounding all non-urban powerlines at an estimated $40 billion (in 2011 dollars).[6] However, such an investment would impose a prohibitive cost on Victorian consumers.

1.3.3. Imposed Costs on Others (Negative Externality)

Under the current legislative energy framework, the cost of bushfires are not directly borne by distribution businesses. While these businesses do bear some cost (as a consequence of asset damage), the bulk of these costs arise from losses experienced by the broader community (life, houses, livestock, timber, etc).[7]

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[6] The Powerline Bushfire Safety Taskforce estimated a 99 percent reduction in powerlines starting bushfires if they are undergrounded. Powerline Bushfire Safety Taskforce, *Final Report* (30 September 2011) 5; The Powerline Replacement Fund found that the cost of powerline undergrounding by $256,669 per km for SWER lines and $842,005 per km for polyphase lines (in 2015 dollars). Acil Allen *Report to Department of Economic Development, Jobs, Transport and Resources Regulatory Impact Statement Bushfire Mitigation Regulations Amendment* (17 November 2015) 11.

[7] VBRC *Final Report* Volume 2

Figure 1.2: AusNet Services / SP AusNet Black Saturday Settlements

Company	Bushfire	Amount of settlement[8]
AusNet[9]	Beechworth[10]	$19.7 m
AusNet	Murrindindi[11]	$260.9 m
AusNet	Kilmore[12]	$378.6 m
TOTAL		$659.2 m

Distribution businesses have, and continue to, incur costs worth hundreds of millions of dollars per year to carry out their regulatory obligations (see **Appendix 1**). In addition, businesses face costs arising from litigation due to bushfire. As an example, in the case of the Black Saturday bushfires, AusNet Services' costs totalled approximately $660 million.

These costs are however not necessarily a sufficient incentive for distribution businesses to make an optimal investment in minimising risk to third parties arising from bushfire. This is because distribution businesses are regulated monopolies, and efficient costs are recoverable from consumers. Efficient costs comprise compliance with regulatory obligations. This also includes public indemnity insurance. In the case of the above litigation, parties reached a court-mediated settlement. The business' insurers agreed to pay these costs. As subsequent increases in premiums constitute a legitimate cost of doing business, they may be recovered from consumers through the economic regulatory framework.

1.3.4. Use of Discretionary Capital

Distribution businesses have discretion in how they spend available capital funds for operational, maintenance and minor capital items, apart from the construction of mandated assets.

The ESV safety performance reports indicate a range of additional actions which businesses have self-nominated in pursuit of safety objectives[13]:

Figure 1.3: Distribution businesses safety actions

Action
Stake poles based on age and condition
Pole top structure – surge diverter replacement
Replace crossarms
Inspect, clean, tighten – pole top fire mitigation
Replace insulators – pole top fire mitigation

As noted above, Bushfire Mitigation Plans provide a means for businesses to demonstrate to ESV how they will undertake capital improvements to improve network bushfire safety. The

[8] This amount reflecting the company's share of costs
[9] The company changed its name from SP AusNet in 2014 following a major change in shareholders. See AusNet Services: ASX & SGX-ST release 4 August 2014.
[10] ASX & SGX – ST Release, SP AusNet, 7 March 2012
[11] ASX & SGX – ST Release, AusNet Services, 6 February 2015
[12] ASX & SGX – ST Release, SP AusNet, 15 July 2014
[13] Energy Safe Victoria, *Safety Performance Report on Victorian Electricity Networks* (2013) 42-43

effectiveness of BMPs, however, is limited as distribution businesses have significant discretion as to what risk reduction items are delivered. These plans are input in nature and do not presently enforce delivery of specific assets or operational practices, nor do they create an incentive to use discretionary capital.

The current f-factor also does little to encourage targeted investment of discretionary capital. This is because, as noted, the current f-factor encourages the distribution businesses to manage all fires equally, regardless of whether they occur in high risk areas during high bushfire-risk weather, or in low-risk fire areas in low bushfire-risk weather. To maintain or improve their total ignitions reduction performance, the businesses must spread their network operations and maintenance expenditure over their entire asset base. This effectively incentivises them to make low cost investment in areas where fires are most concentrated regardless of the inherent risk of these fires.

As all fires are treated equally, what an efficient and prudent business will do to reduce f-factor liability does not necessarily equate to what it should do to reduce bushfire risk. There is no price information to guide the businesses as to where to invest limited capital to achieve maximum public benefit.

1.4. The f-factor is one scheme to deal with the problem

In response to the role electricity assets played in the Black Saturday fires, the State Government introduced an incentive scheme to reduce electricity network distribution network ignitions on 23 June 2011. Known as the f-factor, the scheme followed the design of the Service Target Performance Incentive Scheme (STPIS), and placed an economic incentive on each distribution businesses whereby each year they would be either penalised or rewarded $25,000 for every network ignition above or below their historical five-year benchmark of ignitions.

Importantly, by using a benchmark based on historical averages, the current f-factor is designed to be cost neutral to consumers and distribution businesses over time. It also provides a direct incentive for businesses to undertake network safety improvements in order to reduce bushfire risk. The costs imposed on distribution businesses in the form of penalties in years where they exceed their ignitions benchmarks are balanced by the incentive payments they gain in years where they lower ignitions below their benchmarks. In this way, consumers should receive the benefit of the safety improvements for which they pay and be provided with a measurable indication of progress in network bushfire safety improvements. It must be noted that under the current scheme, the balance of incentive payments to distribution businesses and consumers requires more than one Electricity Determination Pricing Review (EDPR) period in order to achieve cost neutrality. This is because distribution business actions to reduce network ignition risk exist in an environment of weather and network asset condition which has relative short-term volatility, the effects of which average out over the long term. Indeed, the symmetric nature of the current scheme was chosen to contain the risk of short-term volatility.

The current f-factor is a symmetric incentive scheme, which is consistent with the national economic regulatory energy framework to which Victoria is a party. This framework allows electricity distribution businesses to recover the reasonable costs of providing customer services, and improvements on the network required to maintain and enhance this service (see **Appendix 1**).

1.5. Limitations of the current f-factor

1.5.1. Weak Incentive

The State presently has a fire reduction scheme which, over the short term of its four year operation, has applied a weak incentive through an inflexible flat rate of $25,000 for each ignition above or below the business' performance benchmarks. As all ignitions (winter and summer, urban and rural) are counted equally, the short-term incentive power of the current scheme to reduce network ignitions has been limited and has imposed a cost on consumers.

1.5.2. Failure to Target Ignitions of greatest risk – by Geography and Time

The current scheme treats the aggregate annual number of network ignitions as a proxy for bushfire danger. But by failing to distinguish between these ignitions on the basis of differences in bushfire risk, the scheme has produced an inefficient incentive. This has in turn, prevented the f-factor from contributing to the reduction of this ongoing risk to Victorians.

The current f-factor has the advantage of communicating to businesses that all ignitions are of importance and does not exclude any ignition that may start a fire resulting in injury, or loss of life and property. It takes an "all hazards" risk management approach.[14]

In practice, this approach has not been found to incentivise fire start reductions or demonstrably reduce bushfire risk. By treating all fires the same, including those of least concern, those in colder weather and in low bushfire risk areas (LBRAs), the scheme fails to drive targeted bushfire risk reduction in the places and times of greatest risk.

The table below shows distribution business ignitions performance since the introduction of the current unweighted incentive scheme on 22 December 2011. The reduction in the aggregate number of network fire starts relative to the annual average over 2006-10 has been generally poor, with AusNet Services showing the only consistent reduction.

[14] **All-Hazard:** "Any incident or event, natural or human caused, that requires an organized response by a public, private, and/or governmental entity in order to protect life, public health and safety, values to be protected, and to minimize any disruption of governmental, social, and economic services." United States Coast Guard, *Incident Management Handbook* (2006), 25-1

Figure 1.4: Distribution network performance under current f-factor

	Citipower	Powercor	Jemena	AusNet	United Energy
benchmark	30.4	401.8	56.8	256.8	124.2
2012 Ignitions	30	303	42	178	85
% to Benchmark	-1.3%	-24.6%	-26.1%	-30.7%	-31.6%
2013 Ignitions	33	498	91	176	127
% to Benchmark	8.6%	23.9%	60.2%	-31.5%	2.3%
2014 Ignitions	31	463	84	182	214
% to Benchmark	2.0%	15.2%	47.9%	-29.1%	72.3%
2015 Ignitions	14	345	54	120	102
% to Benchmark	-53.9%	-14.1%	-4.9%	-53.3%	-17.9%
Average annual Ignitions	27.0	402.3	67.8	164.0	132.0
% to Benchmark	-11.2%	0.1%	19.3%	-36.1%	6.3%

The current scheme therefore does not deliver optimal fire risk reduction.[15] Distribution businesses are required to allocate capital across a vast network rather than target the areas of most significance. This carries an additional risk that distribution businesses may receive payments for reducing their overall level of ignitions (including winter ignitions in urban areas) in a year when their assets start fires in summer, leading to damaging bushfires.[16]

Treating all areas as equal is also inconsistent with the targeted asset deployment approach required by the Government towards the implementation of Recommendations 27 and 32 of the VBRC. Nor does this approach align with the asset deployment recommendations from the Powerline Bushfire Safety Taskforce (PBST) and the prioritised asset rollout of the Powerline Bushfire Safety Program (PBSP), which specifies a higher safety standard for asset deployment and operation in heightened bushfire risk areas of the network. [17]

[15] Network ignition counts by themselves provide only one indicator of the efficacy of the f-factor and are not conclusive given exogenous variables and the presence of other regulatory safety obligations on distribution businesses.

[16] Introducing a weighted scheme should reduce this risk, but it will not eliminate it.

[17] It must be noted that in their 2011 submissions to the current f-factor, the businesses questioned the likely efficacy of the current f-factor incentive scheme to reduce the bushfire threat posed by the distribution network, because it was untargeted. The businesses also cited criminal law liabilities, insurance and commercial impacts, which, when overlayed on pre-existing legislative requirements, acted as sufficient incentive for them to maintain safe networks. These factors, however, cannot be demonstrated

Accordingly, at best the current f-factor scheme has provided an output for a bushfire risk proxy as posed by all networks ignitions across the Victorian distribution businesses. The scheme has not provided a sufficient incentive to influence.

1.5.3. Failure to Incentivise Full Benefits from Mandated Assets

The f-factor provides an opportunity to incentivise the distribution businesses to extract the full bushfire risk reduction benefit from enhanced network protection devices.

The distribution businesses have commenced a significant program of asset deployment with a view to reducing bushfire risk following the commencement of the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016*. This asset deployment is expected to lead to an estimated over 60 per cent decrease in the risk posed to the public by bushfires started by powerlines.[18]

Broadly speaking there are two different classes of assets: those which require active operation to deliver benefits; and those which do not:

Figure 1.5: Distribution network asset classes

Asset	Active operation required to deliver benefit?
Automatic circuit reclosers (ACRs)	Yes
Rapid earth fault current limiters (REFCLs)	Yes
Covered conductor	No
Underground conductor	No
Vibration dampers	No
Spreaders (armour rods)	No

Consequently, while distribution businesses face an obligation to install the above assets, they do not have an obligation to operate them to maximise bushfire risk reduction.

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to have had an effect in reducing network ignitions. Irrespective of their presence, the fall in ignition levels has been prone to variation for all businesses except AusNet Services, and has only reduced marginally for most of the businesses since 2012. *f-factor Scheme – Citipower/Powercor Submission*, 2011, available at: http://www.energyandresources.vic.gov.au/energy/about/legislation-and-regulation/f-factor-scheme/citipower-powercor, accessed 16 May 2016; *f-factor Scheme – United Energy Submission*, 2011, available at: http://www.energyandresources.vic.gov.au/energy/about/legislation-and-regulation/f-factor-scheme/united-energy, accessed 16 May 2016; f-factor Scheme – Jemena Submission, 2011, available at: http://www.energyandresources.vic.gov.au/energy/about/legislation-and-regulation/f-factor-scheme/jemena, accessed 16 May 2016.

[18] Pending full deployment and operation of enhanced fault detection and suppression technology on the distribution network as mandated by the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016* ; CSIRO modelling commissioned by the Department of Economic Development, Jobs, Transport and Resources (Oct 2015).

One may assume that a distribution business will choose to operate an asset it already has so as to optimise potential safety benefits. However there are countervailing incentives a business faces: the first being to minimise operational costs; the second to minimise supply disruptions. Achieving higher reliability can, in some circumstances, come at the expense of safety. In addition, as noted in **Appendix 1**, STPIS can potentially consume up to 5 per cent of a businesses' annual revenue, making this incentive scheme non-trivial in dictating how distribution businesses allocate scarce resources.

The current f-factor scheme supplies little incentive for distribution businesses to optimise and drive full benefit from the mandated enhanced network protection technologies funded by Victorian consumers to reduce bushfire risk. Fires in these high risk areas will impose no greater penalty than those started in low bushfire risk areas. Arguably, this will distort the risk assessment businesses may make around when they choose to operate these devices and with what degree of sensitivity of network fault detection and suppression capability. This outcome would work against the full benefits realisation of installing these devices on the 22 kV network they are intended to protect.[19] This is not intended to advocate a prescriptive optimal operation of assets, which regulators are often in a poor position to do, but to highlight a lack of proper incentive to businesses under the current scheme to use these assets for the maximum safety benefit for Victorians.[20]

1.5.4. Windfall gains from operation of enhanced network protection devices

The benchmark under the current scheme design places the consumer in the position of paying twice for the benefits of new enhanced network protection technology, as it is not adjusted to take account of the deployment and operation of this technology. If the benchmarks are left unchanged, consumers will pay once to install the devices, and again when ignitions are reduced as a result of device operation.

1.5.5. Summary

By revising the f-factor, it is expected that the weak incentive to reduce network ignitions provided by the current scheme will be improved. A more efficient and targeted risk reduction incentive should incentivise investment and operational improvements to the riskiest areas of the state. A benchmark which reflects ignitions reductions from the introduction and operation of enhanced network fault suppression technologies. Fixing these problems will not eliminate fire starts or mandate the use of new protection technologies or strengthen other regulatory safety obligations placed on distribution business. However, a strengthened f-factor will go some way to improving the effectiveness of the broader safety regulatory framework by incentivising a more efficient ignition risk reduction from the businesses.

[19] Rapid Earth Fault Current Neutraliser technologies will provide the majority of the ignitions reduction on the 22 kV network in line with heightened network fault suppression standards imposed by the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016*.

[20] It is for this reason that Bushfire Mitigation Plans have not been used to prescribe operational settings of electricity distribution network assets.

2. Objective

The objective of the revised f-factor is to drive a targeted reduction in those electricity network ignitions that are most likely to result in harm to human life and property. It is to incentivise action that will achieve the most efficient and significant reduction in bushfire risk without imposing further costs on consumers.

The proposed scheme, like the current scheme, is not intended to be the primary mechanism to reduce the bushfire risk posed by distribution network ignitions. This work remains the object of the mandated asset rollout under the *Electricity Safety (Bushfire Mitigation) Regulations 2016*, and other legislative safety obligations. Nor can the f-factor by itself, promote a more robust use of BMPs and ESMS or incentivise the use of discretionary capital or the mandated assets. A correctly-targeted incentive scheme can and should, however, seek to enhance the risk reduction benefit of the legislative bushfire risk reduction framework by pricing network ignitions in line with the risk exposure of the community.

To achieve this efficiency objective, the revised f-factor seeks to incentivise better alignment between the bushfire risk reduction practices and priorities of the distribution businesses and the bushfire risk exposure of the Victorian Community posed by the distribution network.

The revised f-factor will seek to incentivise distribution businesses to better internalise the external cost of catastrophic bushfires started by electricity network ignitions.

The revised f-factor will require businesses to:

- reduce the likelihood of the subset of ignitions which present the greatest bushfire threat to Victorian communities;
- achieve an aggregate threat reduction over successive years of each EDPR period; and
- efficiently focus available resources to deliver the greatest bushfire safety benefit.

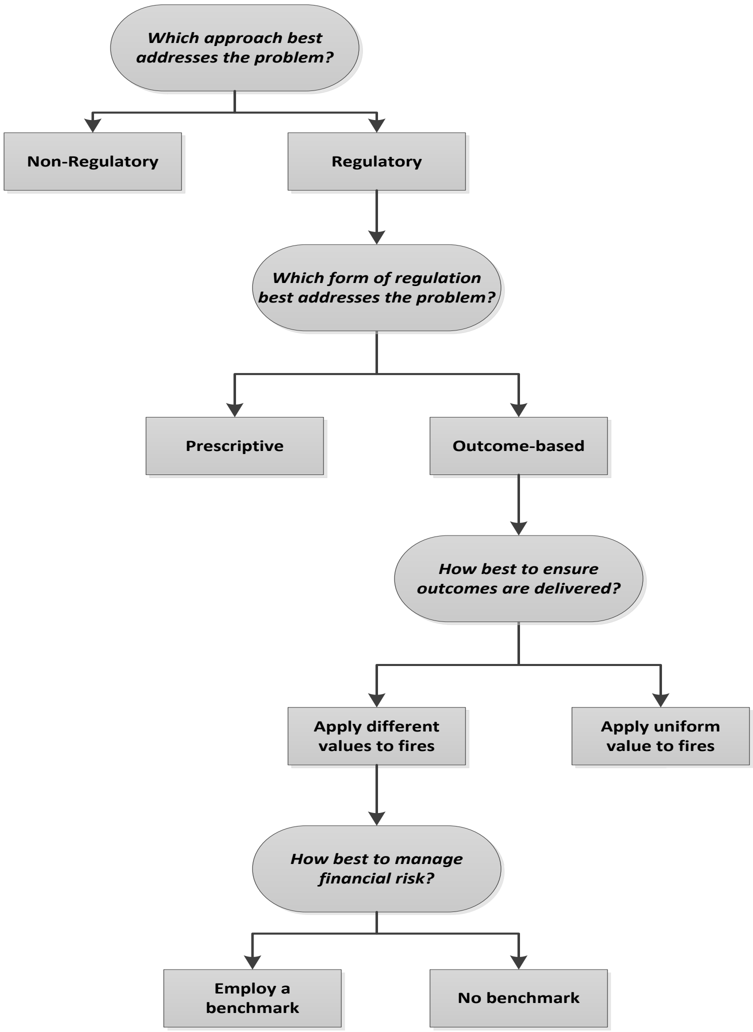
3. Approaches, Options and Methods

This section seeks to identify the preferred solution to the problems identified above by exploring alternatives. It does so by answering the following questions:

- *Is a regulatory or non-regulatory approach preferred?*
- *Would a prescriptive or outcome-based form of regulation be more effective?*
- *What metrics would be most effectively employed in an outcome-based regulation?*
- *How will financial risks arising from the scheme be managed?*

These questions are represented diagrammatically below:

Figure 3.1: Options Decision Tree



3.1. Which Approach Best Addresses the Problem?

At the broadest level, the problems identified in the above diagram can be addressed in three ways:

- ***Do nothing*** – allow existing incentives and drivers to dictate outcomes;
- ***Non-regulatory approach*** – limit Government action to influence businesses without formal legal regulation
- ***Regulatory approach*** – Government to initiate legally binding and enforceable obligations

These are discussed below.

3.1.1. Do Nothing

This option assumes there is no f-factor in place. As there is currently an f-factor scheme in operation, this would entail terminating the current scheme.

Under this option, businesses would continue to bear responsibility for the deployment of assets consistent with regulatory responsibilities. They would continue to employ ultimate discretion as how best to internally allocate resources against competing priorities including normal scheduled maintenance, network augmentations, reliability, customer service and so forth.

Businesses already collect detailed information on network ignitions, report to ESV on these instances and conduct maintenance and replacement works in response. In addition, liability under common law remains for network ignitions resulting in loss of life and property.

However, the absence of a scheme to drive targeted ignitions risk reduction leaves an incentive for the businesses to rely on insurance, spend retrospectively after ignitions occur or spend only on problem areas of the network that are not necessarily aligned to relative bushfire risk.

The balance of reliability and safety is left imbalanced under this option, as distribution business spending decisions are incentivised to align to the STPIS rather than bushfire safety.

For these reasons, this option is not preferred.

3.1.2. Non-Regulatory Approach

One option to address the problems identified above would be to employ a non-regulatory approach and seek to change business behaviour by other means. The most evident non-regulatory approach would be to use information to incentivise businesses to more adequately address bushfire risk. There are two means whereby information could be used to influence behaviour. The first is the supply of information to businesses; the second is the supply of information about businesses to the general public.

In the first case, Government could employ its significant investment in bushfire mapping and modelling to inform businesses of the relative bushfire risk of different network locations. This information can be easily shared with businesses.

In the second case, Government could publicly disclose the fire start data it collects from businesses on an annual basis. This practice has in fact been in place for several years through ESV's annual safety performance reports.

There are however significant shortcomings to these approaches. Firstly, while Government can – and does – provide bushfire risk modelling information to businesses, this is not in itself a financial incentive. At the margins it may influence company behaviour, but only to the extent that countervailing incentives are not stronger.

Secondly, electricity distribution businesses are monopoly essential service providers. A member of the public who finds their distributor has performed poorly in a safety performance report is not in a position to choose an alternative supplier, short of moving locations or going "off grid".

Consequently the efficacy of information-only tools in shaping corporate behaviour are likely to be limited.

For these reasons a non-regulatory option is not preferred.

3.1.3. Regulatory Approaches

Under this approach the Government would institute a legally binding and enforceable obligation on distribution businesses through regulations.

The benefit of adopting a regulatory approach is that business performance against a targeted behaviour is no longer measured against a discretionary goal or a set of recommendations, but is instead non-avoidable, consequence driven and continues as long as the legal instrument remains in place.

A regulatory approach will therefore provide a driver for behavioural change in a targeted and active fashion by incentivising the business to internalise the risk to communities posed by network ignitions.

For these reasons a regulatory approach is preferred.

3.2. Which Form of Regulation Best Addresses the Problem?

Two options are available to regulate distribution businesses: prescriptive regulation; and non-prescriptive, or outcomes-based regulation. These are discussed below.

3.2.1. Prescriptive Regulation

Under this option the Government would state, to a highly granular level, the precise actions distribution businesses should undertake to reduce the harm in question.

Government has used prescriptive regulation at points where there was little room for doubt about the technical measures needed to address a specific risk. This has been done in respect of both indicating which assets to replace or install, and indicating how those assets should be operated.

For example, in January 2012 Energy Safe Victoria issued directions in respect of the control groups[21] used on Automatic Circuit Reclosers (ACRs) on Singe Wire Earth Return (SWER) lines. The Government was in a position to issue the direction given the research undertaken by the Powerline Bushfire Safety Taskforce on how best to employ these devices to reduce bushfire risk.

Similarly, the Government has introduced the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016* which require networks to achieve specific standards of fault detection and response achievable through the installation of Rapid Earth Fault Current Limiters (REFCLs). Once

[21] A control group is a series of programmed procedures which dictate how ACRs operate including the number of reclose attempts, the duration of each reclose, and the duration between reclose attempts.

again, this step followed over 2,000 separate technology tests supported by $5.5 million of Victorian Government investment.[22]

It is difficult for Government to maintain adequate information to inform a prescriptive regulatory approach to electricity network operations. The difficulty is worsened by the continuing technological changes which are affecting the electricity industry. Government would need to make a considerable and ongoing investment to be in a position to prescribe best technical solutions to safe operation of electricity assets.

Consequently further use of prescriptive regulation is not preferred.

3.2.2. Outcomes-Based Regulation

Outcomes-based regulation mandates that a party (for example, the distribution businesses) deliver a result (for example, reduce the bushfire risk posed by the distribution network) but it does not specify how this result must be delivered.

To adopt this option the Government would set a broadly-framed requirement to achieve a desired outcome, while leaving the regulated parties the discretion to determine how this would best be achieved.

Risk ownership for each response to this stated outcome is appropriately left with the businesses and is not transferred to the Government. This approach does not require the State to mandate how network technology is used or how and when operational practices should be undertaken. As noted above, the distribution businesses are best placed to make these operational and maintenance decisions as they hold the best knowledge of how their networks function as a whole and how individual assets operate and fail.

An outcomes-based financial incentive allows the State to target the distribution businesses' attention on the times and places of the network of greatest bushfire risk.

An outcome-based approach has been previously adopted because distribution businesses are best placed to know what technical decisions are required. Distribution businesses are required to submit Bushfire Mitigation Plans to ESV for approval under the *Electricity Safety Act 1998 (Vic)*. The Act specifies what the plans must broadly cover, leaving the businesses to identify the actions businesses must undertake to deliver the outcome of reduced bushfire risk.

Consequently an outcomes-based regulatory approach is preferred.

3.3. What type of Outcome-Based Approach?

The Government could consider a range of approaches to achieve the outcome of reduced harm from bushfires started by electricity assets. But what would be required is a suitable metric that best approximates this outcome. Such approaches could include measuring:

- the frequency of bushfires from electricity asset ignitions;

[22] The Victorian Government's $5.5 million test program of Rapid Earth Fault Current Limiters in 2014 at Frankston South and in 2016 at Kilmore South. Over 1000 tests were performed on live networks. The final reports for these trials are available at: http://www.energyandresources.vic.gov.au/energy/safety-and-emergencies/powerline-bushfire-safety-program/r-and-d/rapid-earth-fault-current-limiter

- the damage done by ignitions of different types;
- fault-levels on the distribution network by frequency and timing;

The difficulty of these approaches is that it is hard to see how they can be used to develop a scheme to provide the outcome of reduced harm, or risk of harm, from network-started bushfires. This is because these metrics are either statistically infrequent, and so would require unreasonable timeframe to trace progress, or assume every fault causes a fire or ignore the possibility that any network ignition could start a fire given the right environmental circumstances.

The outcome based approach that is most likely to be effective is one which applies a measurable and reasonable metric to proxy bushfire risk from electricity assets and finds a reasonable way of incentivising an improved safety outcome that is actionable by a specific party, and is able to be validated, longitudinal and granular.

Network ignitions provide the best proxy for the bushfire danger posed by electricity distribution system assets as it is these faults that contribute to bushfires. The historical records of network ignitions from each distribution business show both a long-term picture and can be used to highlight distribution business safety performance at times of greatest fire risk. These records can also be used to show performance on parts of the distribution network which pose the greatest bushfire risk to the Victorian community. Accordingly, the bushfire safety improvement outcome is achievable and measurable over fire seasons and the EDPR period, satisfying businesses, regulators and the community.

For these reasons, a revised and targeted f-factor is the preferred outcome-based approach.

3.4. How Best to Ensure the Outcomes are Achieved?

An outcomes-based approach could:

- Apply a uniform costing to all fires; or
- Weight fires according to the relative risk they pose.

These approaches are discussed below.

3.4.1. Uniform Treatment of All Fires

The first option available is to weight all distribution network fire starts equally, irrespective of relative bushfire risk. This approach treats the aggregate annual number of all distribution network ignitions as a proxy for harm. It provides financial incentives to distribution businesses to minimise this harm by reducing the total number of asset fire starts on their networks. This is in effect the current scheme and is not preferred for the reasons set out in section 1.5 above.

3.4.2. Weight Fires by The Risk they Pose

This approach recognises that not all fires are of equal concern. The location and timing of network ignitions directly influence the risk to human life and property. However, each additional data field employed by the scheme will add to complexity – and administrative costs – for both businesses and regulators. The test must be whether additional safety gains warrant such administrative costs.

Consequently there are two broad approaches to weighting fires:

- Simplified; or
- Detailed.

These are explored further below.

Simplified Weighting

Under this option weightings would be applied to a subset of factors which have the greatest influence on powerline bushfire risk . These are:

- Time of year; and
- Location.

This would yield a simplified regime of differentiated fire start penalties as illustrated below:

Figure 3.2: Simplified Ignitions Weighting Model

	Time	
Location	Low Risk	High Risk
Low Risk	Lowest priority	Medium priority
High Risk	Medium priority	Highest priority

Specifically, high risk locations would be those currently assigned the status "Hazardous Bushfire Risk Area (HBRA)[23]. Low risk locations comprise all other areas. High risk times of the year would be restricted to the Specified Bushfire Risk Period (SBRP) which extends from 1 November to 31 March[24].

This option has the benefit of being administratively simple. It also leverages established regulated and accepted definitions of higher bushfire areas and times of risk.

