

08 July 2024

Ms. Leanne Hughson  
Chief Executive Officer  
Energy Safe Victoria  
Level 5 4 Riverside Quay  
Southbank VIC 3006

Dear Ms. Hughson,

## Rapid earth fault current limiters (REFCL) operations – consultation paper

Thank you for the opportunity to provide feedback on Energy Safe Victoria's (ESV) preliminary views on how electricity distribution businesses should operate REFCLs as outlined in the REFCL operations consultation paper (the consultation paper) dated January 2024.

### Summary

- Of the five REFCL operational commitments proposed by ESV, all but one is mostly consistent with Powercor's accepted Bushfire Mitigation Plan (BMP).
- Due to the increased negative reliability impacts, we do not support ESV's proposal to restrict our ability to bypass or disable REFCLs when a sustained or permanent fault occurs. The continuation of operation of REFCL in bypass mode outside of bushfire season remains appropriate with consideration to balancing bushfire risk, safety risk and customer experience. Our response to the consultation paper is focused on this commitment.
- We may support this commitment in the future for legislated REFCLs, once technology solutions have been developed and fully implemented to restore reliability performance to pre-REFCL levels.
- Further, it is unclear if ESV's proposals are intended to be mandated for non-legislated REFCLs, such as those installed on the United Energy network. The proposed operating mode changes for non-legislated REFCL's will lead to a degraded performance for UE customers if changes to the UE operating mode are mandated. We do not support any change to the operating mode for United Energy REFCLs.

### Background

#### Powercor

Powercor's REFCLs, located in 22 zone substations as required under Victorian legislation, are in service all year round with an average availability of 99%, enhancing levels of bushfire risk mitigation and public safety across the most vulnerable areas of the network.

Powercor's BMP describes the application of REFCL in service operating modes in detail. In short, we apply two modes:

- Fire risk mode – REFCL in service mode applied during the declared fire danger period and switched into its most sensitive setting on Total Fire Ban days when the FDI is greater than 30.
- Bypass mode – REFCL in service mode applied outside the declared fire danger period. Under this mode, the REFCL remains in operation but in a setting that provides improved reliability performance albeit with reduced safety benefit relative to fire risk mode.

Our operational protocols also provide the flexibility to use bypass mode or to disable the REFCL to support us find complex faults at any time of the year under extenuating circumstances.

The consultation paper states *"REFCLs will not be bypassed or disabled when a sustained or permanent fault is confirmed to reduce adverse supply reliability impacts. REFCLs that are bypassed or disabled do not mitigate bushfires or reduce the risks of electrocution"*. Our interpretation of this is:

- REFCLs will be operated in fire mode all year round, regardless of the level of fire risk.
- As a result, customers on REFCL feeders are likely to experience adverse reliability impacts all year round and this in turn could lead to negative safety outcomes due to loss of supply.
- Finding complex faults such as that experienced in Trentham in early 2022 will be exacerbated.

The first Powercor REFCL was commissioned in late 2016 and the final unit in March 2023. While these devices are providing critical safety improvements, since 2016 customers supplied by REFCL-protected networks have experienced a reduction in supply reliability due to traditional protection devices no longer being capable of operating effectively on REFCL networks.

We maintain that the way we currently operate our REFCLs delivers the right balance between mitigating bushfire risks and keeping communities safe, while reducing adverse reliability impacts as much as possible when the fire risk is not as high. For example, the fire risk in the middle of winter after extensive rainfalls is far less than during the middle of summer. Therefore, operating legislated REFCLs in bypass mode during non-fire season allows us to reduce adverse reliability impacts on communities, while still providing safety benefits.

While we acknowledge that REFCLs do provide other electricity safety benefits, these need to be considered against the risk and negative impacts of increased power outages to customers.

We have consulted specifically with customers at a forum in Ballarat in relation to how we operate REFCLs. Their feedback was that our existing operating modes provide a reasonable balance between safety and reliability and that ESV's proposed commitment could result in a reduction in power reliability. More broadly our consultation with communities across Victoria indicated that our customers have little appetite for reduced reliability.

