

Powerline Bushfire Safety Committee

June 2019

Tom Hallam, GM Regulation and Network Strategy
Mike Carter, GM Network Engineering

Commercial in confidence



missionzero

Agenda



▶ REFCL

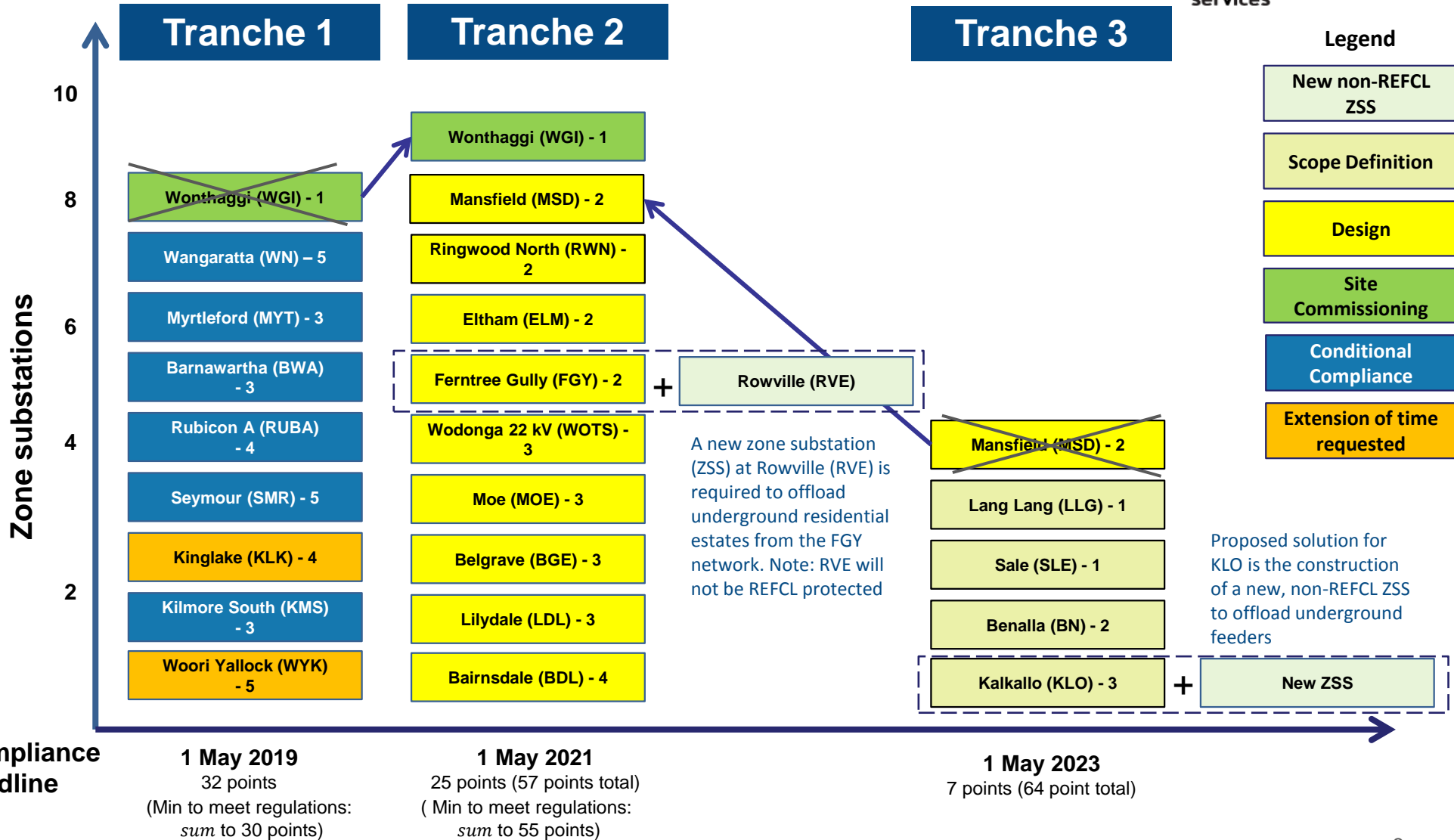
1. REFCL Program Overview
2. Tranche 2
 - 2.1 HV Customer readiness
 - 2.2 Scope exemption application
 - 2.3 Roadmap
3. Tranche 1
 - 3.1 Compliance status overview
 - 3.2 Conditional compliance
 - 3.3 Technical issue
 - 3.4 Harmonics
4. Tranche 3 Update