However, this option does not sufficiently differentiate between risk categories to guide and incentivise distribution businesses to make optimal investment decisions or extract full value from the operation of deployed active assets such as new remotely-adjustable Automatic Circuit Reclosers and Rapid Earth Fault Current Limiters.[25] Instead this option would dissipate effort

[23] *Electricity Safety Act 1998*
[24] Ibid.
[25] These devices work by detecting phase-to-ground, and wire-into-vegetation faults and closing off supply. They can each be adjusted to meet the degree of bushfire threat, with new Single Wire Earth Return (SWER) ACRs remotely set to have fewer attempts to reconnect supply (used as a means to minimise the impact of transient faults) and REFCLs set to less or more sensitive energy detection settings. Further

over too large a section of the network, and over too great a period of time, to meaningfully address times and locations of highest risk. A more detailed approach is required.

Detailed Weighting

Under this option weightings would be applied to *all* factors that influence the harm associated with powerline bushfires.

The performance measure proposed would weight each fire start by:

- Location/geography of the fire start (G); and
- The Fire Danger Rating at the time of the fire start (T).

Each fire start would accrue a quantum of the performance measure Ignition Risk Unit (IRU).

IRU = **G** (Geography) x **T** (Time: Fire Danger Rating).

The weightings reflect community risk as follows:

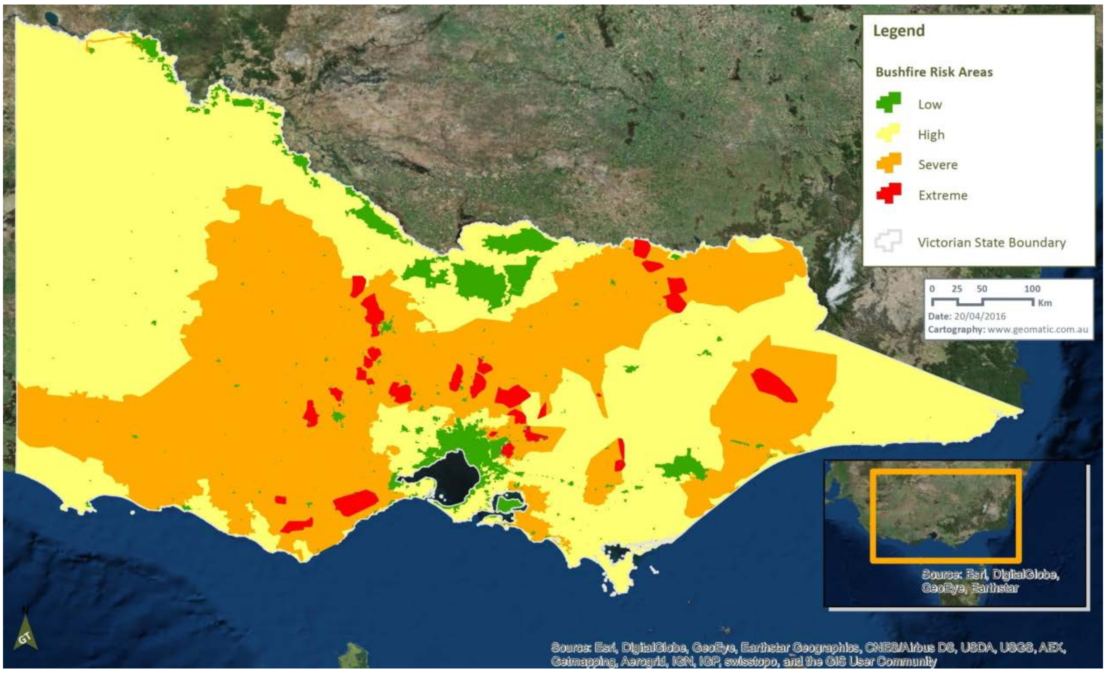
Figure 3.3: Bushfire Risk Weighting Metrics

Metric	Value	What
G	0.2	Low
	1.0	High
	4.6	Severe
	19.8	Extreme
T	0.1	No forecast
	0.2	Low-moderate
	0.5	High
	1.0	Very high
	2.0	Severe
	3.5	Extreme
	5.0	Code Red

information on the impact of adjusting the reclose attempt settings of SWER ACRs is available in the Powerline Bushfire Safety Taskforce, *Final Report* (30 September 2011). In 2012, the Victorian Government responded to Recommendation 32 of the Victorian Bushfires Royal Commission and mandated the installation of new SWER ACRs and the restriction of the number of reclose attempts of these devices on Total Fire Ban and Code Red days. Further information on the operation of REFCLs is in the Final Report of the PBSP Frankston REFCL test program, which is available at: http://www.energyandresources.vic.gov.au/energy/safety-and-emergencies/powerline-bushfire-safety-program/r-and-d/rapid-earth-fault-current-limiter

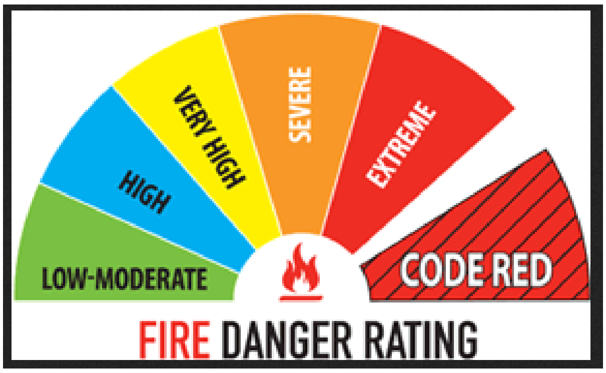
The "**G**" metric is consistent with areas regulated under the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016* which are driven by the high bushfire risk areas of Victoria, as illustrated below:

Figure 3.4: Bushfire Risk Areas for G Metric



The "**T**" metric is based on the Victorian Fire Danger Ratings as illustrated below:

Figure 3.5: BOM Fire Danger Ratings for T metric[26]



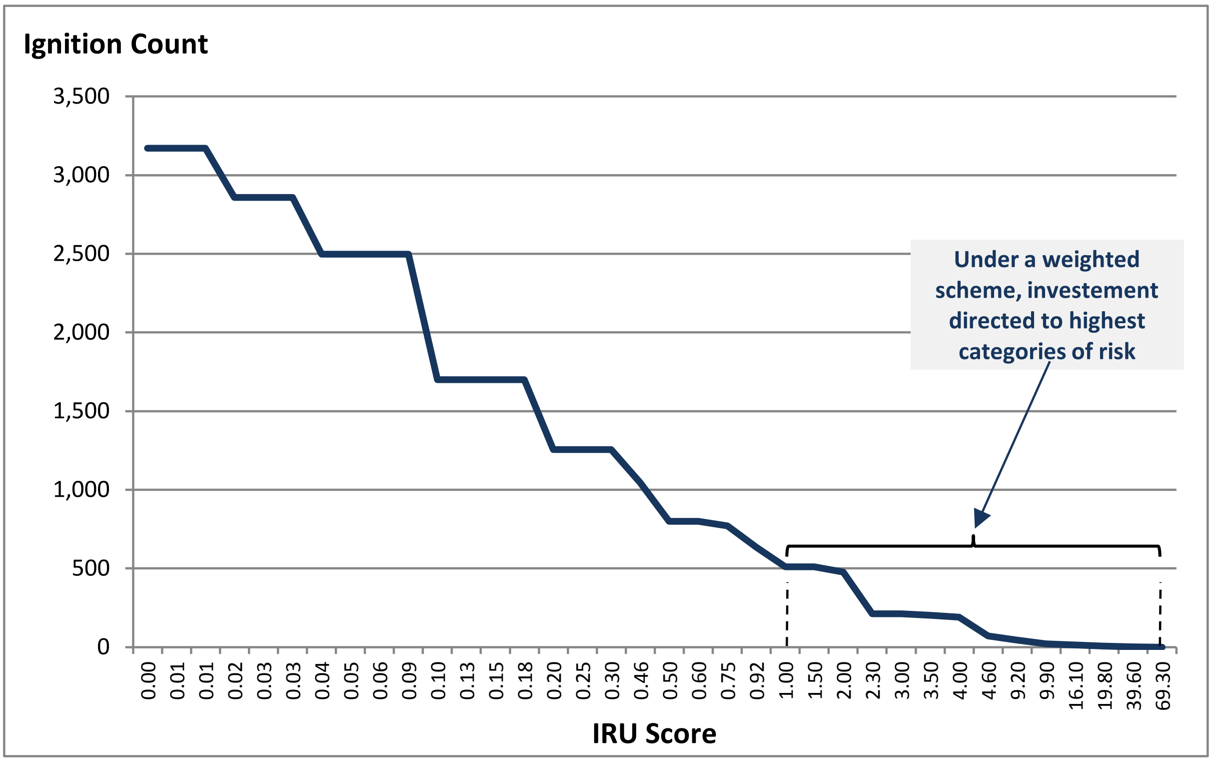
The basis for the relative weightings is given in **Appendix 2.**

The administrative burden of this approach will be minimal as the distribution businesses already collect the following information about each ignition on a powerline: location down to the level of nearest pole (each pole has a unique identification number), fire type and cause, and fire danger ratings on the day of each ignition.

[26] This illustration does not capture the additional "no forecast" category.

The proposed weightings more closely align the incentive measure with the bushfire risk associated with each fire start. Most fire starts do not impose a significant bushfire risk and the graph below shows the number of 2012 to 2015 fire starts with a IRU score higher than the IRU scale on the horizontal axis.

Figure 3.6: Number of network ignitions greater than or equal to a given IRU value



Note: The curve for fire starts under a **weighted** scheme shows the number of historical fire starts (2012 – 2015) that are greater than or equal to each given IRU score. IRU values for the analysis above are **G** (1) x **T** (1) = 1.

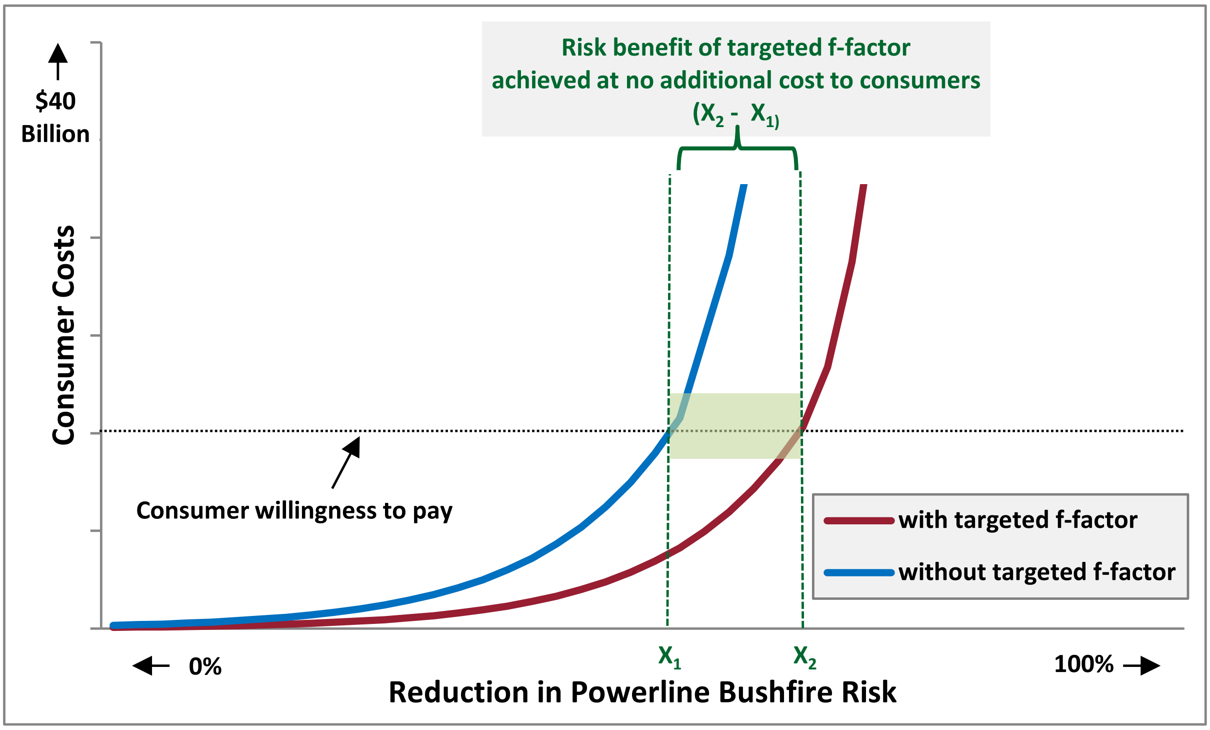
Based on the 2012 to 2015 fire start history, if distribution businesses were to successfully prevent the 16.1 per cent of ignitions with an IRU score greater than 1, the total IRU score across the industry would reduce by 77.1 per cent.

Further details on the development of the weighted measures are provided in **Appendix 2**.

The weighted scheme functions to focus business investment at those risk factors associated with the highest bushfire risk, consistent with the priorities of the Victorian Bushfires Royal Commission 2009 and supported by the Victorian Government.

The objective of adopting these weighted metrics into the f-factor is to leverage a greater safety benefit from the existing funding supplied to distribution businesses. That is, to reduce bushfire danger at no additional cost to consumers, as shown schematically below.

Figure 3.7: Risk benefits comparison of targeted and untargeted f-factor options



This option better aligns financial incentives with the actual harms which the scheme seeks to minimise. Consequently this option is preferred.

3.5. Efficient Pricing of Risk

The proposed f-factor scheme provides price signals to electricity distribution businesses to inform their investment and operational planning activities. This aligns with the objective of the initiative.

The risks to human life and property from powerline bushfires are however not fully in the control of the businesses. Exogenous variables remain. Distribution businesses' exposure to this risk will lead to costs, which will ultimately impact on consumers. It is therefore important that the f-factor scheme ensure the most efficient pricing of these risks. There are two different ways to do so:

- Adopt an asymmetric or "penalty only" regime; or
- Adopt a symmetric regime.

The two approaches are discussed below.

3.5.1. Asymmetric Method

Under an asymmetric regime, businesses would not receive payment to reduce their ignitions but would instead simply pay for every fire on their networks.

An asymmetric regime has not been found to be an appropriate mechanism for the f-factor.

This is because an asymmetric schemes would impose non-recoverable liabilities, resulting in a high likelihood of significant cost pass through to consumers under the national economic regulatory framework. Further detail on the Asymmetric method for the f-factor are available in **Appendix 5**.

3.5.2. Symmetric Method

For a symmetric incentive scheme, a benchmark for performance is set. Differences between a given year's performance and the benchmark are calculated annually, and multiplied by an incentive rate to produce a dollar figure. Where a distribution businesses' performance exceeds the benchmark, it gains a financial increment; where the performance is less than the benchmark, it experiences a financial decrement. In principle, if a benchmark is based on historic performance it will be cost neutral over time. Through a symmetric scheme, the distribution businesses have a financial incentive to improve performance when the costs to deliver this improvement do not exceed the reward they will receive.

Such schemes do not require additional revenues as a consequence of their introduction. From the perspective of distribution businesses, a symmetric scheme is cost neutral over time, as rewards and costs net out. Consumers will only pay more over time if the community receives the benefit of improved performance.

To develop a symmetric scheme which incentivises bushfire risk reduction, both the performance measure and benchmark need to be developed and a suitable incentive rate decided upon.

3.5.3. Impact of climate change on symmetrical incentive scheme

The role of climate change on network ignitions must be acknowledged. Network ignitions occurring in the hotter times of the year present a greater bushfire risk. This is partially due to environmental conditions, such as lack of rain, high heat, and cured combustible material.[27] In the future Victoria may face more fire seasons with a greater number of Total Fire Ban (TFB) days as climate change comes into greater affect. In one respect this shift in weather may present a change in the exogenous factor of weather. As there is no consensus on the timing of climate change, the degree to which this is the case can only be observed over coming years and calls for careful data collection. However, such changes are expected to occur slowly, and consequently are not expected to materially impact the cost neutrality of the proposed scheme.

4. Preferred Option

The preferred option is to deliver a weighted f-factor is a through a symmetric benchmarked scheme, the details of which are provided below.

[27] VBRC *Final Report Summary* (2010) 1.

4.1. Performance Measure

As outlined in section 3.4.2 above, a weighted performance measure is favoured which sets a value for each ignition, based on the location in which it occurs and the time of year in which it occurs.

4.2. Benchmark

A symmetrical f-factor incentive scheme is proposed based on historical performance benchmarks set independently for each distribution business. While annual performance against the benchmark may be influenced by random weather variation, the impact of this variation is expected to average out, which would make the scheme cost neutral over time.

The historically based benchmark is to be adjusted at set intervals to reflect the enhanced bushfire safety that is expected to result from the introduction of new network assets. This new and safer class of network protection technologies have already been funded by consumers. This decrement to the benchmark is necessary ensure that electricity consumers only pay once for the benefits that flow from the roll out and operation of these mandated assets, as described in **Appendix 2**.

The benchmarks for the proposed f-factor will be as follows:

Figure 4.1: Distribution Business IRU benchmarks for Financial Years 2016 - 2020

Company	2016/17	2017/18	2018/19	2019/20
AusNet Services	247.7	247.7	247.7	214.3
CitiPower	3.4	3.4	3.4	3.4
Jemena	9.7	9.7	9.7	9.7
Powercor	468.0	468.0	468.0	412.8
United Energy	22.3	22.3	22.3	22.3

A Risk Reduction Model developed by CSIRO with the cooperation of the distribution businesses can be used to estimate the extent to which new network technologies function to reduce the likelihood of ignitions across the electricity distribution network. This model has been used to quantify the decrements to the benchmark for each distribution business. Further details are given in **Appendix 3**.

Both the benchmark setting and decrements to the benchmark were calculated using available fire start data for the 2012 to 2014 period. Detailed fire start records have been recorded by the distribution businesses for the purposes of AER f-factor reporting since 2012.

4.3. Incentive Rate

The intention of the scheme is to further mitigate bushfire risk through the efficient expenditure of available funding consistent with the targeted application of new codified standards of network protection in specified high bushfire risk locations. The rate needs to be set high enough to provide an incentive for the distribution businesses to prioritise action to prevent fires in high risk locations on high risk days while not creating an undue financial burden on either consumers or distribution businesses. The incentive rate is set in a way that recognises that:

- Fire start historical data is limited (with suitable data only available for a small number of years).
- The fire start reduction impact of new assets has yet to be fully understood in the field environment.
- If f-factor penalties are too high, they may incentivise unintended operational behaviour
- Year to year variations in weather may influence the rate of ignitions experienced.

It is noted that as a result of the weighting process it is not possible to compare the existing scheme incentive rate of $25,000 per fire start with a new rate per IRU. Consequently, it is proposed that the incentive rate be set at a level at which the:

1. Expected financial impact on consumers and businesses will not exceed the levels experienced under the current scheme.[28]
2. Value of individual ignitions with significant risk is not less than the current scheme.
3. There is a balanced incentive for the Distribution Businesses to increase bushfire safety and maintain localised supply reliability .

Incentive rates ranging from $10,000 to $50,000 have been considered in the following analysis.

4.3.1. Financial Impact on Consumers and Businesses

In order to estimate the financial impact on consumers and businesses, CSIRO analysed the fire start data for the 2012-2014 years which was provided by each of the distribution businesses to the AER for the purpose of making determinations under the existing f-factor scheme. Using this dataset, CSIRO prepared weather simulations representing 30,000 weather years for each of the distribution businesses.

The purpose of the CSIRO research was to identify how the IRU outcome of each distribution business may vary under dirfferent weather scenarios, noting that in a year in which the weather is:

- **hotter than average**, there is an increased likelihood that the IRU performance will exceed the IRU baseline (increasing the prospects of a business being penalised); and
- **cooler than average**, there is an increased likelihood that the IRU performance will fall below the IRU baseline (increasing the prospects of customer tariff increases).

To test the potential impact of weather variation on IRU performance, the CSIRO modelling was used to identify three indicative classes of weather year:

[28] The current scheme set the fire start incentive rate at $25,000 to control the amount of distribution business revenue placed at risk and minimise consumer financial impacts. Given the new scheme will introduce the variables of weighted geographical location and Fire Danger Ratings, controlling the incentive rate to maintain current levels of financial impact is a prudent means to avoid unintended consequences.

- a "**cool**" year, taken to be represented by the simulated year at the 25th quantile in the distribution of simulated weather years (i.e. 25% of the 30,000 simulated years have an IRU score below this value).
- a "**typical**" year, taken to be represnted by the mean IRU value for all 30,000 simulated years.
- a "**hot**" year, taken to be represented by the simulated year at the 75th quantile in the distribution of simulated weather years (i.e. 75% of the 30,000 simulated years have an IRU score below this value).

The table below shows an estimate of the annual IRU value for each distribution business that is associated with each of the three identified weather scenarios. It should be noted that the IRU value for the "typical" year is a close approximation to the actual level of the benchmark.

Figure 4.1: Financial impact distribution by weather scenarios

Type of weather year	Cool	Typical	Hot
Quantile	25th	(mean value)	75th
Description	25% of all simulated years have an IRU value less than this.	Average IRU value for all simulated years.	75% of all simulated years have an IRU value less than this.
AusNet Services	205.9	274.3	327.2
CitiPower	1.9	4.1	5.7
Jemena	6.2	8.9	11.32
Powercor	284.3	472.9	614.4
United Energy	8.1	21.0	29.9

Further details of this simulated weather analysis are given in **Appendix 2**.

For each business it is then possible to calculate the difference in IRU value between the:

- "hot" year and the typical year; and
- "cool" year and the typical year.

This provides the basis for estimating the penalty the business would have incurred in a "hot" year and the incentive the consumer would have paid in a cool year (if operational performance with respect to ignitions was unchanged from that of 2012-14)

The two tables that follow show the expected level of payments from consumers to businesses in a cool year and penalties from businesses to consumers in a hot year at various incentive rates.

The table below shows estimates of the total annual amount ($ million) payable by electricity consumers to each distribution business at different Incentive rate values in a "cool" year.

Figure 4.2: Estimates of annual payment levels by consumers to distribution business in cool years at different IRU incentive rate values

Distribution business	IRU Price						
	$10,000	$15,000	$20,000	$25,000	$30,000	…	$50,000
AusNet Services	$0.684	$1.026	$1.368	$1.710	$2.053	…	$3.421
Citipower	$0.022	$0.033	$0.044	$0.055	$0.066	…	$0.110
Jemena	$0.027	$0.040	$0.053	$0.066	$0.080	…	$0.133
Powercor	$1.886	$2.829	$3.772	$4.715	$5.658	…	$9.430
United Energy	$0.129	$0.194	$0.258	$0.323	$0.388	…	$0.646

Further details of the payments and an estimation of the consumer impact are in **Appendix 4**

The table below shows estimates of the total annual amount ($ million) payable by each distribution business to electricity consumers at different Incentive rate values in a "hot" year.

Figure 4.3: Estimates of annual payment levels by distribution business to consumers in hot years at different IRU incentive rate values

Distribution business	IRU Price						
	$10,000	$15,000	$20,000	$25,000	$30,000	…	$50,000
AusNet Services	-$0.529	-$0.794	-$1.058	-$1.323	-$1.587	…	-$2.645
Citipower	-$0.016	-$0.025	-$0.033	-$0.041	-$0.049	…	-$0.082
Jemena	-$0.024	-$0.037	-$0.049	-$0.061	-$0.073	…	-$0.122
Powercor	-$1.416	-$2.124	-$2.831	-$3.539	-$4.247	…	-$7.079
United Energy	-$0.089	-$0.133	-$0.177	-$0.221	-$0.266	…	-$0.443

Further details of the payments and an estimation of the consumer impact are in **Appendix 4**

The table below shows the maximum payments to and penalties actually incurred by each business over the four years of the current scheme between 2012 and 2015.

Figure 4.4: Current scheme maximum payments and penalties to distribution businesses

Distribution business	Maximum Payment ($m)	Maximum Penalty ($m)
AusNet Services	$3.420	**N/A**
CitiPower	$0.410	**$0.065**
Jemena	$0.370	**$0.855**
Powercor	$2.470	**$2.405**
United Energy	$0.980	**$2.245**

Forecast penalties and payments under the different scenarios were compared to historical payments and penalties. It was found that for one distribution business, Powercor, the Incentive Rate would need to be reduced in order to ensure that the penalty to the business (in a "hot" year) and the payment made by customers (in a "cool" year) would not exceed the maximum amount experienced in the past four years.

At an incentive rate of around $13,000 payments from consumers to Powercor in "cool" years would match the maximum payment to Powercor under the existing scheme. At an incentive rate of around $17,000 penalties incurred by Powercor under the existing scheme would match the maximum penalties incurred by Powercor under the existing scheme.

If costs to consumers and businesses are to be similar to the existing scheme, the incentive rate should be in the range of $13,000 - $17,000.

4.3.2. Value of Individual Ignition

By applying the IRU weighting framework, there are 28 different IRU scores that are possible, ranging in value from 0.02 to 99.0.

The financial "value" of an individual ignitions under various penalty rates and a selection of Geographies Geography/and Time combinations is shown below. This sample of ignition values includes both the lowest cost and highest cost category of fire.

Figure 4.5: Individual ignition values by IRU incentive rate, time and geography

Geography Category	IRU Weight	Time Category	IRU Weight	IRU total	Penalty Rate Scenarios					
					$10,000	$15,000	$20,000	$25,000	$30,000	$50,000
Low	0.2	No forecast	0.1	0.02	$200	$300	$400	$500	$600	$1,000
High	1.0	Very High	1.0	1.00	$10,000	$15,000	$20,000	$25,000	$30,000	$50,000
High	1.0	Severe	2.0	2.00	$20,000	$30,000	$40,000	$50,000	$60,000	$100,000
High	1.0	Extreme	3.5	3.50	$35,000	$52,500	$70,000	$87,500	$105,000	$175,000
High	1.0	Code Red	5.0	5.00	$50,000	$75,000	$100,000	$125,000	$150,000	$250,000
Severe	4.6	Severe	2.0	9.20	$92,000	$138,000	$184,000	$230,000	$276,000	$460,000
Extreme	19.8	High	0.5	9.90	$99,000	$148,500	$198,000	$247,500	$297,000	$495,000
Severe	4.6	Extreme	3.5	16.10	$161,000	$241,500	$322,000	$402,500	$483,000	$805,000
Extreme	19.8	Severe	2.0	39.60	$396,000	$594,000	$792,000	$990,000	$1,188,000	$1,980,000
Extreme	19.8	Extreme	3.5	69.30	$693,000	$1,039,500	$1,386,000	$1,732,500	$2,079,000	$3,465,000
Extreme	19.8	Code Red	5.0	99.00	$990,000	$1,485,000	$1,980,000	$2,475,000	$2,970,000	$4,950,000

A table listing all possible combinations of Geography and Time is located in **Appendix 4**

It can be seen that at the incentive rates examined, the value of a single ignition ranges from $200 to $4,950,000

In assessing what constitutes a "significant" fire, for which the community might expect that the "penalty" under the new scheme should not be less than the existing scheme, it is noted that:

- Ignitions in areas classified as HBRA (geography category "high") are considered to be hazardous to the community during the summer months; and
- At a Fire Danger Rating of Severe "If a fire starts and takes hold, it may be uncontrollable".

It would seem appropriate then that the "penalty" for an ignition in a High Geography on a day with a Severe Fire Danger Rating should not be less than the existing penalty of $25,000.

It can be seen from the table above that this would be achieved at an incentive rate of $15,000.

At this level, the two highest IRU categories of ignition have a value of over $1 million and the eight highest categories of ignition as measured by IRU score, have a financial value exceeding $100,000. These are ignitions posing high levels of risk to the community, but which occur infrequently, and it is entirely appropriate that a high penalty value be placed on such ignitions. At an Incentive Rate level of $15,000, the incentive rate functions to:

- provide heightened attention to the most dangerous classes of ignition (the top 8 – 10);
- retain parity with the current scheme with regard to a threshold fire of significance (i.e. a fire in a "high" category of geography occurring on a "severe" weather day); and
- provide a financial rationale for directing resources away from the prevention of relatively low risk ignitions (towards ignitions of higher relative risk).

This analysis notes that there are 13 categories of ignition which are valued at less than $25,000. These are categories which pose a much lower level of risk to the community and occur more frequently. The intention of this scheme revision is to draw attention away from these lesser risk fires. A full tabulation is given in **Appendix 4**.

4.3.3. Provision of Increased Bushfire Safety and Localised Reliability Impacts

Under the proposed new incentive scheme the value of an individual ignition will not be fixed, as is the case in the current f-factor. At times and in places where the community risk is highest, the penalties could be in the millions of dollars, as shown in *Figure 4.5* above.