In the online consultation, ESV referred to distribution businesses accepting the degradation in supply reliability and that this only had an impact on the few high bushfire risk days that occur each year. This is factually incorrect as far as the Powercor network is concerned. REFCLs have led to a

decrease in reliability for our customers, particularly during the entire fire season when they are operated in a more sensitive fire risk mode. Reliability of supply impacts are far greater than the few TFB days referenced, and we have been working tirelessly to improve the situation.

To improve the customer experience, we have developed REFCL compatible Automatic Circuit Reclosers (ACRs), that when fully rolled out by December 2028, will only improve reliability performance by approximately 50%. With the first stages of the deployment of REFCL compatible ACRs in our most vulnerable communities, we have already prevented sustained outages for ~80,000 customers over the past 2 years. Further development on other network protection devices is required to bridge the balance, beyond what these ACRs will be able to deliver.

We would encourage ESV to defer any changes to the Powercor BMP in relation to this proposal until technology solutions have been developed and fully implemented to restore reliability performance to pre-REFCL levels.

#### United Energy

United Energy has three 'non legislated' REFCLs on the network that operate in fire risk mode on TFB days only and in bypass mode at all other times.

It is unclear if ESV's proposed commitments will be mandated for non-legislated REFCLs. If ESV's intent is to do so, the reliability performance impacts for United Energy customers will be even greater.

We do not support any change to the operating mode for non-legislated REFCLs.

#### **Recommendation**

REFCLs are delivering critical safety benefits to our communities by reducing the risk of fire starts during summer, and in particular on TFB days where there is an increased fire risk. As an industry, we need to make sure we are operating and maintaining safe power networks without delivering unintended consequences such as adversely impacting supply reliability to homes and businesses.

As such, we would encourage that any changes take into consideration both the safety and reliability risks.

We contend that by operating legislated REFCLs in the following in-service operating modes, we can deliver the intended safety benefits for our communities while still providing the flexibility to disable at any time of the year to support us find complex faults, allowing us to provide better reliability for our customers:

- Fire risk mode – applied during the declared fire danger period.
- Bypass mode – applied outside the declared fire danger period.

Operating REFCLs in fire risk mode at all times should not be adopted until technology solutions have been developed and fully implemented to restore reliability performance to pre-REFCL levels.

For non-legislated REFCLs, we propose to operate REFCLs in fire risk mode on Total Fire Ban days only and in bypass mode at all other times with the flexibility to disable at any time of the year to facilitate complex fault finding to avoid a reduction in reliability.

Further detailed responses to ESV's specific questions are provided within the consultation paper in the appendix of this response.

We welcome the opportunity to discuss our feedback with ESV to ensure our response is well understood in the context of delivering the best outcomes for our customers.

Kind regards,

A handwritten signature in blue ink that reads "Andrew Bailey". The signature is written in a cursive, flowing style.

Andrew Bailey  
**(Acting) General Manager Electricity Networks**

## Appendix

### Section 3 – Key considerations

- Public safety benefits (mitigation of bushfire and electrocution risks)
- Ensuring efficacy of REFCLs (locating and fixing system defects and network asset weaknesses)
- Impacts on reliability of electricity supply (potential positive and negative impacts)
- Bushfire risks (bushfire risk areas and bushfire risk ratings/levels)

#### 1. Do you agree that the issues outlined here are the key issues to inform how the distribution businesses should be expected to operate REFCLs?

We agree that public safety, REFCL efficacy and reliability are the key REFCL operating issues to consider.

We do however affirm that the language and expectations with respect to REFCLs and electrocution risk should be narrowed with relation to the following:

- Should a person come in direct contact with a live powerline, we do not expect REFCLs to prevent electrocution.
- The initial shock from the power system is likely to still cause serious injury or death.
- REFCLs limit current into the ground and therefore reduce the indirect electrocution risk posed from consequential step, touch, and transfer voltages.

We acknowledge public safety is enhanced, however, REFCLs do not make High Voltage (HV) powerlines safe from direct contact.

We contend that further emphasis be placed on supply reliability as a public safety issue, particularly in the context of vulnerable customers.

