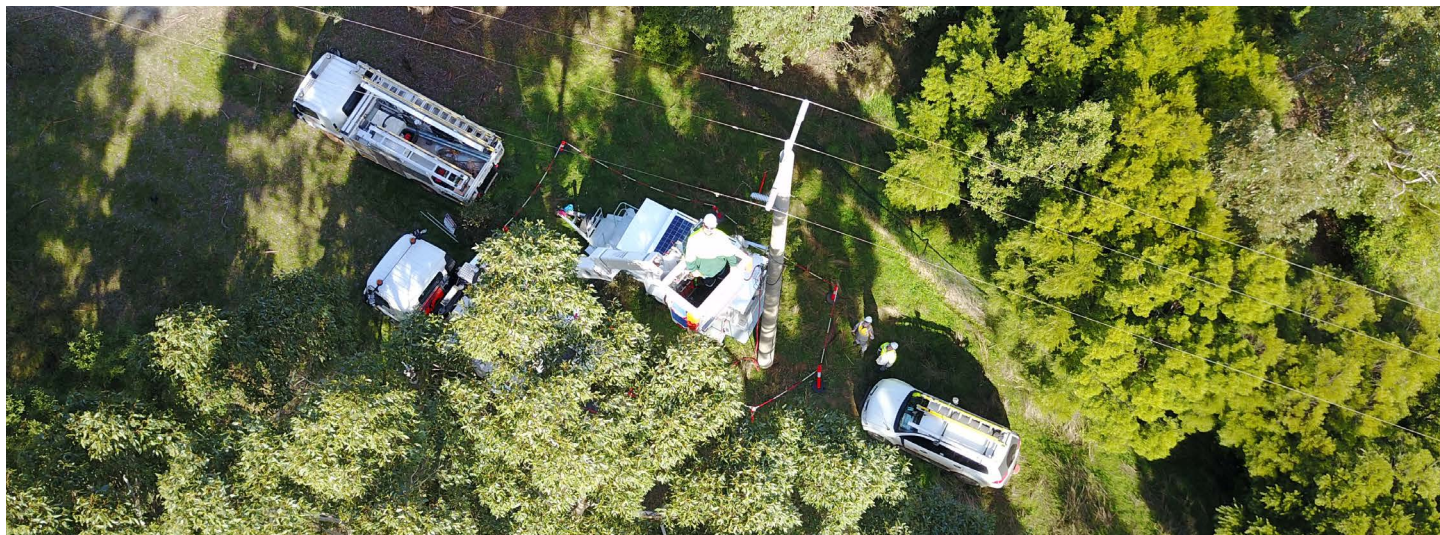


Rapid Earth Fault Current Limiter explained

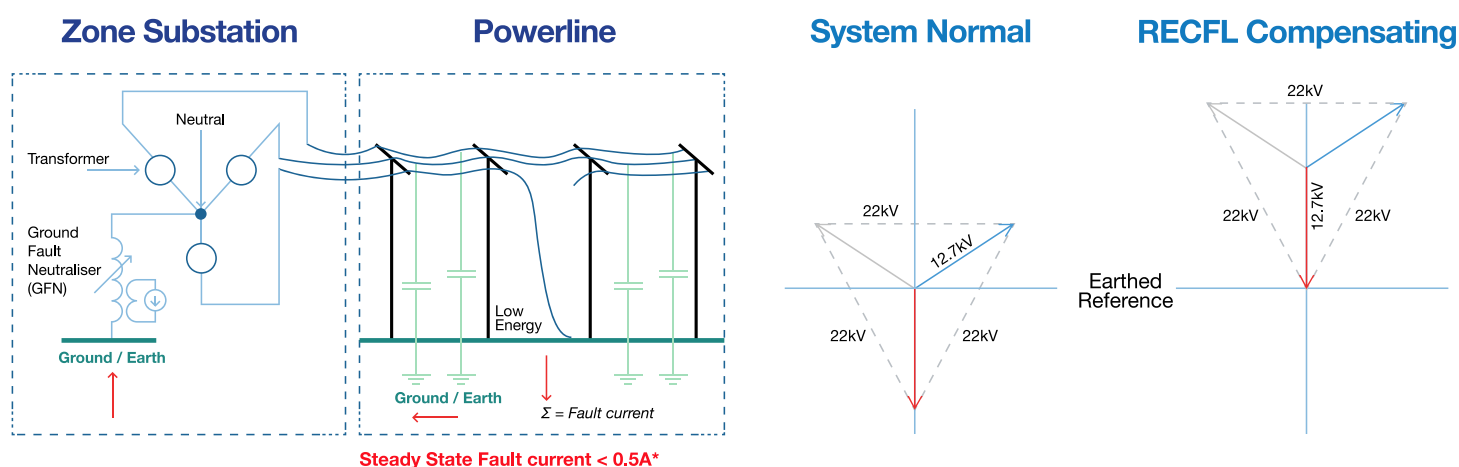


Background

In May 2016, the Victorian Government introduced legislation to mandate the introduction of Rapid Earth Fault Current Limiter (REFCL) technology at 22 of Powercor's zone substations. A REFCL is a protective device which can significantly reduce electrical current during phase to earth faults, preventing sparks and reducing the risk of fire-starts in high bushfire consequence areas.

Operation

The REFCL is installed on a zone substation transformer neutral. During phase to earth (single line to ground) faults, the REFCL injects inductive current that is of equal and opposite magnitude to the capacitive current flow between the faulted and healthy phases, significantly reducing the fault energy from $\sim 13,000\text{A}$ to $\sim 0.5\text{A}$.



This current injection introduces a neutral voltage displacement throughout the resonant network, whereby the faulted phase voltage is reduced to near zero and the two healthy phases are increased to up to 24.2kV.

Impact to HV Customers

Introduction of the REFCL will have the following impact to HVC operations:

- Phase to earth voltages will increase to up to 24.2kV during fault conditions (30 seconds);
- Each phase of a REFCL protected feeder will be elevated to 22kV for 10 continuous minutes during pre-commissioning insulation testing;
- Each phase of a REFCL protected feeder will be subjected to a number of simulated faults during pre-commissioning primary fault testing (30 seconds), elevating the voltage to up to 24.2kV;
- REFCL tuning is automatically conducted several times per day, elevating voltages to up to 16kV (15 seconds);