▶ Other bushfire mitigation programs

5. ACR Program
6. Powerline Replacement

1.0 REFCL Program

Overview as at 31 May 2019



2.1.1 Tranche 2 HV Customer Readiness

Key issues and risks



- ▶ Whilst REFCL readiness dates were formally communicated to the HV customers in August 2018, it is becoming apparent that a number of HV customers are either unable to meet the requested dates or are at significant risk of being unable to do so

HV Customer	Connection points overview				Status	Description	Next steps
Metro Trains Melbourne (MTM)	ZSS	MTM Connections	REFCL Readiness Date	Points	RED	<ul style="list-style-type: none"> • MTM have advised they are unable to meet the T2 compliance deadline of 1 May 2021 • MTM have provided the following REFCL readiness dates based on their current schedules: <ul style="list-style-type: none"> • Eltham (ELM) – August 2021 • Lilydale (LDL), Belgrave (BGE), Ferntree Gully (FGY) – February/March 2022 	<ul style="list-style-type: none"> • Time extension request to be drafted for the four (4) impacted zone substations, totalling 8 compliance points • Time extension of the compliance deadline from 1 May 2021 to 1 November 2022 to allow time for commissioning and testing once the MTM HV connection points are REFCL ready
	Belgrave (BGE)	Upwey	30 April 2020	3			
	Ferntree Gully (FGY)	Ferntree Gully	31 May 2020	2			
	Eltham (ELM)	Eltham Montmorency Wattle Glen	30 June 2020	2			
	Lilydale (LDL)	Lilydale Mooroolbark	31 July 2020	3			
Melbourne Water (MW)	ZSS	MW Connections	REFCL Readiness Date	Points	AMBER	<ul style="list-style-type: none"> • MW have not yet formally confirmed their REFCL solutions for Tranche 2 however asset hardening is likely to be the preferred solution 	<ul style="list-style-type: none"> • MW are planning to undertake testing of their HV assets to determine the appropriate solution • AusNet Services to engage with MW senior management in June 2019 • Note: 2 of the 3 ZSS are also impacted by MTM delays
	Belgrave (BGE)	• Cardinia-Silvian	30 April 2020	3			
	Moe (MOE)	• Thompson Dam • Thompson Dam, Bells Portal	31 May 2020	3			
	Lilydale (LDL)	• Silvian • Olinda	31 July 2020	3			

2.1.2 Tranche 2 HV Customer Readiness

Key issues and risks (continued)



