

REFCL information session

FAQs

Consultation

Two information sessions were held during Energy Safe Victoria's rapid earth fault current limiter (REFCL) operations public consultation. Here are the questions asked during those sessions, along with our answers. Energy Safe will add to this if additional questions are emailed to consultation@energysafe.vic.gov.au.

Please note, that the questions have been edited for brevity and clarity.

Rapid earth fault current limiter (REFCL) operations

Q: Do REFCLs require power to operate, and will they fail to operate if they lose power?

A: REFCLs do require power to operate. That power comes from the zone substation where REFCL protection is installed and the powerlines it protects originate. Therefore, if the REFCL is without power the powerlines will also be without power, so there will be nothing for them to protect.

Q: Are REFCLs monitored remotely through a mobile network?

A: Yes. The electricity distribution businesses AusNet, Jemena, Powercor and United Energy monitor the REFCL's remotely.

Q: What level of risk reduction is expected for a REFCL installation and how reliable are these devices?

A: The [2015 Regulatory Impact Statement](#) for the 2016 amendment to the *Electricity Safety (Bushfire Mitigation) Regulations 2013* estimated that REFCLs would reduce overall bushfire ignition risk for polyphase electric lines by 48-60%. Energy Safe's review of over 5,000 faults indicates that REFCL protection is reducing bushfire ignition risk. In 2024, Energy Safe will commission a functional performance review to undertake a detailed analysis of the fault and incident data collated since REFCLs were first commissioned to confirm the actual risk reduction achieved.

REFCL protection devices are made up of a large coil and power electronic devices. The coil is a simple passive device that is highly reliable. The coil performs most of the work to limit fault energy and thus reduce the risk of fire ignitions, electrocution and arc-flash burns. The power electronics are less reliable and are used to reduce the residual energy further to achieve the extremely low fault currents necessary to achieve the *required capacity* performance standard prescribed in the legislation.

REFCL protection is not duplicated, so if there is a component failure, which will most likely involve the power electronics, the electricity distribution business can still operate with only the coil, which will still deliver a significant reduction in fault energy compared to traditional protection. Alternatively, or in the unlikely event of a fault involving the coil, the electricity distribution business can bypass REFCL protection entirely and revert to traditional fault protection.

Q: What is the accepted ‘spurious trip’ rate for a REFCL installation?

A: There is no single spurious trip rate available for REFCL protection. REFCL protection can become unreliable when the network it protects becomes unbalanced or when the network losses become too large, such as when large quantities of underground cable are added to a network. Both factors are within the control of electricity distribution businesses to manage as part of their ongoing network planning and augmentation activities. The network can also become unbalanced due to network switching or following a fault, and losses can increase during wet weather. In these cases, the electricity distribution business will desensitise REFCL protection to avoid spurious tripping until the cause of the unbalance or increased network losses has passed. During this time REFCLs will still deliver a significant reduction in energy should a fault occur.

Anecdotal reports from electricity distribution businesses indicate that spurious trips are rare, which Energy Safe would expect given that they now have significant experience in managing the factors that can lead to spurious trips.

Q: How do neighbourhood batteries improve REFCL performance?

A: Neighbourhood batteries are unrelated to REFCL performance. Neighbourhood batteries were mentioned in the information session in relation to power outages due to storms. In these cases, neighbourhood batteries that provide stand-alone power (i.e. able to operate in isolation from the electricity grid) can provide power to communities that would otherwise be without electricity.

Q: How mature is the technology for REFCL compatible automatic circuit reclosers (ACR)? And does this fully solve the reliability issues?

A: When the REFCL program began, REFCL-compatible line devices were not commercially available, but some have since emerged. The underlying technology used in REFCL protection has existed for over 100 years, so REFCL-compatible protection algorithms and the protection devices themselves are well established. Combining them and establishing bespoke automated powerline restoration systems will take time to implement and the electricity distribution businesses have been gradually doing this. Energy Safe is encouraging electricity distribution businesses to accelerate the pace at which they are replacing or upgrading existing line protection devices with REFCL-compatible versions to address this underlying cause of reliability issues, thus enabling REFCL-protection to remain in service at all times to maximise the safety benefits to the community.

REFCL operation by distribution businesses

Q: Networks are currently using REFCLs to explain more outages. Is this acceptable?

A: REFCL protection isn't causing more faults. Some adverse supply reliability impacts have been experienced on a small number of powerlines that typically had poor reliability prior to the implementation of REFCLs. This is due to their network configuration and environmental factors; such as powerlines with limited switching capability that run through forests.

Energy Safe expects the potential adverse impacts on supply reliability to diminish over time as the distribution businesses deploy REFCL compatible line devices and augment their networks to address enduring reliability issues. Energy Safe also expects electricity distribution businesses to continually be looking at ways to improve their asset and vegetation inspection and maintenance programs, and the implementation of new fault anticipation technology, to reduce the number of faults that occur thereby impacting supply to customers.

Q: What is being done to make distribution businesses upgrade further devices to improve fault finding time and less disruption to supply? This is especially important nowadays as all communications etc rely heavily on power supply and even emergency services need reliable communications.

A: The Australian Energy Regulator (AER) administers the Service Target Performance Incentive Scheme (STPIS) providing networks with incentives for maintaining and improving network performance. Energy Safe expects any potential adverse impacts on supply reliability to diminish over time as the distribution businesses deploy REFCL compatible automatic circuit reclosers and fault locating devices.

Q: Why are the REFCL compatible devices not installed as a requirement?

