Powercor progress update

Amended bushfire mitigation regulations

Presented by Steven Neave
General Manager Electricity Networks

Our ongoing commitment

"Powercor is committed to reducing bushfire risk through a framework of compliance that facilitates and encourages innovation and continuous improvement"

We are actively "getting on with it"…….

- REFCL trial project implementation (GSB and WND)
- Contribution to R&D
- REFCL program implementation
- LoSAG covered conductor
- Hybrid undergrounding
- Electric line construction area works
- SWER ACRs

Key message: Powercor is actively leading and reducing our bushfire risk

REFCLs – current status

Two trial sites

- Gisborne ZSS and Woodend ZSS

Neither REFCL in operation

Two technical challenges:

- Balancing the network
- Failed component from REFCL invertor

GFN - Arc Suppression Coil

Residual Current Compensator (Inverter)

Control Panel

Key message: Gisborne and Woodend REFCL currently not in operation

Gisborne & Woodend

Trial project commenced in Q2 2015

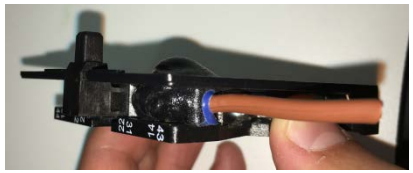
Gisborne ZSS in service Oct'16

- Operating in "TFB Day" mode, ≈50% sensitivity
- 8 weeks in service, now out of service (1 week and counting)

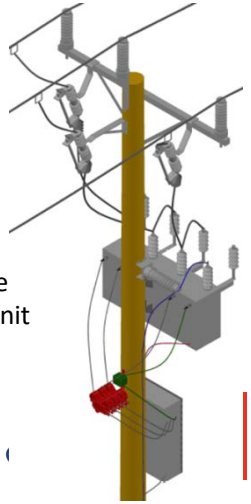
Woodend ZSS pre-commissioned Nov'16

- Awaiting capacitive balancing units to be re-installed

Current expenditure higher than budget



Failed contactor from Inverter



Capacitive balancing unit

Key message: great early progress, technical problems arising

Our program

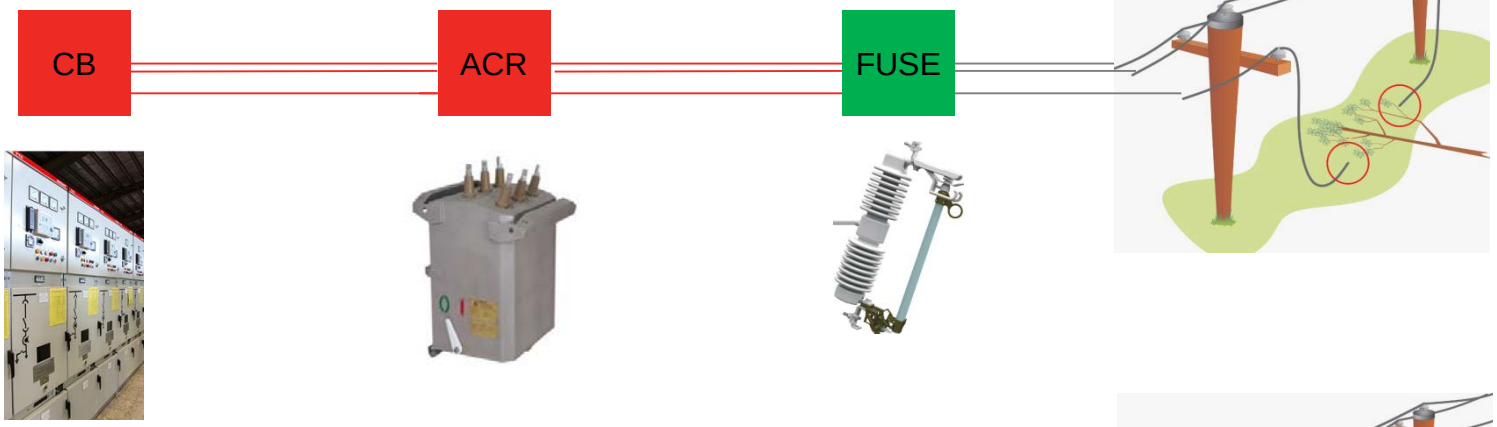
	Tranche 1				Tranche 2				Tranche 3			
Count	*Station*	*Planned Install* [1]	*Req'd Capacity*	*Pts*	*Station*	*Planned Install* [1]	*Req'd Capacity*	*Pts*	*Station*	*Planned Install* [1]	*Req'd Capacity*	*Pts*
1	Gisborne	Apr-17	Apr-19	3	Eaglehawk	Jun-19	Apr-21	5	Stawell	Mar-23	Apr-23	1
2	Woodend	May-17	Apr-19	4	Bendigo TS	May-20	Apr-21	5	Ararat	Apr-23	Apr-23	1
3	Colac	Mar-19	Apr-19	5	Charlton	Mar-20	Apr-21	2	Waurn Ponds	May-21	Apr-23	4
4	Camperdown	Apr-18	Apr-19	4	Bendigo	Apr-20	Apr-21	1	Corio	Apr-21	Apr-23	1
5	Winchelsea	Apr-19	Apr-19	5	Ballarat South	Apr-21	Apr-21	5	Koroit	Apr-22	Apr-23	2
6	Maryborough	Apr-19	Apr-19	5	Ballarat North	Mar-21	Apr-21	4	Terang	Mar-22	Apr-23	2
7	Castlemaine	May-18	Apr-19	4	Geelong	Apr-21	Apr-21	4	Hamilton	Mar-21	Apr-23	2
8									Merbein	Apr-23	Apr-23	1
Points				30				26				13
Total				**30**				**56**				**69**