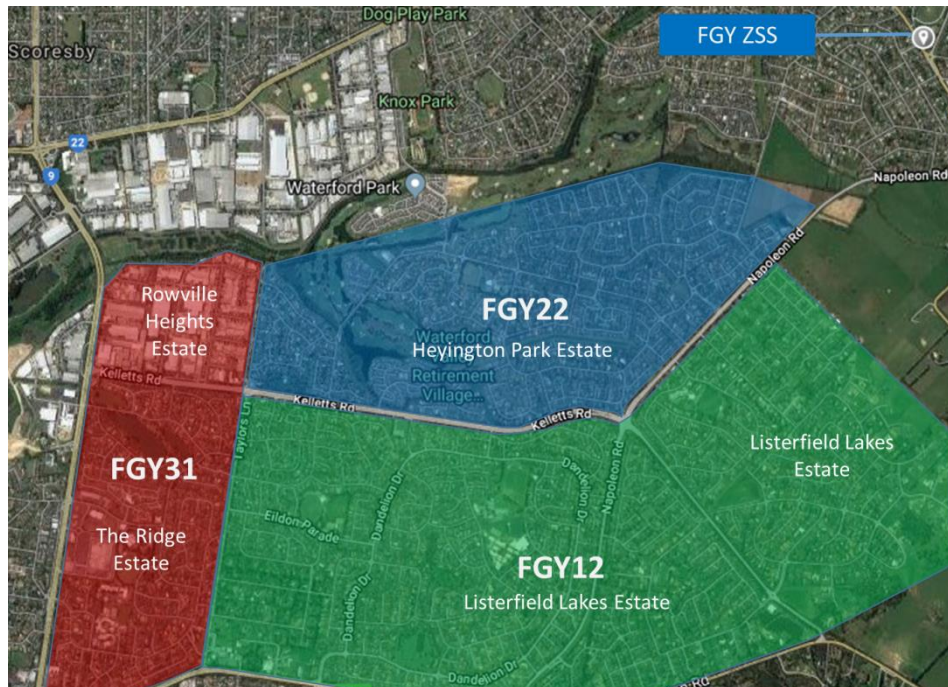
HV Customer	Connection points overview	Status	Description	Current status & next steps								
Australian Defence Force (ADF)	<table border="1"> <thead> <tr> <th>ZSS</th> <th>ADF Connections</th> <th>REFCL Readiness Date</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>Wodonga Terminal Station (WOTS)</td> <td> <ul style="list-style-type: none"> East Bandiana North Bandiana South Bandiana Latchford Barracks </td> <td>30 June 2020</td> <td>3</td> </tr> </tbody> </table>	ZSS	ADF Connections	REFCL Readiness Date	Points	Wodonga Terminal Station (WOTS)	<ul style="list-style-type: none"> East Bandiana North Bandiana South Bandiana Latchford Barracks 	30 June 2020	3	RED	<ul style="list-style-type: none"> ADF have advised in a letter dated 5 June 2019 that: <ul style="list-style-type: none"> No contracts have been signed to deliver REFCL compliance works No project delivery schedule is available for the WOTS sites ADF may seek a waiver or dispensation from ESV where compliance with strengthened electric line safety standards cannot be met 	<ul style="list-style-type: none"> Urgent status meeting with ADF has been requested Time extension for WOTS may be required
	ZSS	ADF Connections	REFCL Readiness Date	Points								
Wodonga Terminal Station (WOTS)	<ul style="list-style-type: none"> East Bandiana North Bandiana South Bandiana Latchford Barracks 	30 June 2020	3									

Key messages:

- Proactive engagement with all HV customers continues
- Metro Trains Melbourne are unable to meet the Tranche 2 timeframe and, as a consequence, AusNet Services are unable to meet the required 55 compliance points by the 1 May 2021 compliance deadline
- Significant concerns over the readiness of both Melbourne Water and Australian Defence Force to meet the required REFCL readiness dates:
 - Melbourne Water has yet to determine their REFCL solutions
 - Australian Defence Force has not yet signed contracts to deliver REFCL compliance works

2.2 Tranche 2 Scope exemption application Treatment of FGY underground residential estates

- ▶ At Ferntree Gully (FGY), there is a significant amount 1980's installed steam cured XLPE underground cable which can not withstand REFCL operations supplying residential estates
- ▶ It is proposed to transfer these underground residential estates from FGY to a new zone substation, Rowville (RVE,) which is proposed to be built next to the East Rowville Terminal Station (ERTS) on AusNet Services-owned land