On days of heightened bushfire risk, the distribution businesses already adjust the sensitivity of existing and enhanced network protection devices including ACRs to an Increased sensitivity to faults. This in turn has already increased the likelihood of supply disruption as these sections of the network are 'locked out' until crews inspect the effected sections of line. The likelihood of the f-factor contributing to significant outages through enhanced operational settings of network devices is therefore considered to be negligible.

The operational tension between safety and supply reliability is and will remain an inherent challenge to the network and pre-dates the current and proposed f-factor. Moreover, the issue of outages as a result of bushfire safety measures, was anticipated by the VBRC and Powerline Bushfire Safety Taskforce in making recommendations accepted by the Government.

The distribution businesses already manage reliability impacts when they apply enhanced safety settings to ACRs on days of heightened bushfire risk. The businesses are also mindful of the welfare of customers and act in accordance with the *Electricity Distribution Code* and other relevant regulatory obligations.

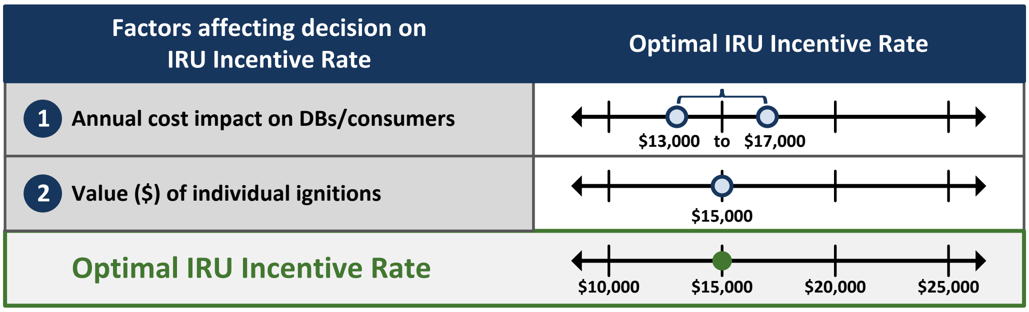
The presence of redundancy systems and smart grid technologies on the network to maintain supply, such as Distribution Feeder Automation, together with the capability of REFCL technology to maintain supply to un-faulted feeders, is expected to further mitigate the impact of localised reliability issues, as these technologies come online and are matured.

The base level penalty rate of the new scheme has nevertheless been set at a point which will not incentivise delays in rectifying faults or reenergising lines, and therefore any dilution of safety and reliability benefits for the community.

4.4. What is a Suitable Incentive Rate?

The influence of the factors considered above are summarised below:

Figure 4.6: IRU incentive rate analysis input



Consequently, it is proposed that the IRU incentive rate for the proposed scheme be set at $15,000 per IRU. At this level the annual cost to consumers in a "cool" year would be small and is estimated to be $2.64 in the case of Powercor. Further details are in **Appendix 4**.

4.5. Conclusion

The characteristics of a symmetric incentive scheme using a weighted performance measure are well matched to the objectives outlined in section 2. In particular the scheme should be cost neutral over time yet focus existing and planned resources on those fire starts of greatest risk to the community.

This preferred option places a different value on each fire according to the risk associated with the time and location of the ignition. Annual ignition performance for each distribution business will be assessed against an historical benchmark, that is decremented at set intervals to capture the benefit of enhanced network safety devices. The scheme, as proposed, functions to balance the financial risk to businesses and consumers with the need to address community concerns with bushfire safety.

5. Cost Benefit Analysis

In the previous section a range of options were analysed and the parameters for the a preferred option were proposed. This section provides a financial analysis of the cost and benefit of introducing that preferred option against the base case of the current scheme.

It is possible to estimate the cost of introducing the proposed scheme. The benefit – avoidance of major and catastrophic bushfires – is more difficult to quantify given that:

- it is not possible to estimate the level of bushfire risk reduction resulting from distribution business operational changes due to the incentive scheme; and
- the avoided cost of bushfires is difficult to estimate on an annual basis due to the variability in intensity and timing of bushfires.

For this reason, this cost benefit analysis utilises a break-even approach.

5.1. Costs

There are both administrative and compliance costs associated with the introduction of the revised f-factor. Administrative costs are expected to be similar to the current scheme:

- Reporting of the ignitions data in a form suitable for f-factor validation is expected to be a marginal additional cost to the business. Ignitions latitude, longitude and nearest pole reporting may impose additional administrative costs on businesses. These are expected to be modest as they should overlay on existing data collection capabilities, estimated at no more than 0.1 FTE, around $10,000 pa. IRU calculation is expected to impose no additional cost as this may reasonably be expected to be undertaken as part of the validation process.
- As all information for the new scheme is already collected there is no incremental cost. ESV will bear the cost of undertaking an annual validation of ignitions data and of issuing and responding to any draft outcome report on ignitions data it may issue before sending the IRU performance outcome to the AER. This analysis and validation builds on existing ESV activities and is estimated to be no more than 0.25 FTE, around $25,000.
- The AER is required to make an annual f-factor input into its Electricity Distribution Pricing Review (EDPR) process in a similar manner as under the current scheme.

Compliance costs must be estimated considering the nature and purpose of the incentive scheme. A benchmark “symmetric” scheme implies that over the long term, if the distribution businesses’ operational methods and infrastructure remain the same, there should be no net benefit or cost to the businesses.

However, exposure to heightened incentives aligned to bushfire risk poses a significant short-term liability risk to distribution businesses if there is no improvement to current ignitions performance. A rational response for a prudent distribution business would be to take action and to expeditiously mitigate this risk. Indeed there are many actions that the distribution businesses can take to reduce the risk and potential penalty of highly weighted ignitions:

- In extreme geographies, for example:
    - Ensure faults are cleared

  - Ensure vegetation clearance meets standards
  - Increase inspection frequencies
  - Ensure infrastructure (such as conductors/ fuses) are not end of life or obsolete
  - Ensure powerline replacement works are completed to a timely manner
- On extreme and code red fire hazard rating days
  - Ensure protection devices (ACRs and REFCLs) are operational and set appropriately

However, it would not be rational for the distribution businesses to increase operational expenditure more than the expected penalties.

As discussed in the incentive rate section above , CSIRO has prepared weather simulations representing 30,000 weather years for each of the distribution businesses. From this data it is possible to calculate the difference between an expected typical "hot" year IRU value and the mean and hence estimate the penalty the business is expected to incur in a "hot" year if operational performance with respect to ignitions was unchanged from that of 2012-14. For the distribution businesses combined penalties are estimated to total $3.1 million (at a penalty rate of $15,000 per IRU).

It follows that the rational compliance costs the distribution businesses would incur in total would not exceed this figure. To the extent that the proposed scheme does not incentivise operational change, then compliance costs would be proportionally smaller. Further explanation of the CSIRO analysis is provided in **Appendix 2**.

5.2. Benefits

The primary objective of the f-factor is to reduce the bushfire threat to Victorian communities. By their very nature the cost of major bushfires varies greatly. The VBRC estimated the cost of the Black Saturday fires at $4.4 billion[29] for the 15 individual fires examined, or $293 million (in 2009 AUD) per fire. The Ash Wednesday fires are estimate to have cost $1.3 billion (in 2009 AUD)[30] or $163 million per individual fire. These figures provide a reasonable range which is consistent with other fires such as the Canberra fires of 2003 which are estimated to have caused financial losses of $350 million[31].

It is estimated that the cost of an individual major bushfire is in the range $163-293 million. The mid-point of$228 million will be used for the purposes of the break-even analysis.

5.3. Break-Even Analysis

Based on the estimated costs (penalties of $3.1 m in a "hot" year plus incremental administrative costs of $35,000) and benefits (avoidance of an individual bushfire with cost of $228 m) the revised f-factor would need to prevent a major bushfire at least once over 73 years to break-even. The assessment of whether this is probable is dependent on:

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[29] VBRC *Final Report* Vol 1 Appendix A
[30] VCCCAR *Working Paper 3 – The cost of disasters to Australia and Victoria* (April 2011) 10
[31] *The Report of the Bushfire Recovery Taskforce* - Australian Capital Territory October (2009) 4

- The incidence of powerline caused major bushfires; and
- The potential impact on the operations of the distribution businesses of the proposed incentive scheme.

5.3.1. Incidence of Major Bushfires Caused by Powerlines

Victoria has a long history of major bushfires. The VBRC identified 52 major bushfire events in the period 1851-2007 to which must be added the Black Saturday fires investigated by the Commission, equivalent to one major bushfire event every 3 years. Specifically, with respect to powerline caused bushfires the Commission noted[32]:

- Nine of the 16 major fires on 12 February 1977 were caused by electrical assets;
- On Ash Wednesday, 16 February 1983, it appears that four of the eight major fires were caused by electricity assets;
- On Black Saturday, 7 February 2009, electricity assets caused six of the 11 major fires.

In a period of less than 40 years, 19 major fires were caused by powerlines, equivalent to one major fire every 2.1 years. At this rate, powerlines would start approximately 24 major bush fires over a 50-year period.

5.3.2. Likely Responses from Distribution Businesses

The proposed evolution of the f-factor scheme focusses attention on those potential powerline fire starts that pose the most risk to the community. As outlined earlier, each ignition start will be weighted by locality (G) and the CFA fire danger rating applying in that locality on that day (T).

There will be significant incentive for a distribution business to take operational steps to minimise the risk of a powerline fire start in sensitive locations in dangerous weather conditions. The highest weighting will be for a powerline caused fire, in an area with extreme risk on a Code Red day. This will generate an IRU rating of 99 which is a penalty of $1,485,000 using a penalty rate of $15,000 per IRU. Although Code Red days are infrequent, it is under such conditions and in these localities that major bushfires occur. The risk of incurring these penalties should incentivise distribution businesses to take every reasonable step to prevent ignitions from electricity assets.

There are four immediate operational and investment responses to the increased incentives under the proposed revised f-factor that a rational distribution business may make.

Targeted Operations and Maintenance

Businesses may choose to restructure their existing operational inspection and maintenance regimes to prioritise high-risk areas ahead of fire seasons.

Expedite Modification Works to Powerlines in Electric Line Codified Areas

The greatest single fire potential liability exists in the “extreme” geographical areas. These areas align to the electric line construction areas prescribed under the *Electricity Safety (Bushfire*

[32] VBRC *Final Report* Section 4.1

Mitigation) Regulations 2016. A rational business may expedite modification of these powerlines to meet the new standards out of its existing awarded funding. The distribution businesses have indicated they may consider such an accelerated deployment of powerlines, which will need to be evaluated by the Australian Energy Regulatory in the normal course of the EPDR processes.

Expedite Installation and Achieve Maximum Operational Benefit of REFCLs and ACRs

The most statistically significant incentive liability is presented by powerlines located in the "Severe" category. Distribution businesses may choose to expedite installation of REFCLs and Automatic Circuit Reclosers (ACRs) in line with the roll out schedule outlined in the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016*.

Full operational benefit of REFCLs in particular will require the distribution businesses to become operationally familiar with the technology, to adapt their networks and operational practices around fault detection and suppression. A rational and prudent business may choose to expedite this process.

Increase Sensitivity of Network Protection Devices

In consultation with the Department, the distribution businesses have raised concerns about their potential liability from ignitions on Code Red days in Extreme (19.8) geographical areas.

They have noted that under this scenario, reliability outputs may need to be carefully weighed against bushfire safety concerns, suggesting adoption of heightened sensitivity of network protection devices on days of greatest fire risk.

Such consideration will need to take account of regulatory obligations imposed by the *Electricity Distribution Code*.

5.4. Conclusion

Given the incidence of powerline caused major bushfires and the incentive provided by the proposed weighted targeted incentive approach, the scheme would reasonably be expected to result in at least one less major bushfire over a 73-year period. At this level the benefits would be similar to the compliance costs. If the scheme results in reducing more than one major bushfire over this period the benefits would exceed the costs.

6. Implementation Plan

Success of the f-factor initiative requires sound implementation. This necessitates the choice of a suitable legal instrument; the effective communication of the new requirement; transition from the prior scheme to the new one; a clear responsibility for administrative functions; and a practical enforcement regime.

6.1. Effective Communications of Requirement

The electricity distribution businesses are the only parties regulated under the scheme. The AER and ESV are the relevant administrative bodies. The latter organisations have been consulted in the development of the proposed enhancements to the f-factor scheme. The distribution businesses have been consulted in the preparation of the benchmark and decrement methodology. This consultation was managed by DELWP, both directly with each business and through the Distribution Business Reference Group convened by the PBSP.

As the proposed regulatory changes are refinements of the existing scheme, the mechanics of the enhancements will be easily understood by the businesses. Given the nature of a weighted scheme, it will be important that all parties understand and have appropriate field processes in place to apply the correct classification to each ignition so that the reported IRU measure for each fire is accurate.

6.2. Transitional Arrangements

It is intended that the liabilities for revised f-factor will commence from 1 July 2016. This means that the existing f-factor will be rescinded at the time the Order-In-Council for the revised scheme is made. As the current scheme operates on a calendar year period, it has been necessary to determine an equitable 6 month fire start target for the January – June period in 2016.

During May 2016, the AER made determinations for the fire start target for each business for the 2016-2020 period. It is proposed that these fire start targets, appropriately reduced to the proportion of fire starts that have historically been incurred by each business in the January – June period as a proportion of the full year target, be adopted as the transitional fire start target.

The seasonally-adjusted benchmarks for 1 January 2016 – 30 June 2016 are as follows:

Figure 6.1: Baselines for Transition Period 1 January – 30 June 2016

Distribution Business	Current Annual Benchmark (2016-2020)	Jan – June Seasonally-adjusted benchmark
AusNet Services	185.8	109.0
CitiPower	25.8	18.6
Jemena	66.1	50.2
Powercor	351.4	237.2
United Energy	134.9	98.0

The transitional benchmarks were established by seasonally-adjusting the current f-factor scheme benchmarks for a 1 January to 30 June period. This is based on the percentage of the actual number of fire starts for each business over 2012 – 2015, that occurred over that 1 January to 30 June period.

After June 2016 the distribution businesses will submit their fire start performance reports to the AER which will then be in a position to make a positive or negative pass through for the transitional January – June 2016 period. Commencement of recalculated f-factor liabilities into IRUs will apply into the current EDPR period, with the 2016/17 financial year forming a second input into the factor performance outcome processed by the AER for revenue determination for 2018.

6.3. Administration

Successful implementation of the revised f-factor requires the:

- Determination of an IRU benchmark for each business, based on the best available historical data and projection of the impact of asset deployment, prior to revised f-factor commencement;
- Establishment of a practical reliable reporting system of IRU performance for each business;
- Annual calculation of incentives for each business by way of a positive or negative pass through by the AER.

Fire starts for each business have been reported to the AER for the 2012-15 calendar year. Although conceptually this data should be sufficient to establish a IRU historical base benchmark, the location format in some instances may not be specific enough. The businesses have been given the opportunity to submit more accurate data prior to the IRU base benchmark being established. The second step is to decrement the base benchmark to take account of the expected reduction in fire starts to be achieved by the roll out ACRs, REFCLs and PRF works. This will be primarily calculated through the application of the CSIRO Risk Reduction Model based on the asset rollouts foreshadowed by the distribution businesses in accordance with the regulated requirements. Distribution businesses have been given the opportunity to review and comment upon the proposed decrements prior to the IRU benchmark determination. This impact was taken into consideration by DELWP.

Accurate reporting will be critical for the successful introduction of the scheme. Distribution businesses will need to review existing fault reporting systems to ensure that:

- faults are correctly reported as fire starts where appropriate; and
- date, time and location of each fire start is accurate.

6.3.1. Role of the Department

The Department shall be responsible for calculating and setting the Ignition Risk Unit f-factor benchmark of each distribution business to be applied under the proposed revised f-factor for the remaining 2016 – 2020 EDPR cycle. These benchmarks will be set into the proposed f-factor Order in Council. Benchmarks for further cycles may be published by the Minister by notice in the Victoria Government Gazette.

6.3.2. Role of Distribution Businesses

The distribution businesses will collect and report ignitions data.

For 1 January 2016 to 30 June 2016, the distribution businesses are collecting their ignitions data as designated under the current system. The businesses will submit this data to the Australian

Energy Regulator in accordance with its request for a Fire Start Report and/or Regulatory Information Notice (RIN).

From 1 July 2016, the distribution businesses will commence collection of ignitions data to the format required for the new f-factor scheme.

Each ignition shall be identified by:

- Latitude and Longitude
- Time and Date
- Declared Fire Danger Rating at the time the ignition was discovered
- Nearest street address
- Nearest Pole Identification Number (nearest pole)
- Feeder Identification
- Zone substation for feeder
- Voltage of the line which the ignition occurred

Ideally, the businesses should progress to supplying a photo of each ignition site.

The distribution businesses will arrange for an independent audit of the data for each Financial Year (starting 2016/2017), calculate the IRU value for each ignition and their IRU performance total. The name of the auditor vendor and the date the audit was completed and a statement of outcome will be included in the report. Distribution business directors will sign this report.

The distribution business provide the data, the calculations output and the report electronically to the AER by **30 September 2017** .

6.3.3. Role of Energy Safe Victoria

Ignitions reporting under the preferred f-factor option will be validated by ESV.

By **30September 2017**, the AER will send ESV the f-factor ignitions data for the 2016/17 and subsequent financial years, with calculated IRUs for each ignition and a final IRU total for the respective year, in accordance with the request for a Fire Start Report or Regulatory Impact Notice (RIN) notice issued to the businesses by the AER.

This validation power encompasses checks that information for specific ignitions is correct, individual IRU calculations are correct and that the IRU totals for each financial year are accurate.

In the event of discrepancy for any ignition in the distribution business data, ESV will engage with the relevant business. If required, ESV will refer the issue to AER to request amendment to the data or undertake further action under the powers of the RIN notice.

The ESV will determine if it is satisfied with this amended information and if so will used it that years' f-factor result.

Upon completing this validation, ESV will issue a preliminary report against the IRU benchmarks as set in the f-factor Order-in-Council. The AER will publish the ESV validation of the data, individual ignition and aggregate results by **30 November 2017** on the AER website**.**

The distribution businesses will have a period of **15 days** to respond to this validation.

ESV will provide the AER with the final validation f-factor performance data and results by **15 February 2018**. The AER will publish this report on its website with its determination by **15 February 2018**.

6.3.4. Role of the Australian Energy Regulator

The AER will receive and process f-factor ignitions for 2015 and for 1 January to 30 June 2016 in accordance with the process for the f-factor contribution to revenue determination adjustments under the current scheme.

Under the revised scheme, the AER will issue a request for a Fire Start Report or a RIN notice to the distribution businesses to supply ignitions data for each financial year.

This request or RIN notice will commence retrospectively for the 2016/2017 financial year.

This request or RIN notice will require each distribution business to provide ignitions data with all fields specified in section 6.3.2 above. In addition, the request or RIN will obligate each distribution business to calculate the IRU value for each ignition on its network for each financial year, starting with 2016/2017, and calculate its total, aggregate IRU value.

The AER will incorporate three inputs for each distribution business for the f-factor to cover the close of the current scheme and the commencement of the proposed one. These are as follows:

- the 2015 calendar year will be factored into the 2017 determination according to the standing arrangements under the current Order-in-Council by **30 September 2017**;
- the 1 January to 30 June 2016 performance outputs for each business will be assessed by the AER against a seasonally-adjusted benchmark and will be factored into the 2018 price determination by **30 September 2018**;
- the 2016 / 2017 financial year performance outputs for each business will be factored into the 2019 price determination by **30 September 2019**.

Pass through amounts from performance determinations for each distribution business will be determined against the ignitions benchmarks from the 2011 – 2015 EDPR period for 2105 and the first six months of 2016.

Performance for the 2016-17 financial year and under subsequent years of the 2016 – 2020 price review period will be measured against the recalculated Ignition Risk Unit (IRU) benchmarks based on the validation performance output data and IRU totals provided by ESV.

6.4. Enforcement Powers

The distribution businesses are monopoly businesses regulated by the AER and ESV. As such there is an existing framework requiring reporting and providing the regulators with a range of sanctions and options should the businesses not comply with the schemes fire start reporting requirements.

6.4.1. The powers of the Australian Energy Regulator

As detailed in the previous section, under the preferred option, annual f-factor economic determinations will continue to be made by the AER from the information it requests through its RIN or other request measures, validated by ESV.

The oversight of the costs to use the distribution network which businesses pass on to Victorian consumers is the responsibility of the AER which is a part of the Commonwealth Australian Competition and Consumer Commission (ACCC). The AER is empowered as the Economic Regulator under Section 15 of the *National Electricity Law (NEL)*, in the *National Electricity (South Australia) Act 1996*.

The *NEL* empowers the AER to compel the businesses to evidence they are operating prudently and efficiently. This information pertains to:

- projected demand for electricity;
- age of infrastructure;
- operating and financial costs; and
- network reliability and safety standards.

This information can be requested by the AER through several mechanisms including Regulatory Information Notices or calls for submissions to 5-yearly EDPR reviews.

Section 5 of the *f-factor Scheme Order 2011 Order in Council* [under Section 16C of the *NEVA 2005*] imposes an obligation on the businesses to report fire starts for the previous year upon annual request by the AER and be in the form specified by the AER. The AER is obliged to publish a Fire Start Report under this section.

Failure to comply completely and accurately with these information requests carries penalties on businesses. Non-compliance is subject to civil penalties - up to $100,000 per breach, and $10,000 per day of continuing breach. This is covered directly under Section 16E of the *NEVA* and by adherence to a determination decision, covered under Section 14B of the *NEL*.

6.4.2. Energy Safe Victoria's powers

The Director of ESV has sufficient powers to allow ESV validated ignitions data and the IRU performance results calculated by the businesses under the proposed f-factor.

Energy Safe Victoria is empowered by the *Electricity Safety Act 1998*, the *Energy Safe Victoria Act 2005* and associated regulations to oversight the safe operation of Victoria's electricity distribution network. ESV has wide ranging powers to compel the businesses to report on the operation of their networks in line with this legislation, to undertake investigations. A validation role for ESV on the f-factor compliments these powers.

In more detail, section 100 of the *ESA* provides ESV powers to compel businesses to independently validate Electricity Safety Management Schemes which they submit to ESV. Under Section 113 A of the *ESA*, distribution businesses are compelled to provide ESV with Bushfire Mitigation Plans. *Electricity Safety (Bushfire Mitigation) Regulations 2013* describes what is required to be in these plans, businesses must indicate operations and maintenance arrangements they intend to undertake in order to manage the bushfire danger presented by their networks, specifying amongst other things: treatment of "at risk" electric lines differentiated by (after a fire, during a Total Fire Ban day, during the fire danger period) and the network in which the BMP applies, plan of inspection with maximum time intervals, standards of training for inspectors, and monitoring and review arrangements for the plan. Failure to provide a BMP is an offence under Section 83BA of the *Electricity Safety Act 1998*, failure to comply with a BMP is an offence under Section 113 B of the *Electricity Safety Act 1998*. ESV has a power of validation and acceptance of BMPs under Section 113C of the *ESA*.

The businesses are also compelled to comply with vegetation clearance requirements around electrical line to reduce the bushfire risk through the *Electricity Safety (Electric Line Clearance Regulations) 2015*.

Energy Safe Victoria issues Distribution Business Electrical Safety Performance Reporting Guidelines to assist businesses to report on ignitions on their networks. Though not binding, businesses have been reporting against these guidelines.

7. Evaluation Strategy

The proposed revised version of the f-factor that will apply from 1 July 2016 differs in a number of fundamental ways from the existing scheme.

Figure 7.1: Differences between current and proposed revised f-factor

Existing scheme (to 2016)	Proposed future scheme (from 2016)
Every fire start is treated as **equal**	Each fire start is treated **differently** due to the unique bushfire risk profile of each
Annual benchmark for fire starts is **static**	Annual benchmark for fire starts is **variable**, reducing periodically as new safety measures are introduced
Expected reduction in fire starts each year **is not estimated**	Expected reduction in fire starts each year **can be estimated**, based on known deployment schedule for new safer technology and an empirical understanding of fault detection properties of each technology
Fire start reporting **does not record** the location of fire starts with a high degree of accuracy	Fire start reporting **does record** the location of fire starts with a high degree of accuracy

The **objective** of the evaluation strategy is to monitor the extent to which the scheme in its new form is both:

- functioning to drive capital investments and operational practices commensurate with enhanced powerline bushfire safety; and
- efficient in its application.

The evaluation strategy will therefore place its primary focus upon the change elements in the scheme and seek to establish how effectively these changes are contributing towards the enhanced powerline safety outcomes that are sought on behalf of the Victorian community.

In order for the f-factor to operate to maximum effect, it will be necessary for:

1) new protection technologies to be **deployed** in the numbers, at the locations and by the dates specified by the government;
2) new protection technologies to **work as expected** in operation;
3) distribution business **fire start reporting** to conform to published standards;
4) the **benchmark targets and annual target decrements** to be equitable, balancing reasonable community and industry expectations, considering:
    a. the performance of the **technology**;
    b. the **fire start** outcomes; and
    c. **external impacts on fire starts** beyond the control of distribution businesses;
5) the **financial impact on consumers** to be negligible, tending towards a cost-neutral result over the years of implementation; and
6) the scheme to elicit a high degree of **support and acceptance from key stakeholders** (industry, regulators, the community and their representatives).

It is these seven elements that provide the subject for evaluation monitoring.

7.1. Evaluation Summary

A more detailed explanation of the subject of the evaluation is provided in tabular form below.

Figure 7.2: Evaluation Activities, Measures and Timings

Subject of Evaluation	Purpose	Measures	Proposed Timing
1 **Deployment**	To confirm that distribution businesses have deployed new safer technologies in the numbers and at the locations published in their respective annual Bushfire Mitigation Plans (BMP).	a Number and location of Rapid Earth Fault Current Limiters (REFCL) deployed compared to BMP commitment.	Annually
2 **Technology in operation**	To establish that technology reduces the likelihood of ignition to the level originally estimated, and where there are differences to establish whether the differences are linked to the: ▪ performance of the technology; or ▪ operation of the technology.	a Analysis of ground to earth faults by cause on REFCL protected 22kV.	Annually
3 **Fire start reporting**	To confirm that the requirements for fire start reporting are being met and to fully enumerate fire starts.	a Number of fire starts by DB, day, declared fire danger rating, powerline type, and location.	Each fire reported within as per requirements Data analysed annually
		b Number of fire starts for which the published reporting standards were not met and the reasons for non-compliance.	Ongoing review of individual fire start records Annually

Subject of Evaluation	Purpose	Measures	Proposed Timing
4 **Benchmark settings**	To test whether the initial benchmark settings and the annual decrements of the benchmark are fair and reasonable.	a Review of benchmark settings (and the annual adjustment) taking into account new information about the technology in operation and the fire start history.	Every five years at end of EDPR period or earlier if required
		b Analysis of fire start causes to inform potential adjustments to the scheme that best direct industry focus to the ignition risks most within their control.	Every five years at end of EDPR period
5 **Consumer costs**	**To assess the extent to which (if at all) industry compliance with the scheme is resulting in additional costs being imposed on electricity consumers.**	a Identify the costs relating to enhanced powerline safety assets required under the regulations that have been passed on to consumers (i.e. approved by the Australian Energy Regulator)	Annually
		b Quantify any costs associated with f-factor compliance that have been passed on to consumers (i.e. approved by the Australian Energy Regulator)	Annually

Subject of Evaluation	Purpose	Measures	Proposed Timing
6 **Reliability Impacts**	**To assess the extent to which (if at all) reliability impacts change after the scheme is introduced.**	a Monitor changes in reliability levels	Annually
7 **Stakeholder acceptance**	To verify that the scheme is effective in its application and supported by the key agents of implementation.	a Qualitative review of the scheme – Energy Safe Victoria	Annually
		b Qualitative review of the scheme – Australian Energy Regulator	Annually
		c Qualitative review of the scheme – Distribution businesses	Annually

8. Consultation Undertaken

The Department of Environment, Land, Water and Planning consulted with the following organisations in the preparation of the methodology and design of the revised f-factor.

Regulators:

- Australian Energy Regulator (AER)
- Energy Safe Victoria (ESV)

The Department has undertaken consultation with both the economic and safety regulators during 2015 and 2016. These consultations have covered the structure of the proposed revisions to the f-factor and on the roles and responsibilities each regulator will have to administer the scheme, including the division of data collection and IRU calculation by ESV and the determination of revenue adjustment by the AER in line with the national regulatory framework and Victorian derogations.