Key message: an aggressive program is required to meet compliance target dates

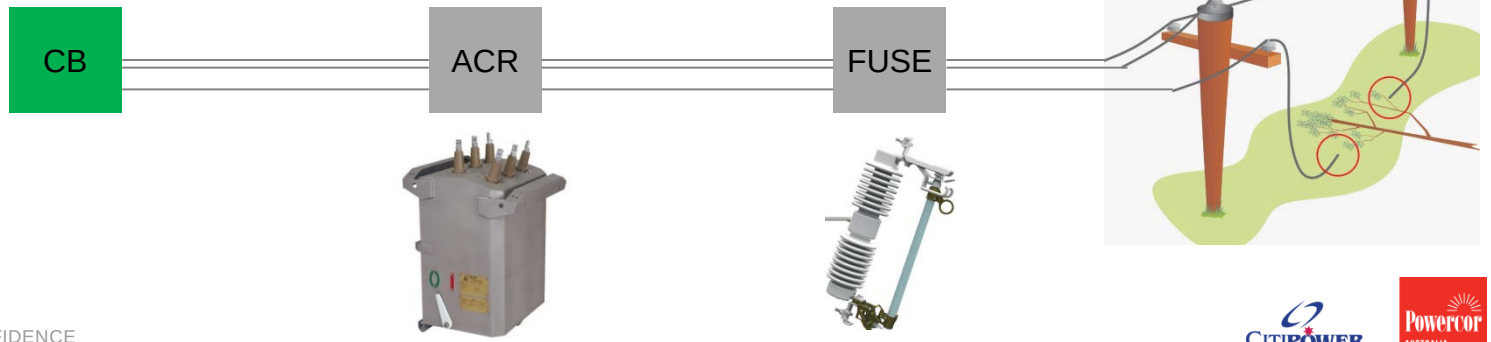
Reliability impact

REFCL protection system will trip the zone substation CB before the ACR and HV fuses operate for sustained outages. Momentary outages excepted.

Conventional



REFCL



Key message: early reliability concerns are being realised with actual experience

Single supplier

Swedish Neutral

Premium Power Protection

- Cost increases
- No local presence
- Competitors require R&D support
- Risk to entire program

Key message: significant risk to entire program, no local support

CITIPOWER

Powercor AUSTRALIA

HV customers

- Customer owned installations and assets
- Limited understanding of their network
- Who reviews any impact on their installation?
- Who funds any required upgrade?
- A hold point to REFCL operation
- Recommend Government initiate a separate program
- Enable 3rd party assessment