#### 2. Do you consider any of the issues to be irrelevant to the operation of REFCLs?

We contend that the following should be considered in relation to the assessment of REFCL operations:

- Section 3.4 pertaining to bushfire risk indicators should be excluded from the REFCL operations paper and instead form part of a separate consideration which addresses the application and configuration of all bushfire safety mechanisms in the context of high (or forecast high) fire danger conditions. This is also appropriate with regard to references to the Australian FDR system, which again ought to be done in the context of a holistic BMP, and not just REFCLs.
- Material changes are also made to other critical protection systems (Fast Overcurrent, Disablement of Reclose, Live Line Sequence etc.), which complement and work together with REFCLs to reduce fire risk. Any discussion on how these are enacted to mitigate ignition ought to be undertaken in full context of mitigating bushfire risk.
- Extending REFCL protected areas or installing additional REFCLs cannot be considered as “operational” as to where REFCL protected networks are configured to meet required capacity on a predefined network.

- An “operational transfer” would likely reduce earth fault sensitivity, jeopardising performance at the complying substation with respect to the performance criteria which define required capacity.
- Permanently extending coverage or installing additional REFCLs requires a legislative or regulatory trigger given the required capital. We support an expansion of REFCL protected networks under an appropriate framework and where we it can be justified as far as practicable in mitigating the associated bushfire risk.

**3. Do you have any information or data about the positive or adverse impacts of REFCLs on supply reliability?**

Minor improvements relating to avoided momentary outages for transient faults has been materially outweighed by the significant deterioration in sustained outages impacting supply reliability experienced by Powercor customers post REFCL implementation.

The number of supply interruptions, as measured by the System Average Interruption Frequency Index (SAIFI) has deteriorated on REFCL protected networks during both fire and non-fire seasons whilst improving on non-REFCL protected networks over the same period. The average fire season SAIFI performance has deteriorated by 38%, whilst the average non-fire season SAIFI performance has deteriorated by 24%. This equates to ~140,000 and ~60,000 additional customers respectively on average experiencing a sustained outage each year.

Additionally, levels of customer, local and state government enquiry and complaints has increased in the REFCL protected networks post commissioning, leading also to increased political and media scrutiny of the way in which we manage and respond to these challenges.

**4. Are there other issues that we should consider in relation to the operation of REFCLs?**

Refer to Question 8.

**Section 4 – Preliminary views and expectations**

- Operating frequency (how often REFCLs are in-service)
- Operating settings (how sensitive REFCLs are to faults and use of bypass modes)
- Ensuring REFCL performance (testing and maintenance programs)
- Broader use of REFCLs (considering the installation and use of REFCLs on additional parts of the supply network)
- Record keeping and reporting (demonstrating REFCLs are operated in accordance with an accepted ESMS and BMP)

**5. Do you agree with the benefits and risks of the options for operating frequency of REFCLs? Do you consider there to be any benefits and risks that have not been captured in the examples?**

We agree that REFCLs should be kept in service all year as prescribed in the Powercor and United Energy BMPs, noting this does not mean fire mode all year round. This is to ensure:

- The network remains hardened (reduced likelihood of cross-country faults)
- The skills to manage and maintain REFCL protected networks are maintained by controllers, operators, and planners (capacitive balance, switching, protection schemes etc.).
- Availability of REFCL protection for live line work

We do believe that the operating modes of REFCL should be balanced in accordance with the risks throughout the year.

- The reliability risk (Option 1) is a consequence of the parameters which define the operating mode.
- Applying a bypass mode framework provides better reliability than conventional protection alone (i.e., better than taking the REFCL out of service), due to the combination of momentary fault suppression (REFCL) and discrimination of permanent faults using conventional practices.
- Applying a bypass mode framework to support REFCL operating frequency, additionally has the safety benefits of no current injection (and associated Earth Potential Rises etc.) for momentary/transient faults.

**6. Do you agree that REFCLs should be in-service continuously throughout the year?**

We support operating REFCLs continuously throughout the year in alignment with our current BMP, noting again that this does not mean in fire mode all year round. The term “continuous service” shall be flexible enough to necessitate removing a REFCL from service where network access, maintenance and operational requirements demand it.

**7. Should different expectations about operating frequency apply to REFCLs that have been installed to meet prescribed requirements under the Act and associated regulations compared with those that have been installed for other reasons?**

REFCLs may be installed for reasons other than fire safety. Where these systems are installed based on “overall benefit”, it may be that reliability improvements form a significant piece to that project’s justification. Expecting these systems to align with an operating frequency specifically targeting bush fire safety is unreasonable.