Distribution Network Service Providers:

- AusNet Services Ltd
- CitiPower / Powercor Australia Limited
- Jemena
- United Energy

The distribution businesses were consulted in one meeting of the Powerline Bushfire Safety Program Distribution Business Working Group on 2 May 2016, in two dedicated f-factor workshops on 18 May and 2 June 2016. A separate meeting was held with AusNet Services on 30 May 2016 and another meeting with Powercor on 1 June 2016. The businesses provided detailed feedback and updated ignitions data with great geolocation specificity.

Other consultation:

The Department also undertook consultation with the Office for Better Practice Regulation (OCPR) in the preparation of the Regulatory Impact Statement for the amendments to the f-factor Order-In-Council.

9. Glossary

ACCC	Australian Competition and Consumer Commission.
ACR	Automatic Circuit Recloser. A network safety device instrumental in reducing bushfire risk.
AER	Australian Energy Regulator. The national economic regulator for the energy sector.
BMP	Bushfire Mitigation Plan
DELWP	Department of Environment, Land, Water and Planning
EDPR	Electricity Distribution Price Review. The five-yearly process which determines costs which electricity distributors can recover from consumers.
ESC	Essential Services Commission. Victoria's independent economic regulator of prescribed essential utility services.
ESV	Energy Safe Victoria. The energy safety regulator.
GSL	Guaranteed Service Level (Payment Scheme)
HBRA	High Bushfire Risk Area.
IRU	Ignition Risk Unit.
kV	Kilovolt. A thousand volts. A measure of electrical potential difference.
LBRA	Low Bushfire Risk Area.
MAIFI	Momentary Average Interruption Frequency Index. A measure of electricity supply reliability concerned with the number of momentary (brief) interruptions an average customer would experience in a given period of time.
NEVA	National Electricity (Victoria) Act 2005
OCBR	Office of the Commissioner for Better Regulation.
PBSP	Powerline Bushfire Safety Program. The Government program tasked with delivery of VBRC recommendations 27 and 32.
PBST	Powerline Bushfire Safety Taskforce.
PV	Present Value. A means of expressing the value of future costs and benefits in today's terms.
REFCL	Rapid Earth Fault Current Limiter. A network safety device instrumental in reducing bushfire risk and improving reliability.
RAB	Regulated Asset Base. The assets of electricity distribution businesses, which form the major feature in determining the revenue they are allowed to recover from customers.
RIS	Regulatory Impact Statement
SAIDI	System average interruption duration index. A measure of electricity supply reliability concerned with how long supply is interrupted.
SAIFI	System average interruption frequency index. A measure of electricity supply reliability concerned with how often supply is interrupted.
SBRP	Specified Bushfire Risk Period.
SECV	State Electricity Commission of Victoria
STPIS	Service Target Performance Incentive Scheme. An incentive scheme for businesses to maintain or improve customer reliability.
SWER	Single wire earth return. A low-cost form of powerline construction which features a single phase at 12.7 kV, commonly used in rural areas.
VBRC	Victorian Bushfires Royal Commission.
VCR	Value of customer reliability. An estimate of the value customers place on a megawatt hour (MWh) of electricity, for the purpose of informing reliability incentive targets.
ZSS	Zone substation. A major point of voltage and current transformation on the electricity distribution network.

10. Document Information

This Regulatory Impact Statement was drafted by the Powerline Bushfire Safety Program, Energy Policy and Programs Branch, Department of Environment, Land, Water and Planning.

The document structure has been adopted consistent with the *Victorian Government Guide to Regulation*, July 2014.

Citations have been drafted consistent with the *Australian Guide to Legal Citation, Third Edition*.

Appendix 1 – Background

Victorian Electricity Distribution Network

For most of the 20th Century Victoria's electricity supply was a State-owned, vertically-integrated monopoly run by the State Electricity Commission of Victoria (SECV). In the 1990s the State Government divested itself of these assets. Thereafter electricity supply was to comprise four separate industries:

Generation refers to power plants which generate electricity either through combustion of fossil fuels (coal, gas); or the use of renewable resources (wind, hydro, solar).

Transmission refers to the movement of this power on large powerlines across the state, at very high voltages (500, 330 or 220 kilovolts). It is taken to a limited number of network locations (terminal stations), for conversion to lower voltages.

Distribution refers to that portion of the supply network stemming from terminal stations and ending with individual customers. At a terminal station sub-transmission voltage (66kV) is taken to a number of network locations ('zone substations') to be converted to a lower voltage (22kV), and distributed on individual *feeders*. Feeders then radiate outward, with further transformation to low voltage to service individual customers[33].

The **retailer's** responsibility is to maintain the billing interface between the industry and individual customers.

This document concerns itself purely with the distribution sector.

Extent of Distribution Assets

The distribution sector is comprised of powerlines delivering electricity at voltages of 66 kilovolts (kV) or less. A total of five business operate distribution infrastructure within Victoria as shown below:

Figure A1.1: Evaluation Activities, Measures and Timings[34]

Company	Circuit km
AusNet	43,822
Citipower	4,318
Jemena	6,135
Powercor	73,889
United Energy	12,837
Total	**141,001[35]**

[33] Low voltage is defined as any voltage under 1,000 volts. See *ANZ Standard 3000*. In Australia low voltage principally comprises voltage of 415 phase-to-phase, or 240 phase-to-ground. As the majority of customers are supplied by single phase power 240 volts is the voltage supplying most customers. A small number of customers are however supplied with low voltage 3 phase power; an even smaller number are supplied with 22kV power.

[34] This table includes both High Voltage and Low Voltage powerlines.

[35] Australian Energy Regulator, *State of the Energy Market* (2014) 67

The geographic distribution of these businesses is shown below:

Figure A1.2: Electricity Distribution Areas

These businesses are subject to economic regulatory oversight as described below.

Economic Regulatory Framework

Electricity Distribution Network Service Providers are natural monopolies. To ensure consumers enjoy efficient costs, these businesses are subject to an economic regulatory framework. This framework is comprised principally of Chapter 6 of the *National Electricity Rules* (*NER*).

The NER are made pursuant to the *National Electricity Law* (*NEL*). The *NEL* relies on template legislation in each participating state. This structure has been adopted to create uniformity in an industry which is principally governed by state law under the constitution. The *NER* are administered by the Australian Energy Regulator (AER).

The *NER* divides the services provided by electricity distribution businesses into two categories: *direct control* and *negotiated services*.

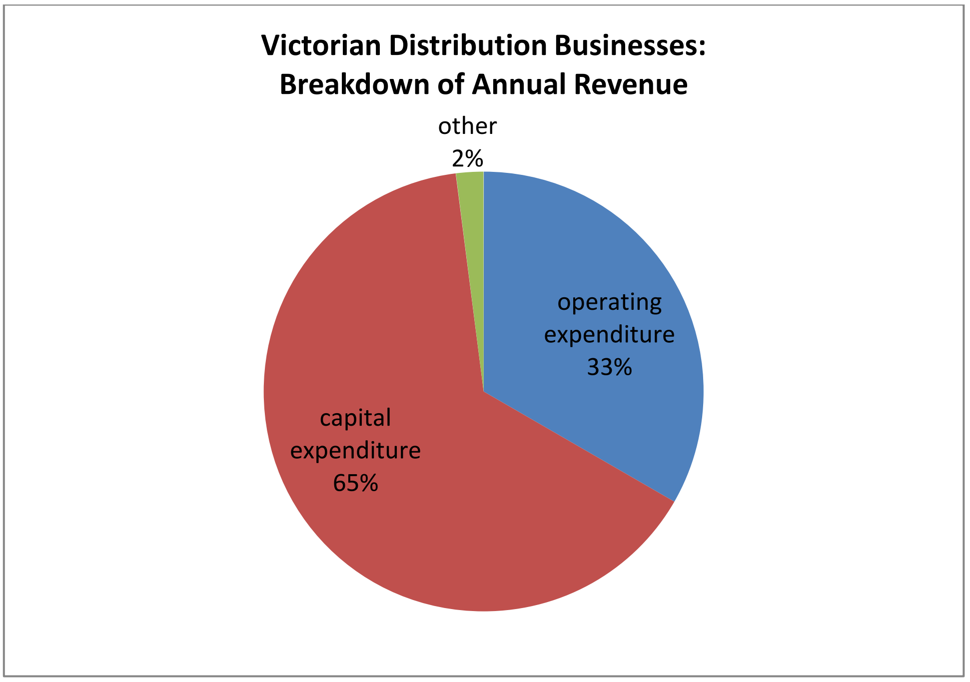
Direct control network services are those which are provided to captive monopoly customers, and consequently must be regulated by the AER. This regulation takes the form of a *distribution determination*. This is the form of service of relevance to this document.

A distribution determination sets the amount of revenue a given Distribution Network Service Provider can recover from its customers through distribution tariffs. These tariffs form a component of a customer's final electricity bill.

The process whereby this occurs is an Electricity Distribution Price Review (EDPR). EDPRs take place every five years, and determine the amount of revenue (the 'revenue cap') which Distribution Network Service Providers are entitled to recover from customers for direct control services.

The businesses' costs broadly encompass operational expenditure and capital expenditure. Capital expenditure includes return on capital and depreciation of the regulated asset base, or RAB. This comprises the greater portion of a business' annual revenue, as shown below:[36]

Figure A1.3: Breakdown of distribution business revenue



Approximately one year prior to the commencement of an EDPR, each Distribution Network Service Provider makes a submission to the AER seeking a quantum of recoverable revenue for the next five-year period. The submission justifies this revenue requirement based on the business' claim for what reasonable costs it will incur to run its business. Such cost claims include compliance with any regulatory requirements (such as safety).

The AER scrutinises these claims, ascertains what the efficient costs of running such a business are, and makes a determination as to what the business' revenue cap will be for the next five years[37]. The assessment of costs includes efficient costs of compliance with regulatory obligations.

In addition to the revenue allowances described above, the economic regulatory framework creates two classes of incentive mechanisms – the first focusses on economic efficiency; the second on reliability of power supply. These are discussed below.

Economic Incentive Mechanisms

The NER establishes mechanisms designed to incentivise businesses to provide network services at lowest cost. If businesses provide services at a lower cost than forecast, they are allowed to keep the difference for the duration of the five-year EDPR. Conversely, if a business overspends,

[36] Australian Energy Regulator. *Consumer guide to Victorian electricity distribution pricing review*, 2016-20 (May 2015) 13

[37] Ibid 3

it will be penalised for the duration of the EDPR period by not being compensated for any overspends.[38]

Reliability Incentive Mechanisms

Under the *NER*, the AER is required to develop and publish a Service Target Performance Incentive Scheme (STPIS).[39] The STPIS rewards businesses for improving service quality relative to historic averages (the previous five financial years). Service quality includes reliability of supply, quality of supply, customer service and guaranteed service levels, or GSL[40]. Of these, reliability of supply and GSL are material to this discussion.

Reliability of supply refers to average reliability. It employs such measures as:

- system average interruption frequency index (SAIFI);
- system average interruption duration index (SAIDI); and
- momentary average interruption frequency index (MAIFI).

Differences between a given year's performance and the five-year historic average are calculated annually, and multiplied by the value of customer reliability (VCR) to produce a dollar figure. Where a business' performance exceeds the historic benchmark, it gains a financial increment; where the performance is less than the benchmark, it experiences a financial decrement. It should also be noted that major events may be excluded from the calculation of performance. As businesses accrue financial gains equal to losses over time under this approach, this forms a *symmetric* incentive scheme.

GSL payments are payments made to individual customers who receive a level of service calculated to be worse than a threshold set by the Essential Services Commission through the *Electricity Distribution Code*. [41] GSL payments address the risk that, if averages alone are used to incentivise business, they may choose to disregard a small number of customers with very poor reliability, as small customer numbers will not significantly affect averages. Distribution Network Service Providers are allowed to earn additional revenue to cover the expected cost of payments made under the GSL Payment Scheme. These are estimated at $11.2 million per annum over the 2016-20 regulatory control period. As businesses will only ever experience a financial loss through such an approach, it comprises an *asymmetric* incentive scheme.[42]

The overall effect of the STPIS is, *inter alia*, to encourage businesses to minimise both the frequency, and duration, of supply interruptions. The effect of the incentive is non-trivial. The

[38] Ibid 16

[39] *National Electricity Rules*, Chapter 6.6.2 (version 76) 684

[40] Australian Energy Regulator, *Electricity distribution network service providers: Service target performance incentive scheme* (2008) 5

[41] Essential Services Commission, *Review of the Victorian Electricity Distributors' Guaranteed Service Level Payment Scheme: Draft Decision* (2015) 5

[42] Essential Services Commission, *Review of the Victorian Electricity Distributors' Guaranteed Service Level Payment Scheme: Final Decision* (2015) 75

amount of revenue at risk is potentially as much as 5 per cent of a business' annual allowable revenue.[43]

Historically the quantum of money which businesses receive, or pay, has been as much as $47 million in a single year (all figures $ millions, nominal) for a single business:

Figure A1.4: STPIS: Increments and Decrements by distribution business, 2006-13

Year	AusNet	Jemena	Powercor	United Energy
2006	2.49	0.96	18.66	0.61
2007	7.37	-0.43	16.25	-1.47
2008	-5.40	0.0	11.94	0.0
2009	-8.48	-0.22	13.15	-9.0
2010	47.56	4.84	9.40	4.05
2011	0.0	-0.27	-6.97	0.0
2012	0.0	-0.29	-7.22	0.0
2013	15.42	8.19	5.65	5.02

The majority of these increments and decrements are associated with power supply reliability – illustrating the extent to which businesses are incentivised to minimise supply disruption.[44]

Safety Regulatory Framework

The *Electricity Safety Act 1998 (Vic)* is the primary instrument which imposes safety obligations on Distribution Network Service Providers. It is administered by Energy Safe Victoria (ESV).

Division 1A of the Act places requirements on electricity distribution businesses in respect of bushfire. This section of the Act specifies general duties as well as creating obligations in respect of Bushfire Mitigation Plans (BMPs). In particular, a specified operator of an at-risk electric line is required to:

- submit a bushfire mitigation plan (BMP) to the regulator (Energy Safe Victoria, or ESV) for approval; and
- comply with the BMP.

The maximum penalties for non-compliance are defined in the Act as being 1,500 penalty units (equating to $227,505 at the 2016 penalty unit rate of $151.67).

The use of BMPs seeks to address the significant information asymmetry between electricity distribution businesses and the Government. The Government is often in a poor position to prescribe in detail the means whereby geographically extensive, technically complex and dynamic networks should best be constructed and operated so as to minimise bushfire risk. By requiring businesses to write their own BMPs – in pursuit of a broadly-framed bushfire safety objective – it is intended that the party best-placed to specify detailed actions in pursuit of this objective will do so. The regulator (ESV) can then validate compliance.

[43] Australian Energy Regulator, *Preliminary decision – Powercor distribution determination – Attachment 11 – STPIS (October 2015)* 12; also Jemena distribution determination – Attachment 11 (October 2015), 8; AusNet distribution determination – Attachment 11 (October 2015) 12
[44] Australian Energy Regulator, *2006-13 Economic Benchmarking RIN – financial and non-financial information*

The approach obligates electricity distribution businesses to perform a bushfire risk assessment on a regular basis, and identify mitigants. It also provides ESV with an instrument which lends itself to compliance validating. ESV then publishes the results for each business in its annual safety performance report.

Electricity Distribution Sector and Bushfires

Victoria is one of the most bushfire-prone regions of the world. This is due to its geography, which promotes seasonal growth of vegetation, followed by brief periods of intense, dry heat in summer which 'cures' this vegetation. In conditions of abundant fuel, high temperatures, low humidity and high winds, a small spark can quickly grow to a conflagration which is essentially unstoppable.

Electricity infrastructure has been linked to deadly bushfires in four years: 1969, 1977, 1983 and 2009. Electricity was not widely present in the Victorian landscape before the State Electricity Commission of Victoria's (SECV) rural electrification program was completed in the 1960s, and consequently has only been a factor in bushfire ignition since that time.

Inquiries were conducted in the wake of the catastrophic bushfires in these years, which showed the link to electricity assets. In general, however, data collection on bushfires and their causes has been poor until recently. For the period for which consistent and reliable data are available, electricity assets have caused an average of 793 fires per annum, as illustrated below[45]:

Figure A1.5: Distribution network fire starts

Year	2012	2013	2014	2015	Average
Fire starts	638	925	974	635	793

These figures represent all fires in both urban and rural locations, not all of which have the potential to subsequently evolve into bushfires. However, in high risk conditions (defined by weather and ground fuel), certain fires have the potential to evolve into bushfires. Further, among those high consequence bushfires (i.e. those which cause fatalities), electricity assets are disproportionately represented as a cause[46].

Actions Taken to Reduce Bushfire Risk

The VBRC recommended eight separate actions be undertaken to reduce powerline bushfire risk in the future. Five of these comprise regulatory obligations imposed on electricity distribution businesses:

[45] Australian Energy Regulator, *Draft determination and explanatory statement: f-factor amount determinations for Victorian electricity distribution network service providers' 2014 fire start outcomes* (June 2015) 3
[46] Victorian Bushfires Royal Commission, *Final Report* (2010) 148-150

Figure A1.6: Victorian Bushfire Recommendation Commission Recommendations

VBRC rec.	Action	Instrument
27	Replace bare-wire 22kV and SWER lines in high bushfire risk areas with technologies which significantly reduce bushfire risk	*Electricity Safety (Bushfire Mitigation) Regulations*
28	Asset inspection at three-yearly intervals	*Electricity Safety (Bushfire Mitigation) Regulations*
29	Enhanced training for asset inspectors	*Electricity Safety (Bushfire Mitigation) Regulations*
30	Address hazard trees (large trees outside the easement which may come into contact with the powerline)	*Electricity Safety Act section 86 B*
32	Enhance safety settings on automatic circuit reclosers	ESV directions; information-based
33	Fit spreaders to any lines with a history of clashing or a potential to do so; Fit dampers to any span greater than 300 metres	ESV directions

Of these recommendations, all except Recommendation 27 were fully actioned by Government during the 2010-2015 EDPR. This resulted in cost pass through applications being made by AusNet Services.

The implementation of Recommendation 27 is taking place through two mechanisms: an on-budget allocation of $200 million (nominal, 2013-2022) under the Powerline Replacement Fund (PRF); and the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016*. The regulatory cost estimates for the Recommendation 27 obligations total $389 million ($2015) across three businesses and is being implemented through the Victorian Government's Powerline Bushfire Safety Program (PBSP).[47] As at May 2016, a final AER determination of these costs is pending.

These costs of meeting bushfire requirements to date are described below:

Figure A1.7: AER determination of PBSP costs

AER approved costs ($ 2012)	On-budget costs (nominal 2013-2022)	Expected future costs ($ 2015)
$46.35 m[48]	$200 m	$389 m

Approximately 99 per cent of these costs are capital expenditure rather than operational expenditure. The relevance of this split is examined in Section 1.

[47] Acil Allen, *Regulatory Impact Statement, Bushfire Mitigation Regulations Amendment* (17 November 2015) 1-2

[48] Australian Energy Regulator, *Final Decision: AusNet cost past through application of 12 December 2011 for Cost arising from the Victorian Bushfire Royal Commission* (Oct 2012) 3; Australian Energy Regulator, *Final Decision: AusNet cost past through application of 12 December 2011 for Cost arising from the Victorian Bushfire Royal Commission* (Oct 2012) 3

Appendix 2 – IRU Methodology

The f-factor scheme is being enhanced to better align the incentive available to the Distribution Businesses (DBs) with the community benefit achieved through a reduction in fire starts.

The redesign of the f-factor scheme is intended to remove an imbalance in the current scheme, which treats every ignition on a powerline as having equal weight.

The revised f-factor scheme will assign:

- greater weight to ignitions associated with heightened bushfire risk; and
- lesser weight to ignitions associated with lower bushfire risk.

Future ignitions will not be quantified as raw ignition counts but expressed as Ignition Risk Units (IRU) that reflect the assigned risk weightings described in this appendix.

This amendment to the scheme is designed to encourage DBs to direct the resources they have allocated for bushfire safety purposes to the most significant risk hazards. By doing so, the greatest possible bushfire safety benefit can be delivered to the Victorian Community.

This appendix describes the methodology and proposed settings for a revised f-factor scheme.

The f-factor methodology has been developed to conform to the following **design principles**.

Figure A2.1 Distribution network fire starts

1. An ignition benchmark target is to be set for each DB based on powerline ignition history.
2. The benchmark is to be calculated on the basis of a weighted value for each historic ignition, consistent with the key bushfire risk factors.
3. The f-factor scheme is to be symmetrical, designed to be cost neutral over time.
4. The unit penalty rate is to be set at a level that will not unduly place financial burden on consumers or DBs over a five year period as a consequence of variations in weather.
5. Consumers should not pay more than once for a safety benefit, with the benchmark to be reduced over time in line with the introduction of any new network safety infrastructure.

The methodology is founded upon data driven modelling, which utilises:

- the ignition records of DBs for the three years from 2012 to 2014, released by the Australian Energy Regulator (AER);
- estimates of fire loss consequence (i.e. property losses) for 2014-15, drawn from Phoenix Rapidfire® using the bushfire modelling work of Dr. Kevin Tolhurst;
- Country Fire Authority (CFA) data on Total Fire Ban (TFB) day declarations since 1945 and the historical daily fire danger ratings;
- the powerline bushfire Risk Reduction Model (RRM) developed for the government by the Commonwealth Scientific and Research organisation (CSIRO), which quantifies the likelihood of ignitions on each part of the electricity distribution network under different weather and environmental conditions; and
- the government's stated requirements for the installation of safer network infrastructure from 2016, under the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016*.

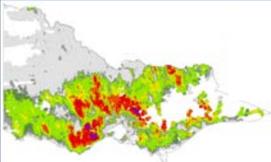
Using these data sources and a range of research analyses, the form of the revised f-factor has been progressively developed over 8 sequential steps. This is illustrated overleaf in **Figure A2:2.**

Figure A2:2: Key steps in the IRU methodology underpinning the revised f-factor design

DEFINE RISK PARAMETERS

1 Identify key bushfire risk factors

Geography – Locational risk factors



Time – Climatic risk factors

2 Classify and weight bushfire risk factors

Geography

Category	Weight
Low	0.2
High	1.0
Severe	4.6
Extreme	19.8

Time

Category	Weight
No forecast	0.1
Low-moderate	0.2
High	0.5
Very high	1.0
Severe	2.0
Extreme	3.5
Code Red	5.0

SET RISK BASELINE

3 Review powerline ignition history

Distribution Businesses reported **3,171** powerline ignitions to the Australian Energy Regulator (2012 to 2015)

4 Rate each historical ignition based on risk factor weightings

G x T

Every historical ignition calculated in **Ignition Risk Units** (range 0.02 – 99.0)

5 Calculate an annual ignition baseline based on Ignition Risk Units

$\sum$ (G x T) = 3,004 IRUs

÷ 4

Annual average IRU level for ignitions: 751 IRUs

SET PRICING PARAMETERS

6 Sensitivity testing - how IRU levels change under different weather scenarios?

As 2012, 2013 and 2014 weather conditions may not be representative of future years, apply statistical techniques to estimate the range of "expected" IRU levels for years experiencing:

Relatively cool conditions vs. Typical conditions vs. Relatively hot conditions

$10k $30k $50k

7 Sensitivity testing - how scale of price adjustments vary under alternate penalty rates?

Consider impacts of an IRU based scheme on electricity pricing at different penalty rate levels

REDUCE RISK BASELINE

8 Adjust annual IRU baseline for each DB to reflect integration of safer network infrastructure

The likelihood of powerline ignitions will reduce through the introduction of safer network infrastructure paid for by consumers.

The IRU baseline level for each DB will be reduced incrementally in line with regulatory obligations to install: 45 REFCLs

Through the application of this methodology, four primary inputs to/settings for the f-factor scheme have been defined:

A. Identification of the **key bushfire risk factors**, the classification of these factors and the weightings to apply;

B. The expression of individual ignitions and annual benchmarks in **Ignition Risk Units** in place of raw ignition counts;

C. Setting the **dollar value of an IRU** to make the f-factor relatively robust to future weather variations (both milder and hotter than average); and

D. Parameters for the periodic decrementing of the IRU benchmark for each DB, in line with their regulatory obligation to install and operate safer network assets.

The remainder of this appendix describes each of these constituent elements of the revised f-factor scheme, and their derivation, in greater detail.

A. Defining the risk parameters

The f-factor scheme in its current form is considered sub-optimal as an incentive for prioritising powerline bushfire mitigation activity as it makes no account for the key factors that define heightened risk exposure.

The community and industry would appear to share an unambiguous appreciation of the primary determinants of bushfire risk. Planning in both emergency management and electricity distribution domains recognise that bushfire risk is greatest:

- in locations having particular environmental features and conditions; and
- under certain weather conditions, the worst of which occur at particular times of year.

That is, bushfire risk has a **spatial** dimension and a **temporal** dimension.

Bushfire prevention and response planning is location specific and strategies are tailored in response to local environmental considerations. Furthermore, codified controls on behaviour are imposed on people on days and in places where the weather conditions are held to pose increased fire danger.

The community's obligations with respect to bushfires apply at the broadest level to cover bushfires originating from any source, whether a powerline, lightning, arson or any other cause.

In preparing policy for bushfire safety with regard to powerlines, as is occurring with these revisions to the f-factor scheme, the framework adopted should be consistent with the broader community expectations and standards relevant to bushfire safety.

The f-factor is accordingly being redesigned in a way that is sensitive to the spatial and temporal dimensions of bushfire risk.

Geographic risk

The IRU methodology recognises four different categories of geography, each of which is associated with a different level of risk.

These **geographic risk categories** are:

1. Low;
2. High;
3. Severe; and
4. Extreme.

Every pole and length of powerline in the electricity distribution network is able to be aligned with only one category. This is to ensure that a future ignition occurring on the electricity distribution network can be assigned to a single geographic risk category.

These categories collectively cover the entire State, irrespective of whether or not powerlines are currently present in a location. In this sense, the geographic classification of risk conforms to the broadest notion of locational risk and is also flexible to future network changes.

Framework for geographic classification

The *Electricity Safety Act 1998* provides for a fire control authority to:

> 'assign a fire hazard rating of "low" or "high" to any area of land for the purposes of this Act or the regulations'[49]

The Country Fire Authority (CFA) has identified:

> *"low and hazardous bushfire risk areas for the Electricity Safety (Electric Line Clearance) Regulations 2010, Electricity Safety (Installations) Regulations 2009 and Electricity Safety (Bushfire Mitigation) Regulations 2003."*[50]

The division of Victoria into low bushfire risk areas (LBRA) and hazardous bushfire risk areas (HBRA) provides the foundation for the geographic classification underpinning the IRU methodology.

In 2010, the Victorian Government accepted the 67 Recommendations of the Victorian Bushfires Royal Commission (VBRC), eight of which relate to reducing the bushfire risk posed by powerlines. VBRC Recommendation 27 requires the introduction of safer powerlines and safer network protection devices. These measures are required to target areas of "highest" bushfire risk.

The Government's Powerline Bushfire Safety Program (PBSP) has used bushfire modelling and mapping expertise in conjunction with the advice of the Emergency Management Commissioner Victoria (the Commissioner) to identify two new categories of geographic priority:

• areas of **extreme** risk (cover 3.9% of distribution network length)	in which heightened standards for powerline installation and replacement will apply
• areas of **severe** risk (cover35.1% of distribution network length)	in which powerlines will be protected through the installation of a new generation of network protection devices.

The requirement for DBs to provide this enhanced level of protection is stipulated in the *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016*.

This provides the IRU methodology with four categories of geographic risk:

1.	**Low**	Includes all areas designated low bushfire risk areas (LBRA).
2.	**High**	Includes areas designated hazardous bushfire risk areas (HBRA) (excluding areas designated Extreme and Severe)
3.	**Severe**	Areas capturing the networks of 45 Zone Substations in which a new standard of network protection must be met over a seven year period (excluding areas designated as LBRA and Extreme)
4.	**Extreme**	Encompassing 33 declared Electric Line Construction areas in which future powerline installation ad replacement work must conform to new standards. (excluding areas designated as LBRA)

This is a hierarchical framework.

- All locations declared to be LBRA are classified as "Low" under the f-factor framework for classifying geographic risk.
- All locations declared to be HBRA are classified as "High" under the f-factor, except where a level of heightened bushfire risk exposure has been defined.