Key message: ownership of this issue required to ensure program not impacted

CitiPower

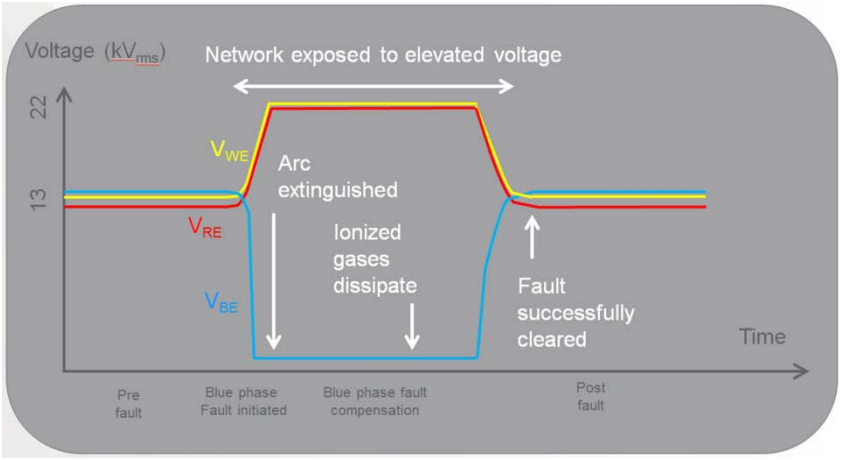
Powercor Australia

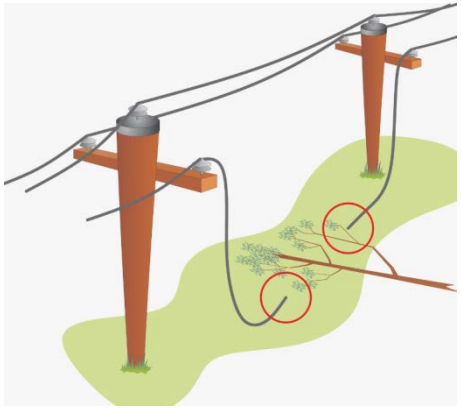
Distribution code

The current Code Section 4.2.2 specifies variations with respect to nominal value of both of these voltages in a single table as follows (current wording shown with areas of proposed changes highlighted):

STANDARD NOMINAL VOLTAGE VARIATIONS				
Voltage Level in kV	**Voltage Range for Time Periods**			**Impulse Voltage**
	Steady State	**Less than 1 minute**	**Less than 10 seconds**	
< 1.0	+10% - 6%	+14% - 10%	Phase to Earth +50%-100% Phase to Phase +20%-100%	6 kV peak
1-6.6	± 6 % (± 10 % Rural Areas)	± 10%	Phase to Earth +80%-100% Phase to Phase +20%-100%	60 kV peak
11				95 kV peak
22				150 kV peak
66	± 10%	± 15%	Phase to Earth +50%-100% Phase to Phase +20%-100%	325 kV peak

+80% = 22.86kV





Key message: intended REFCL operation and the distribution code are in conflict

Collaboration and cooperation

- AusNet Services collaboration
- Government collaboration
- Overseas experience visits
  - New Zealand users visit (Apr’16)
  - Alternate suppliers visit to Europe (Jul’16)
  - Alternate suppliers visit to China (Oct’16)
- PAL active involvement and funding contributions to R&D
- Technical Working Group
  - All DB’s, ESV, technical SME’s

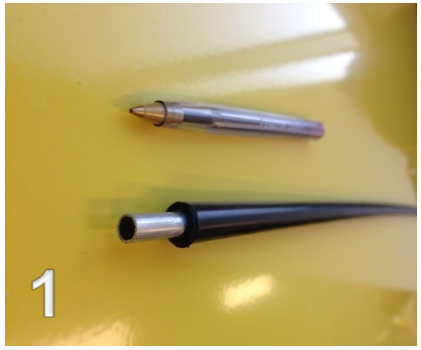
Key message: excellent collaboration within the industry – we are not alone

CitiPower

Powercor Australia

Powerline replacement fund

World First	1. LoSAG covered conductor – world first application	✓ Rural covered conductor ✓ New technology adaptation – carbon fibre core ✓ 295m span installed ✓ 5km's under construction
	2. Hybrid underground design – significant savings	✓ A cost effective solution ✓ 30% savings on full UG
	3. Powerline replacement – significant volumes completed	✓ 200kms UG cable installed ✓ 150kms OH conductor retired ✓ $45m completed

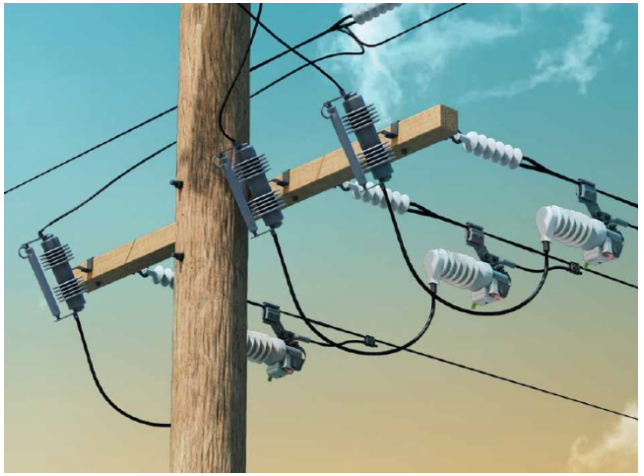


Key message: Gvt funded fire reduction asset replacement now > $45m

SWER ACR's

Period	2016	2017	2018	2019	2020
Volume	100	241	241	240	240

- On track
- Total 1,062 units to be completed by 2020
- Continue to seek innovative solutions
  - Faster protection response
  - Quicker deployment
  - Greater fire risk reduction



Key message: a large program to be addressed using innovative solution