We maintain that we should have flexibility to operate non-mandated REFCLs to align with the operating modes outlined in their respective BMPs. Non-mandated REFCLs are operated in fire modes on TFB days as per BMPs and do provide the necessary fire risk benefits on days of increased fire risk.

Mandating proposed operating frequency requirements to non-legislated REFCLs will make it more difficult to justify expansion of REFCLs on our networks under an as far as practical economic basis.

**8. Are there any other considerations we should have regard to about the operating frequency of REFCLs?**

Victorian REFCL networks have adopted a hybrid system earthing design with the introduction of REFCLs.

- Resonant (REFCL) and Low Impedance (traditional) systems are interchangeable at these sites with legacy low impedance systems retained as back up and always available. Should a very high (>98%) operating frequency (and availability) be expected, then there comes the need to duplicate protection and control systems to ensure redundancy such that this target is guaranteed.
- This is to ensure planned outages, maintenance and breakdowns are tolerated without loss of REFCL protection
- Significant investment would be required across all stations on the REFCL protected networks to create a level of redundancy to facilitate an aspirational 100% in service objective when allowing for the factors outlined in the preceding point.

**9. Do you agree with the benefits and risks of the options for operating settings of REFCLs? Do you consider there to be any benefits and risks that have not been captured in the examples?**

We contend that unless there is an identifiable public safety issue to address (year-round) with respect to high impedance fault detection, then most public safety benefits are derived having a REFCL in service. Further pursuit of public safety enhancements through increases in sensitivity will be overwhelmingly offset by a degradation in reliability.

**10. Do you agree that operating settings are the appropriate way to balance public safety benefits alongside considerations of supply reliability?**

REFCLs provide at least five (5) times the sensitivity of conventional earth fault protection in their least sensitive configuration.

- Sensitivity relates to the detectable earth fault impedance. The reduction in step, touch, and transfer voltage (which is the primary driver in public safety improvements) is achieved once a REFCL is in-service and limiting fault current.

Increasing sensitivity year-round to target a specific safety outcome will have a significant impact on supply reliability. When balancing the inherent safety risks associated with a deterioration in reliability of supply it is unlikely to translate to a material public safety improvement on Victorian networks.

Impacts to reliability will deteriorate as minor imbalance events result in high level outages as our operators struggle to maintain a tight level of network balance.

We therefore do not agree that operating settings are an appropriate way to balance public safety and reliability.



**11. Are the AFDRS levels appropriate for guiding the operating settings of REFCLs? Do you agree with the way we have applied the AFDRS levels in our preliminary views?**

AFDRS levels should be considered in the context of the BMP, with respect and consideration to all other bushfire mitigation controls and risk indicators.

We therefore contend that this question should be excluded from the scope of this paper and be reviewed in a holistic context. Refer our response to Question 1.

**12. Should different expectations about operating settings apply to REFCLs that have been installed to meet prescribed requirements under the Act?**

Refer to Question 7.

**13. Are there any other considerations we should have regard to about the operating settings of REFCLs?**

Maintaining the high levels of sensitivity (required capacity) will come at significant cost over the coming years.

A strategic review at a regulatory and industry level is required to determine whether such capital investment in maintaining extremely high sensitivity levels delivers (or maintains) a reasonable level of bushfire risk reduction or whether directing those funds into other bushfire mitigation projects (such as extending the coverage areas of REFCLs) delivers a better outcome for the investment.

**14. Do you have any comments in relation to testing and maintenance of REFCLs?**

We do not have anything specific to raise in relation to testing and maintenance pertaining to this paper.

**15. Do you have any comments on the broader installation and use of REFCLs?**

We continue to look at opportunities for broader installation of REFCLs on our networks and support the future expansion where it can be demonstrated it is practicable to do so.

Mandating proposed operating frequency or mandating legislated REFCL performance requirements to non-legislated REFCLs will make it more difficult to justify expansion of REFCLs on our networks under an as far as practicable basis.

**16. Do you have any comments on record keeping and reporting by the distribution businesses?**

The current use of operating modes (Declared Fire Danger Periods and TFB Days) makes for a relatively simple and manageable deployment of operating modes.

If AFDRS was used instead, operating mode deployment would be difficult to track and monitor and may lead to adverse risks from an operational perspective of ensuring REFCLs are maintained in the required settings at the appropriate times.