[49] Section 80(a) of the *Electricity Safety Act 1998*
[50] Cited on www.cfa.vic.gov.au/plan-prepare/powerline-vegetation-clearance/

Defining geographic risk priorities

In determining the areas of extreme and severe bushfire risk, an approach was devised to assess the relative bushfire risk of each part of the Victorian electricity distribution network.

For each part of the powerline network three risk elements have been considered:

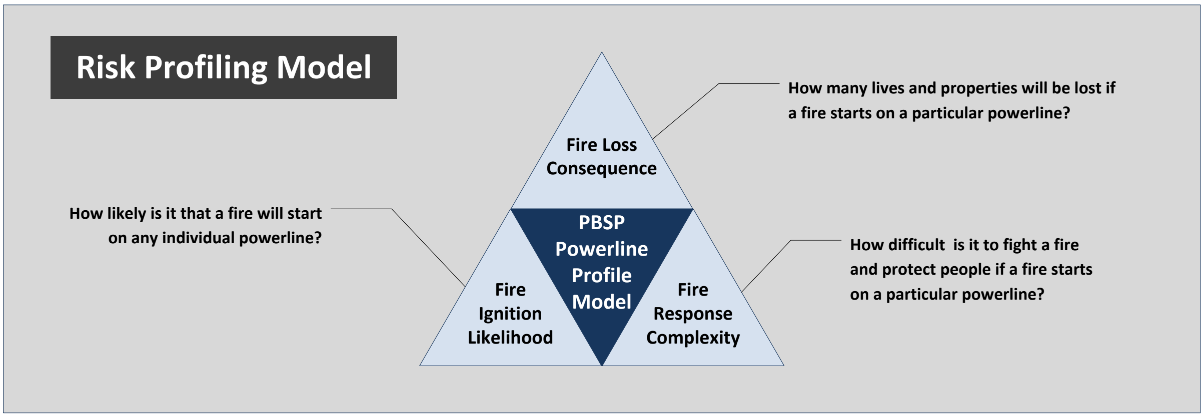
1) **Fire loss consequence**
How many people and houses would be lost, if a fire were to start on a powerline in a particular location?

2) **Ignition likelihood**
How likely is it that a bushfire will start on a particular part of the powerline network?

3) **Fire response complexity**
How readily can the fire be suppressed and people protected, if a bushfire were to start on a particular part of the powerline network?

A high level depiction of the Powerline Risk Profiling model is presented below:

Figure A2.3: Powerline risk profiling model



By integrating data models used to estimate fire loss consequence[51] and ignition likelihood[52], estimates of the relative risk associated with individual powerline assets have been calculated. These models take into account important locational features, such as:

- environmental features (vegetation and terrain); and
- weather conditions (temperature, wind, humidity and dryness of vegetation and soil).

The assessment of the relative bushfire risk associated with a location was further informed by practical "emergency management thinking" and the knowledge of factors such as:

- Location of fire detection and fighting resources;
- Assessment of suppression risk;
- Assessment of evacuation risk; and
- Location of critical infrastructure (e.g. hospitals, bridges).

Data drawn from the Victorian Fire Risk Register (VFRR) was used to support this latter assessment.

[51] Phoenix RapidFire, a fire characteristic mapping model was developed by Dr Kevin Tolhurst and colleagues at the Bushfire Cooperative Research Centre
[52] the Risk Reduction Model (RRM) was developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Spatial representation of geographic risk

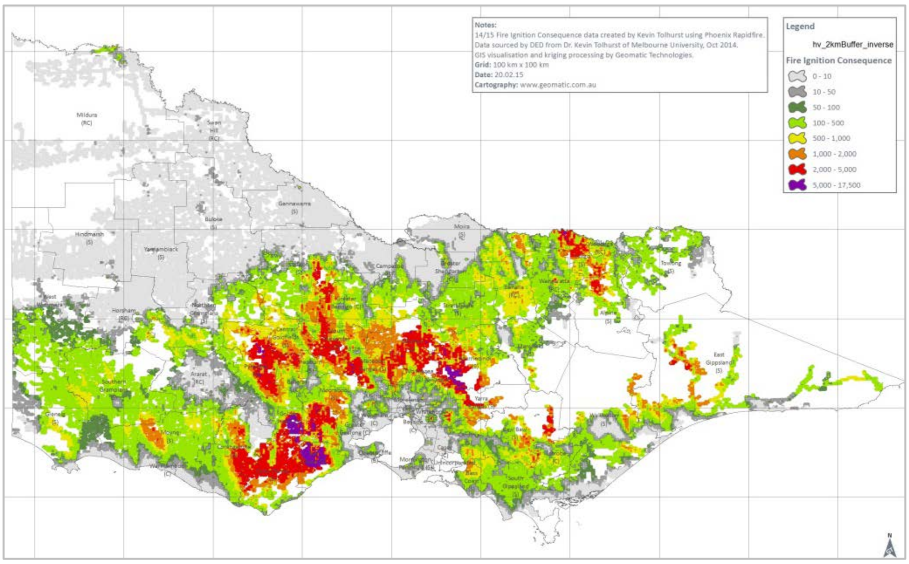
The IRU methodology relies on a capacity to specify the boundaries of each risk level in fine detail. Through the use of Geographic Information System (GIS) software and expertise, the areas associated with all four geographic risk categories can be mapped at a high spatial resolution.

This high degree of geographic specificity is essential to the effective functioning of an f-factor scheme with different geographic priorities.

Figure A2.4: Geographic risk maps

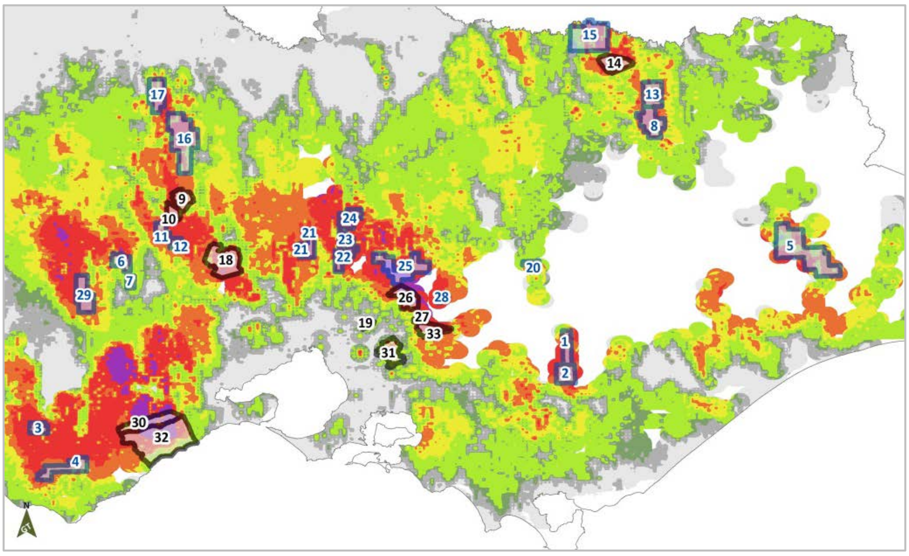
Overall bushfire risk

State-wide powerline bushfire risk is often represented through the map for fire loss consequence for 2014/15[53] (presented on the right), which shows different levels of estimated property loss for fires starting at 27,860 locations proximate to powerlines.



Extreme geographic risk

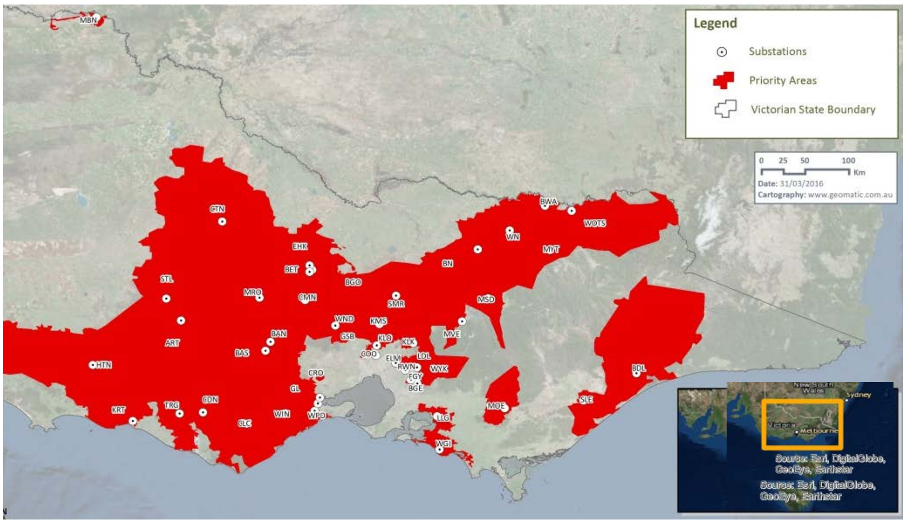
The 33 Electric Line Construction Areas declared in the Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016 are shown to the right, overlayed on the state-wide map for fire loss consequence.



53model 'AN140' - assumes Ash Wednesday conditions and vegetation growth at its worst – Phoenix RapidFire

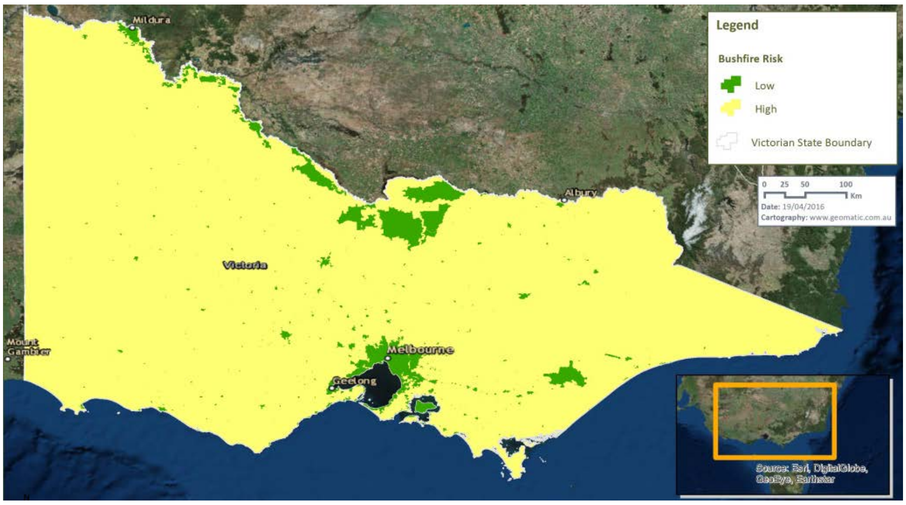
Severe geographic risk

The 45 Zone Substations which are required to achieve an enhanced level of network protection over the next seven years to 2022 are covered by areas represented to the right.



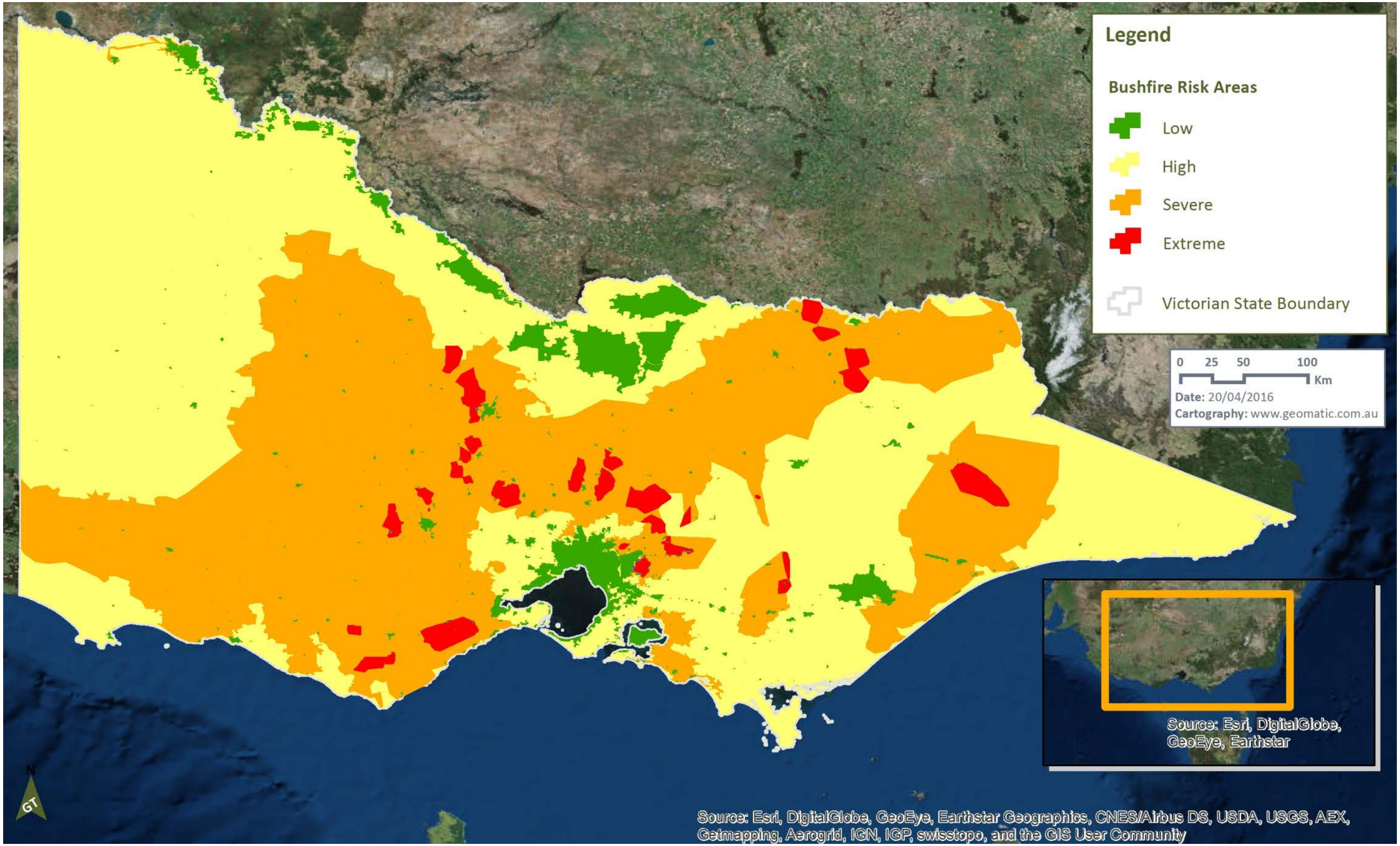
High and low geographic risk

The separation of Victoria intro hazardous bushfire risk areas and low bushfire risk areas is represented in the map to the right.



Bringing these maps together in a way that allocates each part of Victoria to one geographic risk category only, in a hierarchical manner, yields the map presented overleaf.

Figure A2.5: State-wide overlay of geographic risk areas



Rating geographic risk

To support the move to a weighted f-factor scheme it is necessary to quantify the difference in risk between each of the four geographic risk categories.

The Phoenix RapidFire fire behaviour modelling has been used to show that there are large differences in bushfire risk for different parts of the State (as identified by estimates of fire loss consequence associated with house loss).

Assuming a bare-wire powerline configuration (typical of the bulk of the Victorian network), the estimate of fire loss consequence has the most significant influence as a differentiator of geographic risk (consequence x likelihood), as the fire loss consequence point estimates cover a range from zero to over 17,000.

Integrating the estimates for fire loss consequence for 2014/15[54] with the power pole and line data provided by DBs through specialist GIS software, the IRU methodology was used to estimate the relative risk associated with each category of geographic risk.

The table below shows the number of High Voltage (HV) poles across the State that are assigned to each risk category and the average estimated property loss associated with all HV poles in a category.

Figure A2.6: Number of high voltage poles by geographic risk categories

Geographic risk category	Count of High Voltage (HV) Power Poles	Average Fire Loss Consequence per pole (AN 140)
1.Low	194,186	23.9
2. High	165,748	113.9
3. Severe	283,039	523.0
4.Extreme	21,846	2,251.2

HBRA declared locations (associated with the 'high' category) are considered to be the foundation classification for heightened bushfire risk and deemed to be the baseline category.

The high category was allocated a weighing of 1, and all other categories were assigned a weighting based on the ratio of average fire loss consequence per pole for that category relative to the average for the high category. The final calculated weightings are shown below.

Figure A2.7: Geographic category risk weightings

Geographic risk category	Weight
1.Low	0.2
2. High	1.0
3. Severe	4.6
4.Extreme	19.8

These weightings reflect the priority attached to preventing ignitions in these locations.

See Figure A2.8 for an overview of the steps used in calculating geographic risk weightings.

[54] model 'AN140' - assumes Ash Wednesday conditions and vegetation growth at its worst – Phoenix RapidFire

Figure A2.8: Steps used to calculate geographic risk weightings

1 Define the categories of geographic risk

Four categories of geographic risk have been defined.

The *Electricity Safety Act 1998* is used as the foundation, as it provides for low (LBRA) and hazardous bushfire risk areas (HBRA) to be declared.

The Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016 defines parts of HBRA that represent significantly higher bushfire risk.

i	Low	captures powerline infrastructure located in all LBRA declared areas
ii	High	captures powerline infrastructure located in all HBRA declared areas
iii	Severe	captures powerline infrastructure located in 45 targeted Zone Substations
iv	Extreme	captures powerline infrastructure located in 33 targeted electric line construction areas

"High" category excludes areas designated "severe"

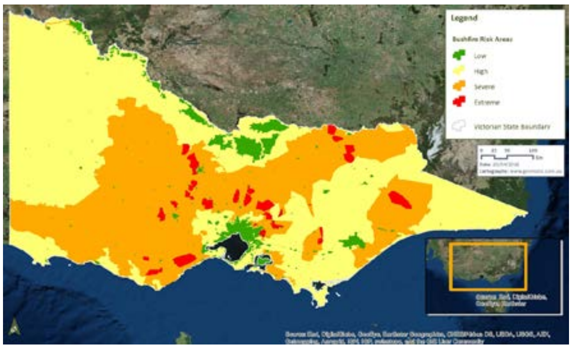
"Severe" category excludes areas designated "extreme"

2 Develop a geo-spatial representation of geographic risk

Define the boundaries to be used for each category of geographic risk

This geographic framework aligns each part of the distribution network (pole and line) to one geographic risk category only.

Through enhanced data capture for fire starts under f-factor, the geographic classification of fires will be straightforward.



3 Quantify bushfire risk by geographic category

Calculate bushfire risk associated with each category of geographic risk

Fire Loss Consequence (FLC) modelling quantifies the estimated house losses for fires starting at 27,860 locations throughout Victoria.

Average house loss (@AN140) per pole was calculated for each of the geographic risk categories.

Geographic Risk Category	No. of Power Poles	Average FLC per Pole (AN140)
Low	194,186	23.9
High	165,748	113.9
Severe	283,039	523.0
Extreme	21,846	2,251.2

4 Select the baseline category

The "High" rating (equating to HBRA) is the establish baseline for defining heightened locational risk.

High

5 Calculate the f-factor weighting for each geographic risk category

The weight for each category is a ratio of the average FLC category value relative to the baseline value

e.g. the weight for category "Low" = 23.9 ÷ 113.9 = 0.2

Geographic Risk Category	Average FLC per Pole (AH140)	Calculation	F-factor Weight
Low	23.9	23.9 ÷ 113.9	0.2
High (baseline)	113.9	113.9 ÷ 113.9	1.0
Severe	523.0	523.0 ÷ 113.9	4.6
Extreme	2,251.2	2,521.2 ÷ 113.9	19.8

Time risk

The IRU methodology recognises seven different categories of time.

These categories represent different levels of risk associated with weather. This risk factor is labelled "time", as the highest risk weather conditions are experienced at particular times of year (summer), as are the lowest risk weather conditions (winter).

The **time risk categories** are:

1. No forecast
2. Low-moderate;
3. High;
4. Very high;
5. Severe;
6. Extreme; and
7. Code Red.

Ratings are forecast using Bureau of Meteorology (BOM) data, based on weather and other environmental conditions such as fuel load.

The BOM provides the fire services with Fire Danger Rating (FDR) calculations from 1 November to 30 April each year. The "No forecast" category covers the period from 1 May to 31 October each year when Fire Danger Ratings are not assigned.

Ratings are assigned separately to each of nine Fire Districts, as are identified below.

Each CFA Fire District has defined boundaries covering designated local government areas (LGA). All LGAs align to a single Fire District, except for Yarriambiack Shire, which is part in Mallee and part in Wimmera.

Fire Danger Ratings can be declared for a given day and CFA Fire District up to four days in advance. Ratings are reviewed as the day approaches and may be modified to enable affected parties to assist them in preparing for potential fires in a manner that is sensitive to changes in the forecast weather conditions.

The f-factor will apply the risk weighting associated with the last official FDR declared by the CFA prior to the date and time of a powerline ignition.

The FDR framework has been used for the f-factor as it an established Victorian mechanism for differentiating fire risk at different times and locations (it should be noted that the spatial aspect of the FDR is considered too coarse an indicator of spatial risk for f-factor purposes, which is why a separate weighting framework has been adopted for weighting geographic risk).

Furthermore, DBs already apply risk based operational practices that are sensitive to FDR declarations, insofar as network devices are set more sensitively on declared Total Fire Ban (TFB) days.

Rating time based risk

Two indices are being used to quantify bushfire risk associated with the "time" of year:

- the Forest Fire Danger Index (FFDI); and
- the Grass Fire Danger Index (GFDI).

The BOM provides the CFA with fire danger index forecasts based on the McArthur Mk V Forest and modified CSIRO Mk IV grassland fire danger meters. Although the CFA consider other factors in their determination of the Fire Danger Ratings, these forecasts are the primary input.

The weightings for temporal risk under the f-factor are based on the FFDI and GFDI in combination, with:

- threshold values for each category of time based risk identified;
- a single measure calculated for each category, based on a combination of FFDI and GFDI;
- a baseline category for time base risk defined (the "Very High" category); and
- a weighting calculated for each category relative to the baseline category.

These steps yield the following weightings for the time dimension of f-factor risk.

Fire Danger Rating	Weighting
No forecast	**0.1**
Low-moderate	**0.2**
High	**0.5**
Very high	**1.0**
Severe	**2.0**
Extreme	**3.5**
Code Red	**5.0**

The figure overleaf illustrates the steps used in the calculation that led to these weightings

Figure A2.9: Steps used to calculate time risk weightings

1 Align with State standard for rating risk relative to daily conditions

Six levels of Fire Danger Rating (FDR) have been defined for Victoria.

They are based on the Forest Fire Danger Index (FFDI) and the Grass Fire Danger Index (GFDI).

They have been incorporated into the BOM's weather forecasts and warnings.

2 Adopt quantitative base of key indices

Two indices inform CFA Fire Danger ratings:

- **FFDI** uses the McArthur Mk V Forest meter.
- **GFDI** uses the modified CSIRO Mk IV grassland fire danger meter.

FFDI	Fire Danger Rating	GFDI
Under 12	Low-moderate	Under 12
Over 12	High	Over 12
Over 25	Very high	Over 25
Over 50	Severe	Over 50
Over 75	Extreme	Over 100
Over 100	Code Red	Over 150

3 Select the baseline FDR category

Consider the CFA descriptions of fire danger for each rating category

The "Very high" rating is the highest rating under which the CFA says that a fire "can most likely be controlled".

Over 25	Very high	Over 25

4 Combine the key indices

A combined value for each FDR level was calculated, noting:

A "No forecast" category was created for the non-fire season months (May to October)

The combined value represents (generally) the average of the FFDI and GFDI threshold values

Fire Danger Rating	FFDI	GFDI	Calculation	Combined Index
No forecast	N/A	N/A	10% of VH	2.5
Low-moderate	Under 12	Under 12	20% of VH	5
High	Over 12	Over 12	50% of VH	12.5
Very high	Over 25	Over 25	(25+25)/2	25
Severe	Over 50	Over 50	(50+50)/2	50
Extreme	Over 75	Over 100	(75+100)/2	87.5
Code Red	Over 100	Over 150	(100+150)/2	125

5 Calculate the f-factor weighting for each FDR category

The weight for each FDR category is a ratio of the category value relative to the baseline value

e.g. the weight for category "Code Red" = 125 ÷ 25 = 5

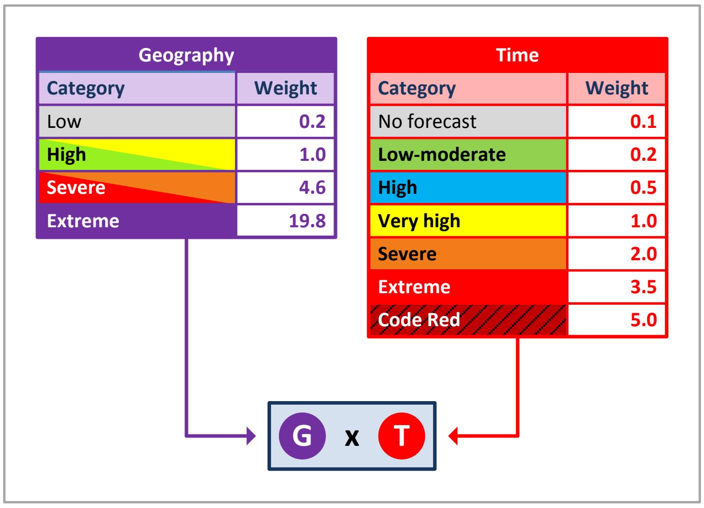
Fire Danger Rating	Combined Index	Calculation	F-factor Weight
No forecast	2.5	2.5 ÷ 25	0.1
Low-moderate	5	5 ÷ 25	0.2
High	12.5	12.5 ÷ 25	0.5
Very high (baseline)	25	25 ÷ 25	1.0
Severe	50	50 ÷ 25	2.0
Extreme	87.5	87.5 ÷ 25	3.5
Code Red	125	125 ÷ 25	5.0

B. Calculating an IRU baseline

The preceding section described the inputs for calculating a weighted measure of risk associated with an ignition on a powerline.

From 1 July 2016, each ignition that occurs on a powerline will be assigned a value expressed in Ignition Risk Units (IRU). The IRU value will combine the weightings for geographic and time based risk, as illustrated below.

Figure A2.10: IRU value from combined geography and time weightings



Under the revised f-factor, the IRU value of individual ignitions can range from 0.02 (0.2 x 0.1) to 99.0 (19.8 x 5.0).

Future ignition events will be evaluated against an IRU baseline, developed on the basis of historical powerline ignition events.

Over the calendar year period from 2012 to 2014, the five Victorian electricity DBs reported the details of 3,171 ignitions to the AER.

An IRU score has been calculated for each ignition using data referencing:

- the date of the ignition; and
- the location of the ignition.

As a result of this calculation, the 3,171 raw ignitions from 2012 to 2015 equate to 2,993.5 IRUs.

The IRU based interpretation of the historical ignition records has been used to set an IRU Baseline for each DB.

Approach to IRU coding

To ensure the highest possible level of precision in calculating an IRU score for an historical ignition, it was necessary to define:

- the exact date of the ignition; and
- the precise location of the ignition (ideally represented as latitude/longitude coordinates).

For the ignition data reported to the AER, a date was specified for 100% of the 3,171 records.

As the current f-factor does not require it, none of the records reported latitude/longitude coordinates. The data preparation phase of the analysis therefore involved the identification of representative coordinates for each ignition, in order to achieve the high degree of precision sought.

This task of geo-coding (providing coordinates) ignition records was undertaken using the best locational information available, which varied significantly from DB to DB and from record to record.

An estimate of the IRU baseline for each DB was calculated and presented to DBs in May 2016, along with a copy of the data used to make the calculations. Through this process of engagement with industry and state and national regulators, the Government has endeavoured to explain the forthcoming changes to the f-factor and provide a mechanism for testing and improving (where possible) the accuracy of IRU calculations.

During June 2016, the DBs provided additional locational data for each historical ignition for the 2012 to 2014 period in addition to fully geo-coded ignition data for the 2015 calendar year, which was released by the AER in late April 2016. This updated data has been incorporated in the final version of the Regulatory Impact Statement.