- HVC asset ratings may be exceeded, with potential for insulation breakdown and failure.

Electricity Distribution Code Obligations

The Essential Services Commission has revised the Electricity Distribution Code to require customers connected to the REFCL network to ensure that their electrical installation can withstand the voltage conditions.

REFCL Readiness Options

1. Asset Hardening

Involves the assessment, testing and replacement of HVC assets, to ensure they have appropriate capability to withstand elevated voltages.

2. Isolation Transformer

Installation of an Isolation Transformer (ISO) at the point of connection to the Powercor network effectively decouples the HVC from the resonant network and the resultant voltage fluctuations.

3. HV to LV Conversion

Supply conversion to low voltage effectively decouples the HVC as above, through introduction of a distribution transformer on the customer premises. Customers need to consider the impact on their tariff structure. This option may only be viable for lower demand customers.

Next Steps

Asset Assessment

It is recommended that HVCs conduct an asset assessment (internal or independent) to determine their individual asset voltage capabilities. The outcome will then inform the strategy selected.

Works Finalisation and REFCL Readiness

Customers will need to ensure their electrical installation can withstand the increased voltage conditions. As Powercor will be implementing the REFCL program over a number of years, Powercor will advise customers of the relevant date by which they need to ensure their electrical installation is REFCL ready.

For further information:

Contact **13 22 06** during business hours, or email us at **refcl_hvc@powercor.com.au**

Visit our website at:

powercor.com.au/refcl