A: The *Electricity Safety Act 1998* (Vic) and associated regulations required the distribution businesses to install REFCLs at 45 zone substations supplying the highest bushfire consequence areas of Victoria by specified dates. There was no specification to install REFCL compatible devices.

Q: Do the distribution businesses currently give any sort of notification to Energy Safe or customers when a REFCL is active?

A: Energy Safe expects the electricity distribution businesses to review and update their bushfire mitigation plan (BMP) to explain how they will operate REFCLs to protect the community. Furthermore, these electricity distribution businesses are required to make their accepted BMP publicly available on their website. Electricity distribution businesses also report on REFCL in-service times and operations to Energy Safe.

Energy Safe Victoria expectations

Q: What are the published technical standards for REFCL design, implementation and testing to meet the Energy Safe Victoria requirements?

A: There are no standards that apply to REFCL protection. Electricity distribution businesses must comply with their general duty, pursuant to section 98 of the *Electricity Safety Act 1998* (Vic), which requires them to minimise hazards and risks to the safety of people, property damage and bushfire danger as far as practicable. The REFCL operations consultation paper of January 2024 sets out Energy Safe's preliminary views of how electricity distribution businesses may be able to comply with this duty in regard to REFCL protection.

Q: How long do you expect for the reliability performance to return to pre REFCL levels?

A: This will depend on the actions of electricity distribution businesses. If Energy Safe's preliminary view remains unchanged, electricity distribution businesses must include plans and timelines to address the underlying cause of the reliability issues in their electricity safety management schemes (ESMS) or bushfire mitigation plans (BMP). Energy Safe may have regard to the reliability and security of electricity supply when considering an ESMS or BMP and can take enforcement action for non-compliance with their accepted ESMS or BMP.

Q: What is Energy Safe proposing to change with respect to the current operating regime?

A: The REFCL operations consultation paper of January 2024 sets out Energy Safe's preliminary views. Consultation on the paper is expected to close by 8 July 2024.

Faults and power outages

Q: How did we end up with the situation that REFCLs are causing more outages?

A: Due to the incompatibility of existing line protection devices with REFCL protection, a fault type that would previously have occurred may still occur but now impact more customers. Energy Safe expects electricity distribution businesses to rectify the underlying issue over the shortest practicable timeframe.

Q: Are there any statistics available about potential outage times with REFCL online at all times v legacy protection in service on low-risk days?

A: There are no statistics that are publicly available. In 2024, Energy Safe will commission a functional performance review to undertake a detailed analysis of the fault and incident data collated since REFCLs were first commissioned to confirm the actual risk reduction achieved.

Q: Can you comment on the faults that showed up in the ‘strengthening’ phase of the system prior to REFCL commissioning? Are they separate to the stats given in consultation data / examples? Is operation of the system at voltage limits included in the annual test regime?

A: Deteriorated assets or assets that were not designed to withstand the over-voltages that occur when a REFCL compensates for a fault are prone to failure. Electricity distribution businesses undertook studies to identify such assets and proactively replaced many as part of their network hardening programs. This included older or waterlogged cables and some classes of surge diverters.

Data used to ascertain how REFCLs are performing in service will be from the date of commissioning onwards, so it will not include faults arising during initial network stress testing.

During annual compliance testing networks are exposed to a large number of controlled faults that result in the full over-voltages that would be experienced as a result of faults under normal operation.

Impacts on customers

Q: What impact do REFCLs have on 22kV HV customers?

A: High Voltage (HV) customers must ensure that their installation can withstand the over-voltages that occur when a REFCL compensates for a fault, in accordance with the Electricity Distribution Code of Practice, administered by the Essential Services Commission.

It is important to note that low voltage customers are not exposed to these over-voltages, i.e. households and most businesses.

Q: What is the expectation for our vulnerable customers such as life support?

A: Energy Safe expects electricity distribution businesses to comply with their duties to minimise the number and duration of supply outages to vulnerable and life support customers. Energy Safe also expects electricity distribution businesses to make targeted investments in their networks to minimise both the risk to these specific customers and public safety more generally.

Q: What does Energy Safe think about longer outages that could be incurred by life support customers with REFCL implemented at all times?

A: Energy Safe expects electricity distribution businesses to take steps to address underlying reliability issues so that REFCLs can remain in-service (that is, switched on and operating to mitigate bushfires and reduce the risks of electrocution) continuously throughout the year except in limited circumstances, such as for planned maintenance or emergency works. Reliability of supply for vulnerable and life support customers is regulated by the Essential Services Commission. Strengthened protections for life support customers took effect in January 2020. <https://www.esc.vic.gov.au/electricity-and-gas/inquiries-studies-and-reviews/strengthening-protections-life-support-customers-2019>

Q: Does Energy Safe Victoria understand the negative impacts of outages on customers?

A: Yes, Energy Safe expects electricity distribution businesses to invest in their networks to minimise outages and improve public safety more generally.

Q: How are customers compensated for outages?

A: Customers that meet certain criteria can access compensation for losses arising from supply interruptions through the Essential Services Commission (ESC). Any questions related to this are best addressed by the ESC.

Who we are

At Energy Safe Victoria we work to keep Victoria energy safe.

We regulate the energy industry and sector to ensure generation, supply and usage uphold safety standards, and engage with the community to raise awareness of energy safety risks.

In everything we do, we strive to deliver on our purpose to keep Victoria energy safe. Always.

www.energysafe.vic.gov.au