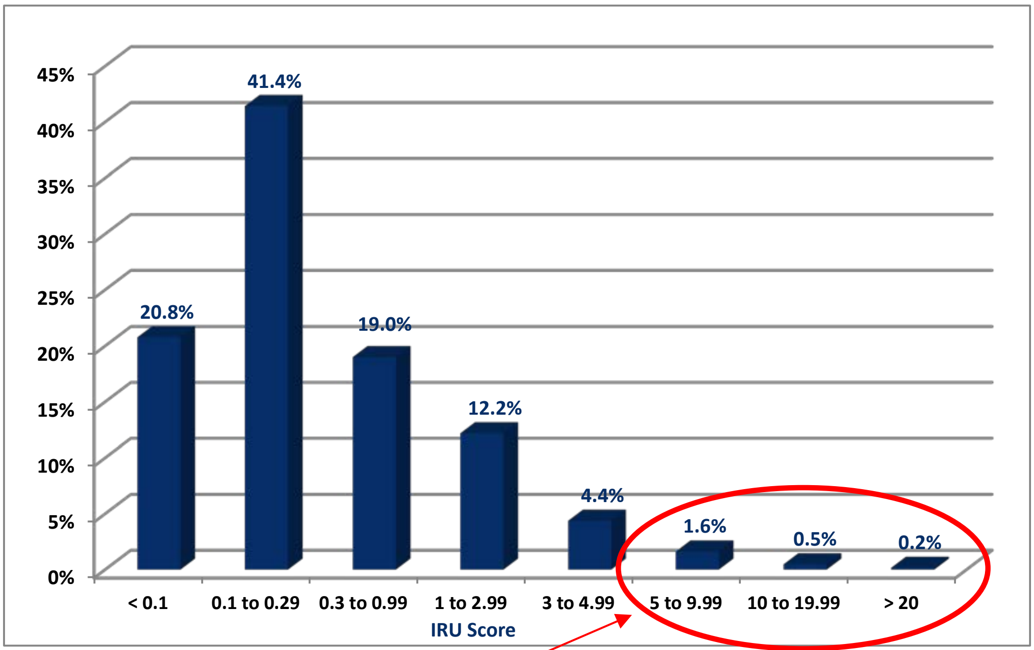
Intended impact of an IRU based scheme

The revised f-factor scheme is designed to better focus the bushfire safety planning of DBs on those days and places that pose the greatest bushfire risk.

From an f-factor perspective, heightened risk is reflected in the IRU vale of individual ignitions.

It is observed that 83.5% of historical fire starts (2012 to 2015) have an IRU score of 1 or less.

Figure A2.11: Percentage distribution of IRU scores for fire starts on powerlines (2012 to 2015)



It is anticipated that DB activity will be largely focussed on preventing ignitions that have a low incidence, but pose the **greatest risk** to the Victorian community.

Analysis of geography

About **one out of four ignitions (23.8%)** occurred in areas in which raised standards of powerline protection will be required under the proposed regulations (i.e. areas in which higher powerline construction standards will apply and/or heightened fault detection).

Figure A2.12: Count of ignitions on powerlines by geography and by distribution business (2012 to 2015)

Distribution Business	Geography of ignitions (locational risk)				
	Low (LBRA)	High (HBRA)	Severe	Extreme	Total
AusNet Services	194	181	243	38	**656**
CitiPower	108				**108**
Jemena	258	13			**271**
Powercor	707	428	449	25	**1,609**
United Energy	473	54			**527**
Total	**1,740**	**676**	**553**	**63**	**3,171**

Source: Raw fire counts - Electricity Distribution Businesses via the Australian Energy Regulator, 2016

This geographic distribution of historical ignitions determines the IRU weighting that will apply with respect to geographic risk.

Analysis of time

About **1 in 20 ignitions (5.7%)** occurred on days where the fire danger rating was either 'severe' or 'extreme'. There were no 'Code Red' days in the 2012 to 2015 period.

Figure A2.13: Count of ignitions on powerlines by Fire Danger Rating (2012 to 2015)

Distribution Business	Fire Danger Rating						
	No Forecast	Low-Moderate	High	Very High	Severe	Extreme	Total
AusNet Services	186	174	186	79	23	8	**656**
CitiPower	26	24	24	23	9	2	**108**
Jemena	46	47	123	41	5	9	**271**
Powercor	258	326	622	310	72	21	**1,609**
United Energy	63	98	262	72	26	6	**527**
Total	**579**	**669**	**1,217**	**525**	**135**	**46**	**3,171**

Source: Raw fire counts - Electricity Distribution Businesses via the Australian Energy Regulator, 2016

Calculated IRU baseline

Based on the powerline ignition history for 2012 to 2015 and the coding assumptions for designating an IRU weighting for time and geographic risk, the annual IRU baseline for each DB is as follows.

The annual IRU Baseline is calculated by dividing the IRU total for 2012-2015 by 4.

Figure A2.14: IRU Baselines

Distribution Business	Raw Ignition Count (2012-15)	IRU Total (2012-15)	IRU Baseline (annual)
AusNet Services	656	990.94	247.7
CitiPower	108	13.48	3.4
Jemena	271	38.8	9.7
Powercor	1,609	1,871.98	468.0
United Energy	527	89.10	22.3
Total	**3,171**	**3004.3**	**751.1**

Distribution Business	Raw Ignition Count	IRU Total	IRU Baseline
	(2012-15)	(2012-15)	(annual)
AusNet Services	656	990.94	247.7
CitiPower	108	13.48	3.4
Jemena	271	38.8	9.7
Powercor	1,609	1,871.98	468.0
United Energy	527	89.1	22.3
Total	**3,171**	**3,004.3**	**751.1**

C. Setting the Incentive Rate for a single IRU

The next part of the methodology has been designed to inform the determination of the dollar value that will be assigned to a single IRU.

Under the **present f-factor**, every individual ignition has a value of $25,000.

Under the **revised f-factor**, an individual ignition no longer has a unit value of 1 but will range in value from 0.02 to 99 IRUs

Appreciating this range of possible IRU scores for an ignition, the value for a single IRU needs to be set at a level that balances the need to both:

- provide the necessary financial incentive for DBs to focus upon all categories of ignition with a high risk profile; and
- ensure that both consumers and DBs are not unduly burdened financially by the application of the revised f-factor scheme.

Under the revised f-factor, **the IRU Incentive Rate will have a value of $15,000**.

This section sets out the analysis and data preparation steps used to inform an IRU Incentive Rate determination. The discussion associated with the assessment of the merit of alternative IRU price points is provided in section 4.3.

Testing IRU sensitivity to weather

The revised f-factor is designed to provide an incentive for DBs to put in place operational actions that are within their control while not exposing them unduly to risks associated with factors outside their control. A key facet of the analysis is therefore directed to the potential impacts of future variations in weather on a weighted IRU based scheme, recognising that extreme weather, both cooler and hotter, may impact upon ignition performance.

Like the existing f-factor scheme, the revised scheme is symmetric in design and has been constructed to be cost neutral over time.

The new scheme will apply initially over a five year period (2016 to 2020), which may or may not experience extremes of weather.

Due to uncertainty about future weather behaviour, it is necessary to consider the impact that alternative weather scenarios may have on IRU outcomes on a year by year basis, and therefore on the cost transfer between DBs and electricity consumers.

In a year in which the weather is:

- **hotter than average**, there is an increased likelihood that the DB performance will exceed the IRU baseline (increasing the prospects of a DB being penalised); and
- **cooler than average**, there is an increased likelihood that the DB performance will fall below the IRU baseline (increasing the prospects of customer tariff increases).

The Department engaged the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to carry out modelling to estimate the impact of variation in future weather on IRU outcomes.

Simulation of future weather years

In setting an IRU baseline for each DB, consideration has been given to how much the IRU outcome may vary from year to year under different weather conditions.

The CSIRO analysed the powerline ignition history of distribution businesses in the three years from 2012 to 2014. To test how the proposed f-factor may function under different weather scenarios, CSIRO generated 30,000 simulated ignition years using the 2012-14 data.

All simulated sample years were based on the observed data in 2012 to 2014. This means, for example, that as no Code Red day appeared in the source data, a Code Red day could not appear in any of the simulated years.

Simulation method

The simulation approach that was used is also known as a bootstrap[55] sampling approach and is particularly useful to develop an understanding of uncertainty in cases where the distribution of quantities of interest is complex. In this case, IRU values are dependent on weather, geography, etc. which have complex interactions that are only partially understood.

Generating samples

The generation of 30,000 simulated ignition year datasets was undertaken in accordance with the following rules:

1. 10,000 simulated three year datasets were first generated;
    - each three year dataset contained exactly 2,537 ignitions, the exact number of ignitions reported for the period 2012 to 2014;
    - sample sets were built by drawing ignitions from the actual ignitions recorded between 2012 and 2014;
    - a record was able to be selected multiple times in a single sample dataset (i.e. sampling with replacement);
2. 30,000 simulated annual datasets were generated from the 10,000 three year datasets;
    - each three year simulated dataset was used to create three separate annual simulated datasets, one representing 2012, another 2013 and the other 2014;
    - an ignition could only be allocated to the year it was drawn from (i.e. if it was a 2012 ignition originally, it could only be allocated to a 2012 simulated year); and
    - an ignition could only be allocated to the DB who reported it.

This approach preserved the inherent differences between years and DBs in relation to fire starts, without restricting the number and weighting of ignitions sampled.

An IRU value was calculated for each of the 30,000 sample years for each DB and the distribution of simulated values analysed.

[55] Efron, B. (1981). "Nonparametric estimates of standard error: The jackknife, the bootstrap and other methods". *Biometrika* **68** (3): 589–599

The figure below follows further illustrates the steps in the sampling method.

Figure A2.15: Steps for developing sample of simulated weather years

1 Assign an IRU value to each ignition

Geo-code ignition records and apply calculated weightings

The ignition data provided by DBs to the AER for the 2012, 2013 and 2014 calendar years was utilised

An IRU score was calculated for each record based on a weighted value for Geographic risk and Time risk.

Distribution Businesses reported
2,537 powerline ignitions
to the Australian Energy Regulator (2012 to 2014)

G x T

Every historical ignition calculated in
Ignition Risk Units (range 0.02 – 99.0)

2 Generate 10,000 sets of simulated data

Each simulated dataset covers a 3 year period (like the source data)

The following rule applies:

- Each simulated set contains 2,537 records
- The same record can be selected multiple times

1. Randomly draw 1 ignition record from the pool of 2,537

2. Return the record to the pool (n must always = 2,537)

3. Repeat steps 1 and 2 until a sample of 2,537 is created

A simulated dataset can be different from the source data in the number of ignitions per DB, the number of ignitions per year and the number of TFB days.

4. Repeat steps 1 to 3 - 9,999 times

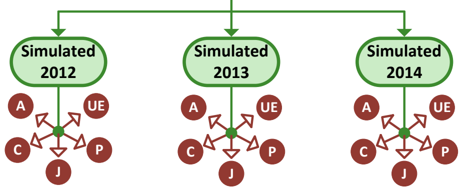
3 Generate 30,000 sets of simulated years

Divide each 3 year set (from step 2) into 3 annual datasets

The following rules apply:

- Each simulated set contains 2,537 records
- Sampled ignition records can only be assigned to the DB they are associated with
- Sampled ignition records can only be assigned to the year they are associated with

1. Assign each sampled record to one of three years (representing a simulated 2012, 2013 and 2014)



2. Assign each annual record to the DB that reported it

3. Repeat steps 1 to 2 – 9,999 times

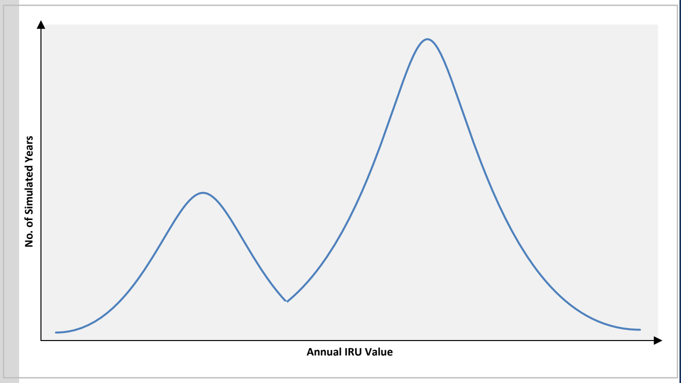
4 Calculate an IRU score for each simulated year and review the distribution

Calculate 30,000 IRU scores for each DB

Within the set of 30,00 simulated years there are implicitly hotter and cooler years

The distribution is bi-modal, reflecting differences in the 2012 data compared to 2013 and 2014, which were more similar

IRU scores for simulated years were used to test IRU outcomes under different weather scenarios



Observations about the 2012 to 2014 data

The Country Fire Authority (CFA) has collected a history of Total Fire Ban (TFB) day declarations dating back to 1945.

Two of the years (2013 and 2014) in the analysis experienced relatively high numbers of TFB days compared to historical averages, placing them at the 75th percentile of TFB day occurrences. On this measure, the studied years are "hotter" on average than most years in the past 70 years.

This observation does not provide a basis for predicting future weather behaviour. It merely suggests that the baseline for IRU scores has been set using data for years that are historically hotter than average based on the incidence of TFB day declarations.

This observation, of itself, provides no indication of the likelihood of hotter or cooler years in the future.

Simulation outcomes by DB

The distribution of 30,000 simulated IRU values was considered for each DB.

These calculations consider all 30,000 simulated years including:

- 10,000 x simulated years for 2012;
- 10,000 x simulated years for 2013; and
- 10,000 x simulated years for 2014.

Figure A2.16: Simulation outcomes by distribution businesses

Category	mean	minimum	maximum	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
AusNet Services	274.34	92.44	931.58	161.31	205.92	256.26	327.24	445.82
CitiPower	4.09	0.40	11.74	1.24	1.88	4.38	5.72	7.30
Jemena	8.88	1.14	21.54	2.92	6.22	9.22	11.32	14.24
Powercor	472.87	132.96	935.38	203.46	284.28	505.19	614.44	727.31
United Energy	21.04	4.06	48.64	6.32	8.12	24.44	29.90	34.40

__NB:__ Percentile figures indicate the percentage of simulated years in which the IRU total is below the stated value.

To test the financial impacts of future weather scenarios, IRU performance outcomes for selected years were compared to the mean IRU value (the value at which the IRU baseline will be set).

The simulated years used for comparative purposes included:

- a **cool** year (taken to be represented by the IRU score at the **25th percentile**);
- a **hot** year (taken to be represented by the IRU score at the **75th percentile**);
- an **extremely cool** year (taken to be represented by the IRU score at the **5th percentile**); and
- an **extremely hot** year (taken to be represented by the IRU score at the 95th **percentile**).

This analysis provided one of three inputs into the decision on IRU unit price, a decision which also included consideration of:

- the magnitude of the dollar value of individual ignitions, particularly at high IRU values; and
- the risk that DBs may be inadvertently incentivised to "trade off" electricity supply reliability (with relatively low penalties) to avoid f-factor related costs at the extreme of IRU risk pricing (e.g. to avoid ignitions on code red days in extreme locations, under the proposed weightings).

D. Adjusting the IRU baseline

The IRU methodology responds to the principle that consumers must not pay more than once for a safety benefit.

The proposed installation of Rapid Earth Fault Current Limiters (**REFCL**) at 45 Zone Substations (**ZSS**) by the end of 2022 is estimated to reduce relative state-wide powerline bushfire risk (likelihood x consequence) by over 40%.

In other words, the introduction of REFCLs will make the ignition events on 22kV powerlines less likely, making it easier for DBs to achieve a fire start performance level that is below their IRU baseline target. The CSIRO modelling shows that a REFCL will reduce the likelihood of ignition on 22kV powerlines by between 48% and 60% depending on the weather and environmental conditions experienced.

If the IRU baseline is held constant, that would mean consumers were paying twice for a safety benefit:

- once for the cost of **installing REFCLs**; and
- again through the f-factor scheme for the reduction in fire starts brought about through the **operation of REFCLs**.

The IRU methodology seeks to reduce the IRU baseline set for DBs in parallel with the ignition reduction benefit associated with the investment in REFCLs.

IRU baseline adjustment method

Using the Risk Reduction Model (**RRM**), CSIRO has quantified how less likely each historical fire would have been if a REFCL had been in operation at the time. This ignition likelihood calculation takes into account weather and environmental conditions specific to each ignition reported between 2012 and 2014.

For every historical ignition that is associated with a 22kV powerline on one of the ZSSs targeted for enhanced protection, there is an expectation that the likelihood of an ignition occurring will be reduced. The RRM calculates the reduction in ignition likelihood for the installation of a REFCL relative to the bare-wire case, taking into account the unique features specific to the location and day of the event. These factors include:

- temperature;
- wind speed;
- humidity;
- dryness of vegetation;
- category of vegetation; and
- terrain.

For a further description of the RRM developed by CSIRO refer to **Appendix 3**.

Sample calculation

An ignition that occurred on a 22kV powerline in an LBRA and on a day with a Fire Danger Rating of Very High, would have a baseline IRU score of:

G x T which equals 0.2 x 1.0 = 0.2

If a REFCL were to be installed by 2019 at the ZSS which supplies that 22kV powerline, and the RRM reduction in ignition likelihood was estimated to be 0.55, then the IRU value contributed to the IRU baseline from 2019 would reduce to:

$$(1 - 0.55) \times 0.2 = 0.09$$

Change to the IRU baseline

In total, 801 of the ignitions reported to the AER took place on 22kV powerlines that will be protected by a REFCL by 2023. The table below shows how the IRU baseline would be decremented for each DB under two alternative REFCL deployment scenarios:

- a schedule favoured by the State, which would target the highest risk ZSSs first; and
- a compliant schedule favoured by the DBs, which is preferred on operational/logistical grounds.

The two deployment scenarios yield very similar results, in terms of their impact on the IRU baseline.

Figure A2.17: Decremented baselines according to mandated asset deployment scenarios

Company	State Deployment Scenario				DB Deployment Scenario			
	2016 to 2019	2019 to 2021	2021 to 2023	After 2023	2016 to 2019	2019 to 2021	2021 to 2023	After 2023
AusNet Services	247.7	208.9	155.7	136.0	247.7	214.3	155.3	136.0
CitiPower	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Jemena	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Powercor	468.0	416.4	365.6	311.2	468.0	412.8	356.4	311.2
United Energy	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3
Grand Total	**748.4**	**661.4**	**558.6**	**485.9**	**748.4**	**663.6**	**548.4**	**485.96**

Over seven years to 2023, the total IRU baseline across all DBs would reduce by 35.8% based on the analysis of the 3,171 ignitions occurring in the period 2012 to 2015.

While the table above shows how the IRU baseline for each distribution business would be reduced over the seven year period to 2023 via this methodology, this RIS only deals with the first decrement in 2019 as it falls within the bounds of the current five-year Electricity Distribution Price Review (EDPR) period from 2016 to 2020.

Decrements to the IRU baseline beyond 2020 will apply the same methodology, but will take into account updated powerline ignition data and powerline performance data that will be available at that time.

The *Electricity Safety (Bushfire Mitigation Regulations) Amendment Regulations 2016* require distribution businesses to achieve a heightened level of protection at a number of zone substations by 1 May 2019. The DBs (AusNet Services and Powercor) have proposed which zone substations they will provide enhanced protection for in order to meet this requirement.

The IRU baseline for each of AusNet Services and Powercor will be reduced for the subsequent financial year, commencing on 1 July 2019.

The DB proposed deployment scenarios comply with regulatory requirements and so it is appropriate to use these as the basis for IRU baseline adjustment.

The initial IRU baseline target for each DB and the adjusted IRU baseline for 2019 are shown in the table below.

Figure A2.18: Initial IRU baseline and Adjusted 2019 IRU baseline

Company	IRU Baseline to 30 June 2019	IRU Baseline from 1 July 2019
AusNet Services	247.7	214.3
CitiPower	3.4	3.4
Jemena	9.7	9.7
Powercor	468.0	412.8
United Energy	22.3	22.3

Appendix 3 – The Risk Reduction Model

The PBSP Risk Reduction Model (RRM) calculates the likelihood of an ignition at a particular location based on the vegetation, terrain, and type of electricity distribution assets present. The likelihood is dependent on fire weather conditions: wind speed, temperature, drought factor and relative humidity. RRM can predict the performance of new asset types, and can compute total risk given fire consequence information.

In 2014 the Victorian Government's Powerline Bushfire Safety Program (PBSP) commissioned CSIRO to develop a quantitative model that could estimate the current and future risk of bushfire ignitions due to high voltage (HV) electricity distribution powerlines in non-urban areas.

The model, known as the Risk Reduction Model (RRM) applies for current bare-wire assets with ACR and fuse protection, as well as future asset types such as insulated overhead cable with ACR and Rapid Earth Fault Current Limiting (REFCL) electrical protection.

RRM is a collaborative effort by CSIRO, PBSP, Geomatic Technologies and FACIO Pty Ltd (Mr Gary Towns). Substantial electrical industry expertise has been combined with professional analytics knowhow.

The RRM has four main components:

FAULTS MODEL. Estimating (pre-ignition) electrical fault rates using historical data on faults on bare wire assets.

FAULT TO IGNITION MODEL. Converting pre-ignition electrical fault rates into fire ignition rates.

FUTURE ASSETS MODEL (FAM). Estimating electrical fault rates and ignition rates for alternative asset types.

RISK CALCULATION. Using the other model components and pre-computed bushfire consequence data to create estimates of current and future bushfire powerline risk.

By using the RRM risk calculation in various ways, PBSP has been able to assess the current level of risk, prioritise areas for powerline replacement and for REFCL deployment, and estimate the total risk reduction in Victoria due to planned mitigation activity.

RRM has been used to predict that with optimal targeting of asset replacements and electrical protection upgrades, Victoria can achieve a two-thirds reduction in bushfire risk due to powerlines by addressing only a small percentage of the total electrical distribution system.

Principles

The principles underpinning RRM are:

- RRM needs to be spatially explicit, and concerned with ignition likelihood and risk (ignition likelihood multiplied by fire consequence).
- There are too few ignitions on the Victorian electricity distribution system (relative to the range of influencing factors) to enable us to look primarily at ignitions when seeking reliable statistical models. Our focus needs to be on faults, and on how faults evolve into ignitions.
- Meteorological conditions, vegetation dryness, vegetation-type/land-use, and line construction (SWER or 22kV, and bare, insulated or underground line) are the most important factors influencing the rates of faults and ignitions on the network, and need to be captured in RRM.
- Because in-the-field historical data is not available for new assets like 22kV REFCL-protected line, statistical data analysis and electrical engineering models need to be combined in RRM. The electrical engineering models need to sufficiently describe how faults will occur and evolve in existing and new assets.

Faults Model

The analysis of HV distribution system historical fault data (2007-2013) from Ausnet Services and Powercor is used to:

1. Determine which faults are relevant: i.e., unplanned, on the network, and on bare-wire HV lines.
2. Determine whether the fault is on 22kV or SWER.
3. Ensure that each fault is associated with a cause (e.g., private tree branch) and impact (e.g., broken conductor), according to a standard taxonomy.
4. Locate the fault, down to the smallest number of HV poles possible, using various techniques including text mining and address matching.
5. Determine the meteorological conditions that applied locally at the time of each fault.
6. Determine the total exposure of poles to different levels of meteorological conditions over time.
7. Form a statistical understanding of fault occurrence rates (number of faults divided by exposure), in terms of line type, fire weather variables, vegetation, and terrain.

Achieving this involved several months of data cleansing, data linking, text analysis and human interpretation. The result is that RRM provides a detailed quantitative view of how bare-wire fault rates are influenced by the major variables in Victorian rural HV networks. The cleansing, linking, analysis and interpretation tools offer ongoing collateral benefits.

Figure A3.1: Number of HV faults classified by cause and impact and geographically located in DB data

Best Location Match	Number of faults
ACR	7052
Feeder	24080
None	80
Pole	54445
Pole by Address	5717
Poles by Address	2042
Poles by Locality	597
Poles by Partial ID	278
Section	24850
Switch	1222
Transformer	3402
Zonesub	551
Grand Total	**124316**

Fault to Ignition Model

Powerline-initiated fire ignition history from 2007-2013 has been linked to faults and meteorological data to build a data-driven understanding of the probabilities of faults escalating into ignitions, depending on line type, the broad class of fault (i.e., animals, vegetation, deterioration and so on), vegetation, and fire weather conditions.

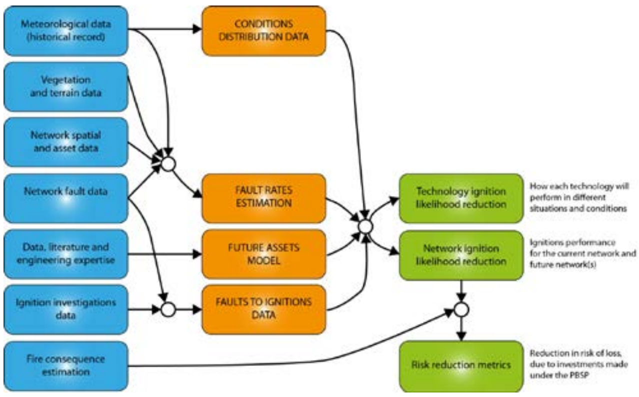
This enables RRM to predict ignition rates in different locations and conditions, and for new asset types, from the fault rate estimations obtained from the RRM Faults Model.

Future Assets Model (FAM)

The FAM quantitatively estimates the performance of new 22kV and SWER HV distribution system technology options relative to the conventional bare-wire assets. The FAM is used to estimate relative fault and ignition likelihood rates (i.e., for new versus incumbent technology) with explicit consideration of the attributes of physical barriers (insulation and undergrounding) and electrical protection options, as well as vegetation, terrain slope, fire weather conditions (wind, temperature, drought factor, humidity), fault root cause, fault impact and fire danger rating (in accounting for ACR settings). This is done for over two dozen HV technology options.

The FAM approach involves estimating how faults partition into electrical impedance cases (Low, High and VH) and electrical mode (P-E, P-P and P-P-E) for every line type (22kV and SWER) and fault cause and impact combination. The actions of physical protection (insulation) and electrical protection (e.g., REFCL) in changing rates of fault detection and ignition-causing energy discharge is also quantitatively estimated. This information is combined with the historical fault data to form predictions of fault rates for the asset types (technology options) for which there is no substantial in-the-field history to draw upon. The RRM Fault to Ignition Model is then applied in order to estimate relative ignition rates for the range of asset types

Figure A3.2: Data and processing flow in the RRM



Risk Calculation

RRM enables the fire ignition likelihood to be computed at the location of any pole or any region of poles in the entire network, for existing or future asset types.

When the ignition likelihood data is combined with data on predicted fire consequence (number of dwelling losses) based on simulation experiments (with Pheonix Rapidfire), reductions in fire risk due to asset changes can be computed. In turn this can be used for asset replacement targeting and other analysis and decision-making.

Relational database and GIS-based methods of applying RRM for risk assessment have been constructed, and have subsequently been used for a range of purposes by PBSP.

Estimates of Likelihood Reduction

RRM data can be mined to obtain estimates of the average ignition likelihood reduction due to technology changes.

Figure A3.3: Estimates of Likelihood Reduction

Asset Type	Average ignition rate reduction
22kV Bare & ACR Op Change	1.1%
22kV Bare & REFCL	55.1%
22kV Bare, REFCL & ACR	55.4%
22kV Insulated OH Bare Eqpt w ACR & REFCL	98.7%
22kV U/G Insul Eqpt w ACR & REFCL	99.0%
SWER Bare & ACR Op Change	13.4%
SWER Insulated OH Bare Eqpt w ACR	96.2%
SWER U/G Insul Eqpt w ACR	96.8%

Use of RRM for F-Factor Scheme Revisions

RRM's ability to estimate ignition likelihood reduction at a pole level (due to changes in asset construction, or section or feeder protection), under specified fire weather conditions, enables assessment of the likelihood that past ignition events would have occurred if different asset technology options were deployed. This enables us to sample past events ("bootstrap") and create synthetic future years where the asset profile (i.e. REFCL rollout) is different, so as to understand how accumulated IRU values might be "decremented" compared to a 2016 baseline in accounting for future REFCL deployment and other asset replacement.

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Appendix 4 – Analysis to support Incentive Rate Determination

From 1 July 2016, each ignition on a powerline in the Victorian electricity distribution network will be assessed for the relative bushfire risk associated with it. A weighted measure of that risk will be calculated, expressed in Ignition Risk Units (IRU), using the methodology described in Appendix 2.

There are 28 possible categories of ignition, ranging in value from 0.02 to 99.0 IRUs.

As the f-factor is an incentive scheme, an incentive rate needed to be determined for a single IRU.

An IRU value was determined guided by one of the five key principles underpinning the design of this revised f-factor scheme. That is:

> ***"4. The unit penalty rate (i.e. Incentive Rate) is to be set at a level that will not unduly place financial burden on consumers or DBs over a five year period as a consequence of variations in weather."***

In keeping with this principle and the broader design principles of the scheme, an **Incentive Rate** of **$15,000** was determined. The rationale for this determination is set out in section 3.5.2.

This appendix captures some of the analysis that informed that determination. Two of the key areas of focus were the:

1. Financial impacts on consumers and businesses; and
2. Value of individual ignitions.

Financial impacts on consumers and businesses

The five figures that follow present the results of analysis for each of the five Victorian electricity distribution businesses.

Common to each analysis are six key components:

1. An estimate of the annual household electricity bill applicable to consumers in that network;
2. An estimate of the annual IRU value for ignitions under a range of weather scenarios, using the results of weather simulation research carried out by the CSIRO (see Appendix 2);
3. The total annual dollar value of IRU performance under the seven different weather scenarios for six different Incentive rates (ranging from $10,000 to $50,000);
4. The annualised penalty (payment from DBs to consumers – **in black**) or payment (from consumers to DB – **in red**) that would apply for each weather scenario/incentive rate combination. These are calculated as variations from an annual benchmark, represented by the mean (Typical year);
5. The annual aggregated penalties and payments (shown in 4) are then represented as a cost increase/decrease per household; and
6. The cost increase/decrease per household is finally presented as a percentage change to the average annual household bill, as presented in 1.

Figure A4.1: Financial impacts of f-factor associated with network of AusNet Services

1

Distribution Business	Customers	Average Household Bill
AusNet Services	**685,194**	**$1,618**
CitiPower	325,917	$1,242
Jemena	318,430	$1,448
Powercor	765,241	$1,588
United Energy	658,453	$1,387

AusNet Services

2

Calculation Parameters	Unit Value($) of 1 IRU	Cool - Most Extreme (Minimum)	Extreme-Cool (5th percentile)	Cool (25th percentile)	Typical (Mean)	Hot (75th percentile)	Extreme-Hot (95th percentile)	Hot - Most Extreme (Max)
	IRU CATEGORY and VALUE	92.44	161.31	205.92	274.34	327.24	445.82	931.58
3 **Annualised Value ($ Million)**	$10,000	$0.924	$1.613	$2.059	$2.743	$3.272	$4.458	$9.316
	$15,000	$1.387	$2.420	$3.089	$4.115	$4.909	$6.687	$13.974
	$20,000	$1.849	$3.226	$4.118	$5.487	$6.545	$8.916	$18.632
	$25,000	$2.311	$4.033	$5.148	$6.858	$8.181	$11.146	$23.290
	$30,000	$2.773	$4.839	$6.178	$8.230	$9.817	$13.375	$27.947
	...	...	...	...	...	...	...	...
	$50,000	$4.622	$8.065	$10.296	$13.717	$16.362	$22.291	$46.579
4 **Annualised Penalty/Payment ($ Million)**	$10,000	$1.819	$1.130	$0.684	$0.000	-$0.529	-$1.715	-$6.572
	$15,000	$2.728	$1.695	$1.026	$0.000	-$0.794	-$2.572	-$9.859
	$20,000	$3.638	$2.261	$1.368	$0.000	-$1.058	-$3.430	-$13.145
	$25,000	$4.547	$2.826	$1.710	$0.000	-$1.323	-$4.287	-$16.431
	$30,000	$5.457	$3.391	$2.053	$0.000	-$1.587	-$5.144	-$19.717
	...	...	...	...	...	...	...	...
	$50,000	$9.095	$5.652	$3.421	$0.000	-$2.645	-$8.574	-$32.862
5 **Annualised change in average household bill**	$10,000	$1.33	$0.82	$0.50	$0.00	-$0.39	-$1.25	-$4.80
	$15,000	$1.99	$1.24	$0.75	$0.00	-$0.58	-$1.88	-$7.19
	$20,000	$2.65	$1.65	$1.00	$0.00	-$0.77	-$2.50	-$9.59
	$25,000	$3.32	$2.06	$1.25	$0.00	-$0.97	-$3.13	-$11.99
	$30,000	$3.98	$2.47	$1.50	$0.00	-$1.16	-$3.75	-$14.39
	...	...	...	...	...	...	...	...
	$50,000	$6.64	$4.12	$2.50	$0.00	-$1.93	-$6.26	-$23.98
6 **Annualised % change in average household bill**	$10,000	0.08%	0.05%	0.03%	0.00%	-0.02%	-0.08%	-0.30%
	$15,000	0.12%	0.08%	0.05%	0.00%	-0.04%	-0.12%	-0.44%
	$20,000	0.16%	0.10%	0.06%	0.00%	-0.05%	-0.15%	-0.59%
	$25,000	0.21%	0.13%	0.08%	0.00%	-0.06%	-0.19%	-0.74%
	$30,000	0.25%	0.15%	0.09%	0.00%	-0.07%	-0.23%	-0.89%
	...	...	...	...	...	...	...	...
	$50,000	0.41%	0.25%	0.15%	0.00%	-0.12%	-0.39%	-1.48%

Notes

1. Customer numbers sourced from publication, State of the Energy Market 2015, Australian Energy Regulator.
2. Average household bill value derived from source data about tariff changes for 2016 published by the AER (https://www.aer.gov.au/news-release/lower-network-charges-for-victorian-electricity-customers-in-2016)
3. Household impact calculated assuming that 50% of the aggregate payment/penalty is attributable to residential customers and 50% to commercial customers.

Figure A4.2: Financial impacts of f-factor associated with network of CitiPower

1

Distribution Business	Customers	Average Household Bill
AusNet Services	685,194	$1,618
CitiPower	**325,917**	**$1,242**
Jemena	318,430	$1,448
Powercor	765,241	$1,588
United Energy	658,453	$1,387

CitiPower

Calculation Parameters	Unit Value($) of 1 IRU	IRU CATEGORY and VALUE: Cool - Most Extreme (Minimum)	Extreme-Cool (5th percentile)	Cool (25th percentile)	Typical (Mean)	Hot (75th percentile)	Extreme-Hot (95th percentile)	Hot - Most Extreme (Max)
2		0.40	1.24	1.88	4.09	5.72	7.30	11.74
3 **Annualised Value ($ Million)**	$10,000	$0.004	$0.012	$0.019	$0.041	$0.057	$0.073	$0.117
	$15,000	$0.006	$0.019	$0.028	$0.061	$0.086	$0.110	$0.176
	$20,000	$0.008	$0.025	$0.038	$0.082	$0.114	$0.146	$0.235
	$25,000	$0.010	$0.031	$0.047	$0.102	$0.143	$0.183	$0.294
	$30,000	$0.012	$0.037	$0.056	$0.123	$0.172	$0.219	$0.352
	...	...	...	...	...	...	...	...
	$50,000	$0.020	$0.062	$0.094	$0.204	$0.286	$0.365	$0.587
4 **Annualised Penalty/Payment ($ Million)**	$10,000	$0.037	$0.028	$0.022	$0.000	-$0.016	-$0.032	-$0.077
	$15,000	$0.055	$0.043	$0.033	$0.000	-$0.025	-$0.048	-$0.115
	$20,000	$0.074	$0.057	$0.044	$0.000	-$0.033	-$0.064	-$0.153
	$25,000	$0.092	$0.071	$0.055	$0.000	-$0.041	-$0.080	-$0.191
	$30,000	$0.111	$0.085	$0.066	$0.000	-$0.049	-$0.096	-$0.230
	...	...	...	...	...	...	...	...
	$50,000	$0.184	$0.142	$0.110	$0.000	-$0.082	-$0.161	-$0.383
5 **Annualised change in average household bill**	$10,000	$0.06	$0.04	$0.03	$0.00	-$0.03	-$0.05	-$0.12
	$15,000	$0.08	$0.07	$0.05	$0.00	-$0.04	-$0.07	-$0.18
	$20,000	$0.11	$0.09	$0.07	$0.00	-$0.05	-$0.10	-$0.23
	$25,000	$0.14	$0.11	$0.08	$0.00	-$0.06	-$0.12	-$0.29
	$30,000	$0.17	$0.13	$0.10	$0.00	-$0.08	-$0.15	-$0.35
	...	...	...	...	...	...	...	...
	$50,000	$0.28	$0.22	$0.17	$0.00	-$0.13	-$0.25	-$0.59
6 **Annualised % change in average household bill**	$10,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%
	$15,000	0.01%	0.01%	0.00%	0.00%	0.00%	-0.01%	-0.01%
	$20,000	0.01%	0.01%	0.01%	0.00%	0.00%	-0.01%	-0.02%
	$25,000	0.01%	0.01%	0.01%	0.00%	-0.01%	-0.01%	-0.02%
	$30,000	0.01%	0.01%	0.01%	0.00%	-0.01%	-0.01%	-0.03%
	...	...	...	...	...	...	...	...
	$50,000	0.02%	0.02%	0.01%	0.00%	-0.01%	-0.02%	-0.05%

Notes
1. Customer numbers sourced from publication, State of the Energy Market 2015, Australian Energy Regulator.
2. Average household bill value derived from source data about tariff changes for 2016 published by the AER (https://www.aer.gov.au/news-release/lower-network-charges-for-victorian-electricity-customers-in-2016)
3. Household impact calculated assuming that 50% of the aggregate payment/penalty is attributable to residential customers and 50% to commercial customers.

Figure A4.3: Financial impacts of f-factor associated with network of Jemena

1

Distribution Business	Customers	Average Household Bill
AusNet Services	685,194	$1,618
CitiPower	325,917	$1,242
Jemena	**318,430**	**$1,448**
Powercor	765,241	$1,588
United Energy	658,453	$1,387

Jemena

#	Calculation Parameters	Unit Value($) of 1 IRU	Cool - Most Extreme (Minimum)	Extreme-Cool (5th percentile)	Cool (25th percentile)	Typical (Mean)	Hot (75th percentile)	Extreme-Hot (95th percentile)	Hot - Most Extreme (Max)
2	IRU CATEGORY and VALUE		1.14	2.92	6.22	8.88	11.32	14.24	21.54
3	Annualised Value ($ Million)	$10,000	$0.011	$0.029	$0.062	$0.089	$0.113	$0.142	$0.215
		$15,000	$0.017	$0.044	$0.093	$0.133	$0.170	$0.214	$0.323
		$20,000	$0.023	$0.058	$0.124	$0.178	$0.226	$0.285	$0.431
		$25,000	$0.029	$0.073	$0.156	$0.222	$0.283	$0.356	$0.539
		$30,000	$0.034	$0.088	$0.187	$0.266	$0.340	$0.427	$0.646
		...	...	...	...	...	...	...	...
		$50,000	$0.057	$0.146	$0.311	$0.444	$0.566	$0.712	$1.077
4	Annualised Penalty/Payment ($ Million)	$10,000	$0.077	$0.060	$0.027	$0.000	-$0.024	-$0.054	-$0.127
		$15,000	$0.116	$0.089	$0.040	$0.000	-$0.037	-$0.080	-$0.190
		$20,000	$0.155	$0.119	$0.053	$0.000	-$0.049	-$0.107	-$0.253
		$25,000	$0.193	$0.149	$0.066	$0.000	-$0.061	-$0.134	-$0.317
		$30,000	$0.232	$0.179	$0.080	$0.000	-$0.073	-$0.161	-$0.380
		...	...	...	...	...	...	...	...
		$50,000	$0.387	$0.298	$0.133	$0.000	-$0.122	-$0.268	-$0.633
5	Annualised change in average household bill	$10,000	$0.12	$0.09	$0.04	$0.00	-$0.04	-$0.08	-$0.20
		$15,000	$0.18	$0.14	$0.06	$0.00	-$0.06	-$0.13	-$0.30
		$20,000	$0.24	$0.19	$0.08	$0.00	-$0.08	-$0.17	-$0.40
		$25,000	$0.30	$0.23	$0.10	$0.00	-$0.10	-$0.21	-$0.50
		$30,000	$0.36	$0.28	$0.13	$0.00	-$0.12	-$0.25	-$0.60
		...	...	...	...	...	...	...	...
		$50,000	$0.61	$0.47	$0.21	$0.00	-$0.19	-$0.42	-$0.99
6	Annualised % change in average household bill	$10,000	0.01%	0.01%	0.00%	0.00%	0.00%	-0.01%	-0.01%
		$15,000	0.01%	0.01%	0.00%	0.00%	0.00%	-0.01%	-0.02%
		$20,000	0.02%	0.01%	0.01%	0.00%	-0.01%	-0.01%	-0.03%
		$25,000	0.02%	0.02%	0.01%	0.00%	-0.01%	-0.01%	-0.03%
		$30,000	0.03%	0.02%	0.01%	0.00%	-0.01%	-0.02%	-0.04%
		...	...	...	...	...	...	...	...
		$50,000	0.04%	0.03%	0.01%	0.00%	-0.01%	-0.03%	-0.07%

Notes
1. Customer numbers sourced from publication, State of the Energy Market 2015, Australian Energy Regulator.
2. Average household bill value derived from source data about tariff changes for 2016 published by the AER (https://www.aer.gov.au/news-release/lower-network-charges-for-victorian-electricity-customers-in-2016)
3. Household impact calculated assuming that 50% of the aggregate payment/penalty is attributable to residential customers and 50% to commercial customers.

Figure A4.4: Financial impacts of f-factor associated with network of Powercor

1

Distribution Business	Customers	Average Household Bill
AusNet Services	685,194	$1,618
CitiPower	325,917	$1,242
Jemena	318,430	$1,448
Powercor	**765,241**	**$1,588**
United Energy	658,453	$1,387

Powercor

2

Calculation Parameters	Unit Value($) of 1 IRU	IRU CATEGORY and VALUE: Cool - Most Extreme (Minimum)	Extreme-Cool (5th percentile)	Cool (25th percentile)	Typical (Mean)	Hot (75th percentile)	Extreme-Hot (95th percentile)	Hot - Most Extreme (Max)
		132.96	203.46	284.28	472.87	614.44	727.31	935.38
3 Annualised Value ($ Million)	$10,000	$1.330	$2.035	$2.843	$4.729	$6.144	$7.273	$9.354
	$15,000	$1.994	$3.052	$4.264	$7.093	$9.217	$10.910	$14.031
	$20,000	$2.659	$4.069	$5.686	$9.457	$12.289	$14.546	$18.708
	$25,000	$3.324	$5.087	$7.107	$11.822	$15.361	$18.183	$23.385
	$30,000	$3.989	$6.104	$8.528	$14.186	$18.433	$21.819	$28.061
	...	...	...	...	...	...	...	...
	$50,000	$6.648	$10.173	$14.214	$23.643	$30.722	$36.365	$46.769
4 Annualised Penalty/Payment ($ Million)	$10,000	$3.399	$2.694	$1.886	$0.000	-$1.416	-$2.544	-$4.625
	$15,000	$5.099	$4.041	$2.829	$0.000	-$2.124	-$3.817	-$6.938
	$20,000	$6.798	$5.388	$3.772	$0.000	-$2.831	-$5.089	-$9.250
	$25,000	$8.498	$6.735	$4.715	$0.000	-$3.539	-$6.361	-$11.563
	$30,000	$10.197	$8.082	$5.658	$0.000	-$4.247	-$7.633	-$13.875
	...	...	...	...	...	...	...	...
	$50,000	$16.995	$13.470	$9.430	$0.000	-$7.079	-$12.722	-$23.126
5 Annualised change in average household bill	$10,000	$2.22	$1.76	$1.23	$0.00	-$0.93	-$1.66	-$3.02
	$15,000	$3.33	$2.64	$1.85	$0.00	-$1.39	-$2.49	-$4.53
	$20,000	$4.44	$3.52	$2.46	$0.00	-$1.85	-$3.32	-$6.04
	$25,000	$5.55	$4.40	$3.08	$0.00	-$2.31	-$4.16	-$7.55
	$30,000	$6.66	$5.28	$3.70	$0.00	-$2.78	-$4.99	-$9.07
	...	...	...	...	...	...	...	...
	$50,000	$11.10	$8.80	$6.16	$0.00	-$4.63	-$8.31	-$15.11
6 Annualised % change in average household bill	$10,000	0.14%	0.11%	0.08%	0.00%	-0.06%	-0.10%	-0.19%
	$15,000	0.21%	0.17%	0.12%	0.00%	-0.09%	-0.16%	-0.29%
	$20,000	0.28%	0.22%	0.16%	0.00%	-0.12%	-0.21%	-0.38%
	$25,000	0.35%	0.28%	0.19%	0.00%	-0.15%	-0.26%	-0.48%
	$30,000	0.42%	0.33%	0.23%	0.00%	-0.17%	-0.31%	-0.57%
	...	...	...	...	...	...	...	...
	$50,000	0.70%	0.55%	0.39%	0.00%	-0.29%	-0.52%	-0.95%

Notes
1. Customer numbers sourced from publication, State of the Energy Market 2015, Australian Energy Regulator.
2. Average household bill value derived from source data about tariff changes for 2016 published by the AER (https://www.aer.gov.au/news-release/lower-network-charges-for-victorian-electricity-customers-in-2016)
3. Household impact calculated assuming that 50% of the aggregate payment/penalty is attributable to residential customers and 50% to commercial customers.

Figure A4.5: Financial impacts of f-factor associated with network of United Energy

1

Distribution Business	Customers	Average Household Bill
AusNet Services	685,194	$1,618
CitiPower	325,917	$1,242
Jemena	318,430	$1,448
Powercor	765,241	$1,588
United Energy	**658,453**	**$1,387**

United Energy

	Calculation Parameters	Unit Value($) of 1 IRU	IRU CATEGORY and VALUE: Cool - Most Extreme (Minimum)	Extreme-Cool (5th percentile)	Cool (25th percentile)	Typical (Mean)	Hot (75th percentile)	Extreme-Hot (95th percentile)	Hot - Most Extreme (Max)
2			4.06	6.32	8.12	21.04	29.90	34.40	48.64
3	**Annualised Value ($ Million)**	$10,000	$0.041	$0.063	$0.081	$0.210	$0.299	$0.344	$0.486
		$15,000	$0.061	$0.095	$0.122	$0.316	$0.449	$0.516	$0.730
		$20,000	$0.081	$0.126	$0.162	$0.421	$0.598	$0.688	$0.973
		$25,000	$0.102	$0.158	$0.203	$0.526	$0.748	$0.860	$1.216
		$30,000	$0.122	$0.190	$0.244	$0.631	$0.897	$1.032	$1.459
		...	...	...	...	...	...	...	...
		$50,000	$0.203	$0.316	$0.406	$1.052	$1.495	$1.720	$2.432
4	**Annualised Penalty/Payment ($ Million)**	$10,000	$0.170	$0.147	$0.129	$0.000	-$0.089	-$0.134	-$0.276
		$15,000	$0.255	$0.221	$0.194	$0.000	-$0.133	-$0.200	-$0.414
		$20,000	$0.340	$0.294	$0.258	$0.000	-$0.177	-$0.267	-$0.552
		$25,000	$0.425	$0.368	$0.323	$0.000	-$0.221	-$0.334	-$0.690
		$30,000	$0.509	$0.442	$0.388	$0.000	-$0.266	-$0.401	-$0.828
		...	...	...	...	...	...	...	...
		$50,000	$0.849	$0.736	$0.646	$0.000	-$0.443	-$0.668	-$1.380
5	**Annualised change in average household bill**	$10,000	$0.13	$0.11	$0.10	$0.00	-$0.07	-$0.10	-$0.21
		$15,000	$0.19	$0.17	$0.15	$0.00	-$0.10	-$0.15	-$0.31
		$20,000	$0.26	$0.22	$0.20	$0.00	-$0.13	-$0.20	-$0.42
		$25,000	$0.32	$0.28	$0.25	$0.00	-$0.17	-$0.25	-$0.52
		$30,000	$0.39	$0.34	$0.29	$0.00	-$0.20	-$0.30	-$0.63
		...	...	...	...	...	...	...	...
		$50,000	$0.64	$0.56	$0.49	$0.00	-$0.34	-$0.51	-$1.05
6	**Annualised % change in average household bill**	$10,000	0.01%	0.01%	0.01%	0.00%	0.00%	-0.01%	-0.02%
		$15,000	0.01%	0.01%	0.01%	0.00%	-0.01%	-0.01%	-0.02%
		$20,000	0.02%	0.02%	0.01%	0.00%	-0.01%	-0.01%	-0.03%
		$25,000	0.02%	0.02%	0.02%	0.00%	-0.01%	-0.02%	-0.04%
		$30,000	0.03%	0.02%	0.02%	0.00%	-0.01%	-0.02%	-0.05%
		...	...	...	...	...	...	...	...
		$50,000	0.05%	0.04%	0.04%	0.00%	-0.02%	-0.04%	-0.08%

Notes
1. Customer numbers sourced from publication, State of the Energy Market 2015, Australian Energy Regulator.
2. Average household bill value derived from source data about tariff changes for 2016 published by the AER (https://www.aer.gov.au/news-release/lower-network-charges-for-victorian-electricity-customers-in-2016)
3. Household impact calculated assuming that 50% of the aggregate payment/penalty is attributable to residential customers and 50% to commercial customers.

These figures were used to compare Incentive Rate price points under the modelled weather scenarios to the actual payment/penalty history of DBs under the original f-factor operating (2012 to 2015).

Table1 below shows information associated with the current f-factor scheme, highlighting:

- The annual benchmark against which ignition outcomes have been assessed for each DB (e.g. 256.8 for AusNet Services);
- The actual count of ignition for each DB in each of the past four years (e.g. there were 54 ignitions on the Jemena network in 2015);
- The maximum payment to each DB over the four year ([ignition count – benchmark] x $25,000) – e.g. $2.470 million paid to Powercor;
- The annual change to annual household bills attributable to that payment (e.g. $1.61 per household for Powercor); and
- The maximum penalty payable by each DB over the four years ([ignition count – benchmark] x $25,000) – e.g. $2.245 million paid by United Energy.

Figure A4.6: Ignition performance (2012 to 2015) and maximum penalties and payments

Distribution business	Benchmark target	No. of fire starts in 2012	No. of fire starts in 2013	No. of fire starts in 2014	No. of fire starts in 2015	Payment: Maximum ($m)	Payment: change in average household bill ($)	Payment: % change in average household bill ($)	Penalty: Maximum ($m)
AusNet Services	256.8	178	176	182	120	$3.420	$2.50	0.15%	**N/A**
Citipower	30.4	30	33	31	14	$0.410	$0.63	0.05%	**$0.065**
Jemena	56.8	42	91	84	54	$0.370	$0.58	0.04%	**$0.855**
Powercor	401.8	303	498	463	345	$2.470	$1.61	0.10%	**$2.405**
United Energy	124.2	85	127	214	102	$0.980	$0.74	0.05%	**$2.245**
Total	**870**	**638**	**925**	**974**	**635**				

One focus for the analysis was to identify the Incentive Rate threshold for each DB at which:

- In a cool or extremely cool year, the maximum historical payment level will be breached; and
- In a hot or extremely hot year, the maximum historical payment level will be breached

These results are shown here in **figure A4.6**.

Figure A4.7: Threshold IRU Payments and Penalties Benchmarking

Distribution business	IRU Price Benchmarking – Payment: Cool (25) Equals Historical Max	IRU Price Benchmarking – Payment: Ext. Cool (5) Equals Historical Max	IRU Price Benchmarking – Penalty: Hot (75) Equals Historical Max	IRU Price Benchmarking – Penalty: Ext. Hot (95) Equals Historical Max
AusNet Services	$49,987	$30,257	N/A	N/A
Citipower	$185,905	$144,091	$39,766	$20,220
Jemena	$139,263	$62,113	$349,956	$159,421
Powercor	$13,097	$9,168	$16,988	$9,452
United Energy	$75,849	$66,574	$253,398	$168,044

Only the Powercor results are in a range that would affect a decision on the Incentive Rate.

Value of individual ignitions

Another focus of the analysis was consideration of the value of individual ignitions, as set out below.

Figure A4.8: Value of Individual Ignitions

Geography Category	IRU Weight	Time Category	IRU Weight	IRU total	Penaly Rate Scenarios $10,000	$15,000	$20,000	$25,000	$30,000	$50,000	Ignitions (2012-14) No.	1 every . .
Low	0.2	No forecast	0.1	0.02	$200	$300	$400	$500	$600	$1,000	252	4.3 days
Low	0.2	Low-Moderate	0.2	0.04	$400	$600	$800	$1,000	$1,200	$2,000	275	4.0 days
High	1.0	No forecast	0.1	0.10	$1,000	$1,500	$2,000	$2,500	$3,000	$5,000	102	10.7 days
Low	0.2	High	0.5	0.10	$1,000	$1,500	$2,000	$2,500	$3,000	$5,000	578	1.9 days
High	1.0	Low-Moderate	0.2	0.20	$2,000	$3,000	$4,000	$5,000	$6,000	$10,000	130	8.4 days
Low	0.2	Very High	1.0	0.20	$2,000	$3,000	$4,000	$5,000	$6,000	$10,000	241	4.5 days
Low	0.2	Severe	2.0	0.40	$4,000	$6,000	$8,000	$10,000	$12,000	$20,000	52	3 weeks
Severe	4.6	No forecast	0.1	0.46	$4,600	$6,900	$9,200	$11,500	$13,800	$23,000	111	9.9 days
High	1.0	High	0.5	0.50	$5,000	$7,500	$10,000	$12,500	$15,000	$25,000	201	5.4 days
Low	0.2	Code Red	5.0	0.50	$5,000	$7,500	$10,000	$12,500	$15,000	$25,000	0	Not recorded
Low	0.2	Extreme	3.5	0.70	$7,000	$10,500	$14,000	$17,500	$21,000	$35,000	13	12 weeks
Severe	4.6	Low-Moderate	0.2	0.92	$9,200	$13,800	$18,400	$23,000	$27,600	$46,000	105	10.0 days
High	1.0	Very High	1.0	1.00	$10,000	$15,000	$20,000	$25,000	$30,000	$50,000	72	2 weeks
Extreme[1]	19.8	No forecast[1]	0.1	1.00	$10,000	$15,000	$20,000	$25,000	$30,000	$50,000	4	9 months
High	1.0	Severe	2.0	2.00	$20,000	$30,000	$40,000	$50,000	$60,000	$100,000	17	2 months
Severe	4.6	High	0.5	2.30	$23,000	$34,500	$46,000	$57,500	$69,000	$115,000	216	5.1 days
High	1.0	Extreme	3.5	3.50	$35,000	$52,500	$70,000	$87,500	$105,000	$175,000	7	5 months
Extreme	19.8	Low-Moderate	0.2	3.96	$39,600	$59,400	$79,200	$99,000	$118,800	$198,000	6	6 months
Severe	4.6	Very High	1.0	4.60	$46,000	$69,000	$92,000	$115,000	$138,000	$230,000	98	11.2 days
High	1.0	Code Red	5.0	5.00	$50,000	$75,000	$100,000	$125,000	$150,000	$250,000	0	Not recorded
Severe	4.6	Severe	2.0	9.20	$92,000	$138,000	$184,000	$230,000	$276,000	$460,000	19	2 months
Extreme	19.8	High	0.5	9.90	$99,000	$148,500	$198,000	$247,500	$297,000	$495,000	22	7 weeks
Severe	4.6	Extreme	3.5	16.10	$161,000	$241,500	$322,000	$402,500	$483,000	$805,000	4	9 months
Extreme	19.8	Very High	1.0	19.80	$198,000	$297,000	$396,000	$495,000	$594,000	$990,000	8	4.5 months
Severe	4.6	Code Red	5.0	23.00	$230,000	$345,000	$460,000	$575,000	$690,000	$1,150,000	0	Not recorded
Extreme	19.8	Severe	2.0	39.60	$396,000	$594,000	$792,000	$990,000	$1,188,000	$1,980,000	3	1.5 years
Extreme	19.8	Extreme	3.5	69.30	$693,000	$1,039,500	$1,386,000	$1,732,500	$2,079,000	$3,465,000	1	3 years
Extreme	19.8	Code Red	5.0	99.00	$990,000	$1,485,000	$1,980,000	$2,475,000	$2,970,000	$4,950,000	0	Not recorded

Note 1: An ignition occurring on a 'no forecast' day, cannot have an IRU score exceeding 1.

Appendix 5 – Asymmetric Method

In an asymmetric incentive scheme a threshold for performance is set and a penalty imposed if a business does not meet the threshold performance level. An example of such a scheme is the GSL Payments Scheme referred to in Appendix 1. Under the GSL scheme, consumers receive a payment if they suffer unplanned interruptions exceeding a set number of hours annually, or if unplanned sustained interruptions exceed a given number. The scheme is intended to improve the reliability for the **worst served** customers. The threshold is set at a level intended to provide an incentive to address the more extreme low levels of reliability experienced by a small number of customers.

This incentive to improve reliability for the worst served customers is paid for by all customers and is therefore a cross-subsidy. Distribution businesses are permitted to earn additional revenue to cover the payments expected to be made under the GSL scheme. The businesses have an incentive to at least maintain the current level of performance, and to improve performance where it is economically efficient to do so, to reduce GSL payments.

To develop an asymmetric scheme to incentivise bushfire risk reduction, the performance measure and the threshold must be defined.

As outlined in Section 4, a weighted fire start measure (the IRU approach) is the favoured method to set this threshold.

Threshold

In establishing a threshold IRU level two factors need to be considered:

- The degree and nature of the incentive provided to the businesses; and
- The cost of scheme to consumers, both absolutely and in relation to the achievement of bushfire risk reduction benefits.

An inevitable outcome of weighting fire starts to reflect bushfire risk is that IRU performance measures will be highly influenced by weather, and thus highly variable year to year. This has important implications for both of the above factors.

If the threshold is set at zero or a low level, the businesses will be strongly motivated to take steps to minimise IRU results regardless of weather. This would involve both refocussing existing expenditures as well as undertaking additional expenditure where it is economic. This will, however, impose additional costs on Victorian consumers. Currently distribution businesses are funded to undertake works to reduce fire starts but not eliminate them. Consequently with a low threshold IRU scheme they will always incur penalties and would receive a revenue allowance to cover the expected costs. As the level of penalties is weather dependent it will be difficult to estimate these costs and the likely amount of the allowance is unknown.

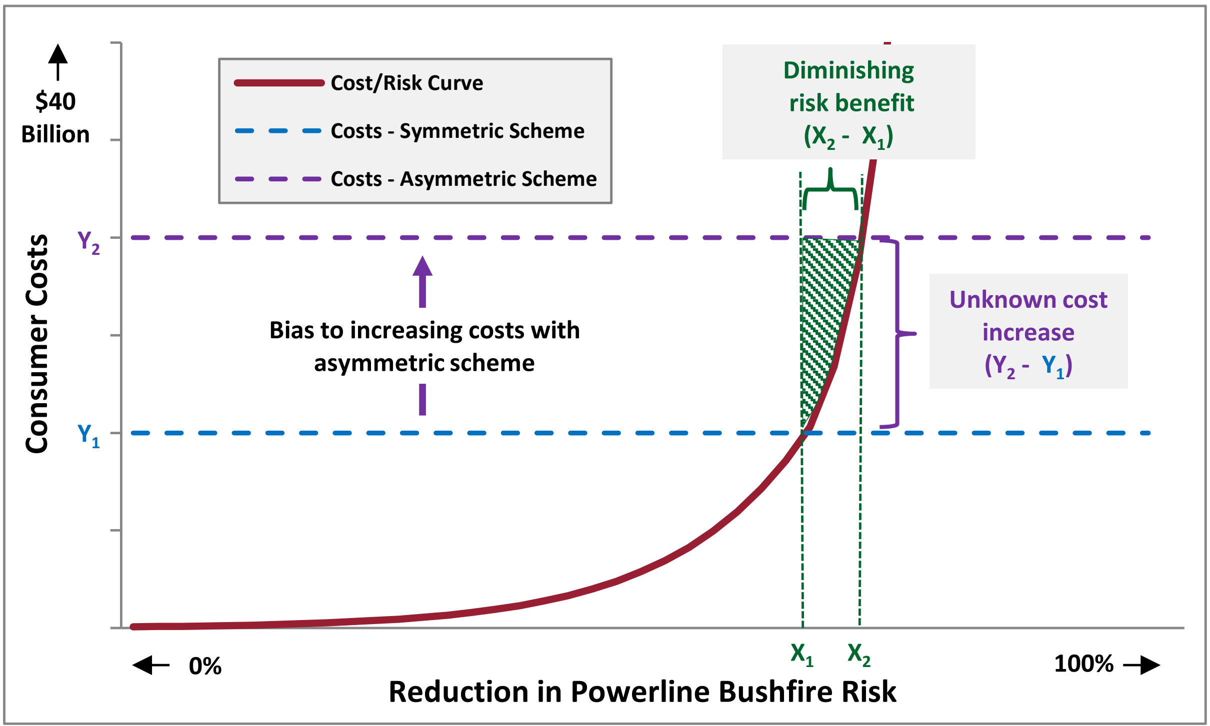
If the threshold is set at a high IRU level, then businesses will be incentivised to focus on bushfire risk reduction in years when they are at risk of exceeding their threshold. As penalties would be expected to be incurred less often, consumer costs would be lower, but still difficult to estimate.

Business Response to Asymmetric Method

Setting a low or zero IRU threshold level could be seen to imply a new safety standard. Distribution businesses may increase capital and operational expenditure bids to meet this implied new standard. Both the safety and economic regulators would be in a difficult position to adjudicate such claims. This leaves consumers exposed to a higher costs as businesses may incur capex and opex to a level which is beyond that currently accepted as achieving the optimum fire reduction benefit.

This is shown conceptually below. The current cost structure (which would apply under an asymmetric scheme) is shown as Y1 and the bias towards a higher cost structure shown as Y2. This would lead to a diminishing additional risk benefit at a higher cost to that achieved to date:

Figure A5.1: Asymmetric mechanism cost vs risk reduction benefit



Asymmetric with Mitigants

In light of the above, measures may be applied to an asymmetric scheme to limit the impact of weather.

Restrict Penalties To Exceeding Multi-Year Threshold

Businesses' ignition penalties could be restricted to performance in excess of a set IRU threshold. The threshold would be expended as IRUs over multiple years.

At first glance, this option seems to provide an effective and fair way of limiting the businesses' liabilities. Very hot years are a statistical minority. Consequently, in most years businesses will accrue a smaller penalty or none under this approach.

The effectiveness of this approach lies in creating an incentive for businesses to minimise penalties beyond what they presently incur.

The risk of this approach is that it is likely to fail to drive businesses to reduce risk beyond their current practice through using existing funding efficiently.

Without the balancing effect of incentive payments, this option still exposes businesses to non-recoverable liabilities. The extent of these liabilities will be dependent on weather variability. It is likely that the businesses may make a case for significant further network investment under this option. This approach is not recommended.

Impose A Maximum IRU Liability Cap

Alternatively, the reverse approach may be taken and a cap introduced which eliminates liability beyond a set threshold of probability which does not return investment. Such a cap provides a means to discourage over-investment for the cumulative maximum risk exposure which has a low probability. This cap could be established by limiting the maximum aggregate IRUs each business could accrue annually or over five year periods.

However, this would blunt the incentive of distribution businesses to minimise bushfire risk in extreme weather periods. This would be counter to the intention of the initiative. Consequently it is not recommended.

Conclusion

The key challenges for an asymmetric incentive scheme are:

- Setting and defending a threshold level; and
- Managing the cost to consumers.

For these reasons, an asymmetric approach either with or without mitigants is not preferred.

Appendix 6 – Proposed Revised f-factor Order-in-Council

National Electricity (Victoria) Act 2005

F-FACTOR SCHEME ORDER 2016

Order in Council

The Governor in Council, under section 16C of the **National Electricity (Victoria) Act 2005**, makes the following Order:

1. Purpose
The purpose of this Order is to revoke the previous f-factor scheme Order that commenced on 23 June 2011, and to provide for the establishment of a new f-factor scheme that targets incentives towards ignitions that pose the greatest risk of harm through the use of ignition risk units (***IRU***s).

2. Commencement
This Order comes into effect on the day it is published in the Victoria Government Gazette.

3. Revocation of previous f-factor Order
The f-factor scheme Order published in the Victoria Government Gazette No. G 25 on 23 June 2011, and dated 21 June 2011, is revoked.

4. Interpretation
(1) In this Order and unless the context otherwise requires–

2016-2020 regulatory control period means the regulatory control period 1 January 2016 to 31 December 2020;

Central Plan Office means the Central Plan Office of the Department of Environment, Land, Water and Planning;

electric line construction area has the same meaning as it has in the Electricity Safety (Bushfire Mitigation) Regulations 2013;

f-factor scheme means an incentive scheme that provides incentives for Distribution Network Service Providers to reduce the risk of fire starts and reduce the risk of loss or damage caused by fire starts;

fire danger rating means a forecast rating announced by the Bureau of Meteorology that represents the fire danger index predicted for a specific area in which a fire is located;

fire start – see clause 5;

fire start report – see clause 6;

hazardous bushfire risk area has the same meaning as it has in the **Electricity Safety Act 1998**;

IRU means ignition risk unit;

IRU amount **–** see clause 11;

IRU target – see clause 10;

polyphase electric line has the same meaning as it has in the Electricity Safety (Bushfire Mitigation) Regulations 2013;

previous f-factor scheme Order means the f-factor scheme Order published in the Victoria Government Gazette No. G 25 on 23 June 2011, and dated 21 June 2011;

relevant Distribution Network Service Provider, for the purpose of calculating a revenue adjustment, means the particular Distribution Network Service Provider for whom the revenue adjustment is being calculated;

relevant distribution system, for the purpose of calculating a revenue adjustment, means the distribution system that is owned, operated or controlled by the relevant Distribution Network Service Provider;

relevant financial year, for the purpose of calculating a revenue adjustment under clause 9, an IRU target or an IRU amount, means the financial year ending 18 months prior to the commencement of the regulatory year for which the revenue adjustment is being calculated;

> *Example: For the regulatory year commencing 1 January 2020, the relevant financial year is the 2017/18 financial year.*

required clearance space means a clearance space required under the Code of Practice for Electric Line Clearance as prescribed pursuant to Part 8 of the **Electricity Safety Act 1998**;

> *Note: See regulation 7 and Schedule 1 to the Electricity Safety (Electric Line Clearance) Regulations 2015.*

revenue adjustment means a revenue adjustment under clause 9 or clause 13, and may be positive or negative;

tree has the same meaning as it has in the **Electricity Safety Act 1998** and includes (without limitation) a hazard tree within the meaning of section 86B of that Act.

> *Note: tree, as defined in section 3 of the **Electricity Safety Act 1998**, includes vegetation.*

validation report **–** see clause 7.

(2) Unless the context otherwise requires, words and expressions used in the National Electricity (Victoria) Law or the National Electricity Rules have the same meaning in this Order as they have in that Law or those Rules.

> *Note: Used in this Order are distribution system, distribution consultation procedures, framework and approach paper, national electricity objective, publish, regulatory control period, regulatory year and relevant entity which are all defined in either the National Electricity (Victoria) Law or the National Electricity Rules.*

5. What is a fire start?

(1) A fire start is any fire –

(a) that starts in or originates from a distribution system;

(b) started by any tree, or part of a tree, falling upon or coming into contact with a distribution system;

(c) started by any person, bird, reptile or other animal coming into contact with a distribution system;

(d) started by lightning striking a distribution system or a part of a distribution system;

(e) started by any other thing forming part of or coming into contact with a distribution system; or

(f) otherwise started by a distribution system.

(2) For the purposes of clause 5(1)(b), it is irrelevant whether the tree or part of the tree that fell upon or came into contact with the distribution system is or was, before the fire start, inside or outside a required clearance space.

6. Fire start reports

(1) The AER may request a Distribution Network Service Provider to provide a fire start report in respect of a financial year.

Note: See section 16G of the ***National Electricity (Victoria) Act 2005****.*

(2) The AER's request must be in writing and must specify when the fire start report is to be provided which shall be no later than 30 September in each year.

(3) A fire start report must –

(a) be in electronic format;

(b) be in the form that the AER from time to time specifies;

(c) be signed by a director of the Distribution Network Service Provider, or other officer of the Distribution Network Service Provider approved by the AER;

(d) if the Distribution Network Service Provider is the service provider in relation to more than one distribution system, distinguish between distribution systems;

(e) list all fire starts for a financial year, stating in each case and where known;

(i) what kind of fire start it was;

(ii) the date, time and latitude and longitude for each fire;

(iii) the unique identification number of the pole and polyphase electric line nearest to the fire start;

(iv) the voltage of the electric line in which the ignition occurred;

(v) the estimated value of the fire start expressed in IRUs, calculated in accordance with this Order;

(f) state whether the fire was reported to a relevant entity;

(g) calculate the total IRU amount for the financial year on the basis of information contained in the fire start report, in accordance with this Order;

(h) include such other information as the AER may from time to time specify;

(i) include an independent audit of the fire start report undertaken by an external auditor;

(i) stating, in the auditor's opinion, whether the information contained in the fire start report is accurate and reliable; and

(ii) which is acceptable to the AER.

Note: Clause 5(1) specifies the various kinds of fire starts.

(4) The AER may develop and publish guidelines as to the form of a fire start report and information to be included in a fire start report.

(5) The AER must publish a fire start report.

(6) This clause does not require, prevent or limit the AER serving a regulatory information instrument.

> *Note: See also section 16E(1)(d) of the* ***National Electricity (Victoria) Act 2005*** *which has the effect that the AER may also make and serve regulatory information instruments for the purposes of this Order.*

7. Validation of fire start reports by Energy Safe Victoria

(1) The AER may request Energy Safe Victoria to conduct and provide a validation of a fire start report.

> *Note: See section 7A of the* ***Energy Safe Victoria Act 2005****.*

(2) The AER's request must be in writing and must specify when the report on the validation (the ***validation report***) is to be provided which shall be no later than 30 November in each year.

(3) A validation report –
   - (a) must be in writing;
   - (b) must include an assessment of the accuracy of the information provided in the fire start report pursuant to clauses 6(3)(d) – (f) and (h);
   - (c) must verify the estimate of the IRU amount for the financial year provided under clause 6(3)(g);
   - (d) must include such other information as the AER may from time to time specify; and
   - (e) may otherwise be in the nature of a due diligence inquiry.

(4) In a validation, Energy Safe Victoria may have regard to–
   - (a) any information (including information given in confidence) in the possession or control of Energy Safe Victoria;

> *Note: See section 7A(1) of the* ***Energy Safe Victoria Act 2005****.*

   - (b) any information provided to Energy Safe Victoria by the AER for the purposes of the validation, which may include information obtained pursuant to section 16G of the ***National Electricity (Victoria) Act 2005***, clause 6 or a regulatory information instrument; and
   - (c) any further information that Energy Safe Victoria may request a Distribution Network Service Provider to provide for the purposes of the validation.

(5) The AER must publish a validation report, and must notify the Distribution Network Service Provider whose fire start report is the subject of the validation, of the publication of the validation report.

(6) Within 15 business days of being notified by the AER under subclause (5) of the publication of the validation report, the Distribution Network Service Provider may make submissions to the AER in respect of the validation.

(7) The AER may provide any submissions referred to in subclause (6) to Energy Safe Victoria, and may request Energy Safe Victoria to conduct and provide a revised validation responding to those submissions.

(8) A request under subclause (7) must be in writing and must specify when the revised validation report is to be provided which shall be no later than 15 February in the year following the year in which the validation was first provided.

(9) A revised validation must comply with subclauses (3) and (4).

(10) The AER must publish a revised validation report, and must notify the Distribution Network Service Provider whose fire start report is the subject of the validation, of the publication of the revised validation report.

(11) This clause does not require, prevent or limit the AER serving a regulatory information instrument.

8. F-factor scheme determination

(1) The AER must make an f-factor scheme determination in accordance with this Order, in respect of each regulatory control period.

*Note: Pursuant to section 16E(1)(a) and (b) of the **National Electricity (Victoria) Act 2005**, the AER must perform or exercise its functions and powers under this Order in a manner that will or is likely to contribute to the achievement of the national electricity objective.*

(2) An f-factor scheme determination made in respect of the 2016-2020 regulatory control period must be made no later than 30 September 2018.

(3) An f-factor scheme determination made in respect of a regulatory control period subsequent to the 2016-2020 regulatory control period must be made so as to take effect at the commencement of the regulatory control period.

(4) The AER must publish an f-factor scheme determination. An f-factor scheme determination may be published as part of a distribution determination for the relevant regulatory control period.

9. Revenue adjustment

(1) An f-factor scheme determination must establish an f-factor scheme under which there is a revenue adjustment for each Distribution Network Service Provider.

(2) A separate revenue adjustment must be made for each Distribution Network Service Provider for the 2015, 2016 and 2017 regulatory years in accordance with the previous f-factor scheme Order, as if that Order had not been revoked.

(a) A determination made under the previous f-factor scheme Order continues in force for the purposes of this subclause (2).

(3) A separate revenue adjustment must be made for each Distribution Network Service Provider for the 2018 regulatory year, in accordance with clause 13.

(4) A separate revenue adjustment must be made for each Distribution Network Service Provider for the 2019 regulatory year, and for each subsequent regulatory year, in accordance with the following formula–

$$\boldsymbol{Revenue\ adjustment} = \boldsymbol{Incentive\ rate} \times (\boldsymbol{IRU\ target} - \boldsymbol{IRU\ amount})$$

where –

(i) ***Revenue adjustment*** is the adjustment to the revenue for the relevant Distribution Network Service Provider for the regulatory year;

(ii) ***Incentive rate*** is $15,000;

(iii) ***IRU target*** is the IRU target applicable for the relevant financial year for the relevant Distribution Network Service Provider, as specified in clause 10; and

(iv) ***IRU amount*** is the number of IRUs accrued in relation to the relevant distribution system in the relevant financial year, determined in accordance with clause 11.

Note: See the definition of "relevant financial year" in clause 4. By reason of that definition, the revenue adjustment for a regulatory year is made on *the basis of the IRU target and IRU amount for the relevant financial year, which ends 18 months prior to the commencement of the regulatory year.*

(5) An f-factor scheme determination may specify how the revenue adjustment is to occur. For the avoidance of doubt and without limitation, the revenue adjustment may –
  (a) be by way of a pass through;
  (b) be by way of an annual adjustment to be included in the control mechanism for a distribution determination;
  (c) be expressed as a percentage adjustment to revenue;
  (d) take effect over more than one regulatory year; and
  (e) take effect over more than one regulatory control period.

(6) For the purposes of a distribution determination, a revenue adjustment is not revenue of, expenditure by or a cost of a Distribution Network Service Provider unless the AER determines otherwise.

(7) For the purposes of subclauses (3) and (4), the AER may have regard to any determination made under the previous f-factor scheme Order.

10. IRU target

(1) The IRU targets for each Distribution Network Service Provider for each of the following relevant financial years are:

Relevant financial year	Distribution Network Service Provider				
	Ausnet	**Citipower**	**Jemena**	**Powercor**	**United Energy**
FY 2016/17	247.7	3.4	9.7	468.0	22.3
FY 2017/18	247.7	3.4	9.7	468.0	22.3
FY 2018/19	247.7	3.4	9.7	468.0	22.3
FY 2019/20	214.3	3.4	9.7	412.8	22.3

Note: See the definition of "relevant financial year" in clause 4. By reason of that definition, the revenue adjustment for a regulatory year is made on the basis of the IRU target for the relevant financial year, which ends 18 months prior to the commencement of the regulatory year.

Therefore, the IRU target for FY2016/17 is used to calculate the revenue adjustment for 2019, the IRU target for FY2017/18 is used to calculate the revenue adjustment for 2020, and so on.

(2) The IRU targets for relevant financial years after the 2019/20 financial year may be published by the Minister by notice in the Victoria Government Gazette.

(3) If the Minister does not publish the IRU target for a relevant financial year under subclause (2), the IRU target for that financial year is the same as the IRU target for the 2019/20 financial year as specified in the table in subclause (1).

11. IRU amount

(1) Subject to subclauses (3) and (5), the AER must calculate the IRU amount accrued by the relevant Distribution Network Service Provider in the relevant financial year in the relevant distribution system in accordance with the following formula –

$$\boldsymbol{IRU\ amount} = \sum_{f=1}^{n} \boldsymbol{danger\ multiplier_f} \times \boldsymbol{location\ multiplier_f}$$

where *n* is the total number of fire starts determined under clause 12 to have occurred in the relevant distribution system during the relevant financial year and –

where *f* represents each individual fire start that occurred in the relevant distribution system during the relevant financial year and –

(a) ***danger multiplier*** is, for fire start *f* –
   (i) 0.1 where no fire danger rating is forecast at the time the fire started;
   (ii) 0.2 where the fire danger rating is low-moderate at the time the fire started;
   (iii) 0.5 where the fire danger rating is high at the time the fire started;
   (iv) 1 where the fire danger rating is very high at the time the fire started;
   (v) 2 where the fire danger rating is severe at the time the fire started;
   (vi) 3.5 where the fire danger rating is extreme at the time the fire started; or
   (vii) 5 where the fire danger rating is Code Red at the time the fire started.

(b) ***location multiplier*** is, for fire start *f* –
   (i) 0.2 where the fire start occurred in an area that is not a hazardous bushfire risk area; or

if the fire start occurred in a hazardous bushfire risk area, the highest applicable value of–

   (ii) 1;
   (iii) 4.6 where the fire start occurred in an area delineated and bounded in red as represented on the plan lodged in the Central Plan Office and numbered LEGL./16-354; or
   (iv) 19.8 where the fire start occurred in an electric line construction area.

Note: for fire starts that occurred in a hazardous bushfire risk area, the location multiplier values are not mutually exclusive and the highest applicable value applies. For example, if a fire start occurs in an area that is an electric line construction area (ie clause 11(1)(b)(iv) applies) and at the same time, that area also falls within an area delineated and bounded in red on plan LEGL./16-354 (ie clause 11(1)(b)(iii) applies), the location multiplier value would be 19.8 not 4.6 because 19.8 is the highest value applicable to that fire start.

(2) In determining the IRU amount for a financial year, the AER may have regard to the reports, submissions and information specified in clause 12(1). This subclause does not limit the matters that the AER may have regard to in determining the IRU amount.
(3) If the AER considers that the reports, submissions and information specified in clause 12(1) cannot be used, or are not suitable to be used, to determine the IRU amount, the AER may –
   (a) determine the IRU amount to be 1.5 times the IRU target; or
   (b) determine the IRU amount to be some other amount, having regard to the information referred to in clause 12(2).
(4) The AER must consult with the relevant entities in any case where the IRU amount is to be determined in accordance with subclause (3).
(5) Notwithstanding anything in this clause, if no fire danger rating is forecast at the time that a fire started (ie subclause (1)(a)(i) applies) and the fire start occurred in an electric line

construction area (ie subclause (1)(b)(iv) applies), the value of the danger multiplier times the location multiplier for that individual fire start is 1.

12. Number of fire starts

(1) In determining the IRU amount or the number of fire starts that occurred in a relevant distribution system for a financial year, the AER may have regard to –

(a) a fire start report;

(b) a validation report (or revised validation report);

(c) a Distribution Network Service Provider's submissions provided under clause 7;

(d) any information obtained pursuant to a regulatory information instrument; and

(e) any information relating to fire starts the AER receives from a relevant entity pursuant to a request made under section 16G of the **National Electricity (Victoria) Act 2005** and clause 6.

(2) If there is no or incomplete data for fire starts for any financial year, or the AER considers the data or any part thereof inadequate for any reason, the AER may use –

(a) the number of fire starts that occurred in relation to the relevant distribution system in other financial years;

(b) the number of fire starts that occurred in relation to a reasonably comparable distribution system; and

(c) estimates,

which may be determined having regard to any information the AER considers appropriate, including the reports, submissions and information specified in subclause (1).

(3) Subclause (2) does not prevent the AER using all or any part of the incomplete or inadequate data.

(4) The AER must consult with the relevant entities when determining the number of fire starts.

(5) This clause does not require, prevent or limit the AER serving a regulatory information instrument.

13. Transitional arrangements for 2018 revenue adjustment

(1) A separate revenue adjustment must be made for each Distribution Network Service Provider for the 2018 regulatory year in accordance with the following formula–

$$\boldsymbol{Transitional\ adjustment} \\ = \boldsymbol{Transitional\ rate} \times (\boldsymbol{Transitional\ target} - \boldsymbol{Number\ of\ fires})$$

where –

(i) ***Transitional adjustment*** is the adjustment to the revenue for the relevant Distribution Network Service Provider for the 2018 regulatory year;

(ii) ***Transitional rate*** is $25,000;

(iii) ***Transitional target*** is the number of fire starts for the first six months of the 2016 regulatory year as specified in the following table:

	Distribution Network Service Provider				
	Ausnet	**Citipower**	**Jemena**	**Powercor**	**United Energy**
Transitional target (fire starts)	109.0	18.6	50.2	237.2	98.0

(iv) ***Number of fires*** is the number of fire starts determined under clause 12 to have occurred in the first six months of the 2016 regulatory year.

14. Consultation procedures

(1) The distribution consultation procedures set out in clause 6.16 of the National Electricity Rules (as amended by this clause) are taken to apply and must be followed by the AER when it makes a decision to vary a distribution determination pursuant to clause 6.13A of the National Electricity Rules.

Note: Clause 6.13A is inserted in the National Electricity Rules by section 16E(2)(a) of the ***National Electricity (Victoria) Act 2005****.*

(2) In making an f-factor scheme determination, the AER must follow –
- (a) the distribution consultation procedures set out in clause 6.16 of the National Electricity Rules as amended by this clause; or
- (b) the procedures for making a distribution determination set out in clauses 6.8 to 6.11 inclusive and clause 6.12.2(a) of the National Electricity Rules, as amended by this clause,

which procedures and clauses are all taken to apply.

(3) For the purposes of subclauses (1) and (2)(a), clause 6.16 of the National Electricity Rules is taken to be amended as follows –
- (a) Clause 6.16(b) is replaced with –
  "The AER must *publish*:
  - (1) its proposal for the f-factor scheme determination or variation of a distribution determination;
  - (2) an explanatory statement that sets out the provisions of the **F- factor Scheme Order in Council 2016** and the *Rules* under or for the purposes of which the f-factor scheme determination, or variation of the distribution determination, is required and the reasons for the f-factor scheme determination or variation; and
  - (3) an invitation for written submissions on the proposal.";
- (b) The invitation for written submissions referred to in clause 6.16(b)(3) must be sent to–
  - (i) affected Distribution Network Service Providers;
  - (ii) the Minister; and
  - (iii) the relevant entities;
- (c) The references to "final decision" in clauses 6.16(e), 6.16(f) and 6.16(g) are to be read as references to an f-factor scheme determination or a decision to vary a distribution determination as the case may be; and
- (d) All further amendments necessary or consequential on the amendments in paragraphs (a) to (c) of this subclause are made.

(4) Subclause (3)(a) does not limit the documents or information that the AER may publish.

(5) Subclause (3)(b) does not limit who the AER may invite submissions from or consult with.

(6) For the purposes of subclause (2)(b), clauses 6.8 to 6.11 and clause 6.12.2(a) of the National Electricity Rules are taken to be amended as follows –

(a) All references to "distribution determination" in clauses 6.8 to 6.11 of the National Electricity Rules are to be read as a reference to an f-factor scheme determination;

(b) The framework and approach paper must set out the AER's likely approach (together with its reasons for that approach) to an f-factor scheme determination;

(c) Clauses 6.8.1(b) and (g) do not apply;

(d) Clause 6.8.1A does not apply;

(e) Clause 6.8.2(a) is replaced with –

"(a) A Distribution Network Service Provider must, at the time required to do so under paragraph (b), submit a regulatory proposal to the AER with respect to an f-factor scheme which proposal must comply with the **F-factor Scheme Order in Council 2016**";

(f) Clauses 6.8.2(c)(1) to (5) and (7) do not apply;

(g) Clauses 6.8.2(d1) and (d2) do not apply;

(h) All references to "proposed *tariff structure statement*" and "separate *tariff structure statement*" in clause 6.8.2 are deleted;

(i) The reference to "the Rules" in rule 6.9.1(a) and the second reference to "the Rules" in clause 6.9.3(a) are to be read as references to this Order;

(j) Clause 6.9.1(a)(2) is deleted;

(k) All references to "proposed *tariff structure statement*" in clauses 6.9.1 and 6.9.2 are deleted;

(l) Clauses 6.9.3(a)(2) and (4) are deleted;

(m) All references to "proposed *tariff structure statement*" in clause 6.9.3 are deleted;

(n) References in clauses 6.10.2(a)(3) and 6.11.2(3) to the inclusion of the constituent decisions are deleted;

(o) All references to "proposed *tariff structure statement*" in clauses 6.10 and 6.11 are deleted;

(p) Clause 6.12.2(a)(2)(i) is deleted; and

(q) All further amendments necessary or consequential on the amendments in paragraphs (a) to (p) of this subclause are made.

Dated [INSERT DATE]
Responsible Minister
HON. LILY D'AMBROSIO MP

Minister for Energy, Environment, Climate Change and Suburban Development