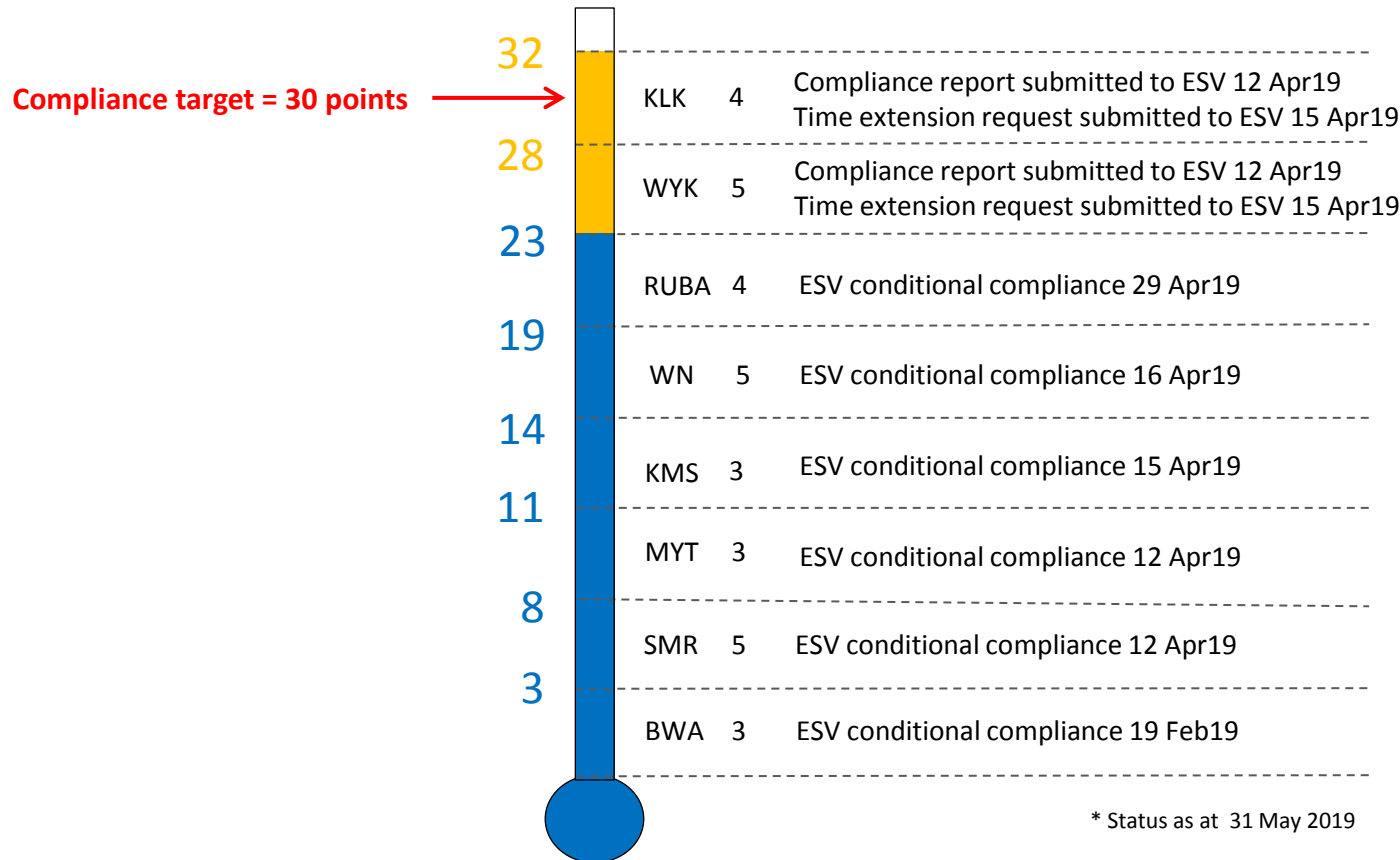


- ▶ In addition to reducing the number of customer outages and significant cost of testing and replacing this underground cable, it reduces the capacitance of the FGY network
- ▶ The following feeders will be transferred to RVE, a non-REFCL ZSS:
 - › FGY12
 - › FGY22
 - › FGY32
- ▶ RVE will be build in two stages
 - › Single supply transformer ZSS to meet the T2 compliance deadline
 - › Second supply transformer to be added post the T2 compliance deadline

Key message:

- Underground residential estates will be transferred from the FGY network to a new non-REFCL zone substation to minimise customer outages associated with the testing and replacement of old underground cables and to remove the need for a 3rd Ground Fault Neutraliser (GFN) to be installed to achieve 'required capacity' by the Tranche 2 compliance deadline of 1 May 2021

3.1 Tranche 1 Compliance Status Overview



Legend	
■	Points conditionally approved
■	Time extension requested

Key messages:

- Conditional compliance has been obtained from ESV for 6 of the 8 ZSSs totalling 23 compliance points
- Extension of time request for Woori Yallock (WKY) and Kinglake (KLK) is being assessed by ESV. The decision is expected by mid-June 2019

3.2 Tranche 1 Conditional Compliance

Overview of the conditions by ZSS



ZSS	Points	# of Feeders	Conditional Compliance Achieved	Complying Zone substation	Conditions						
					Calibration	Delta Admittance	Harmonics	Damping	Inverter Tripping	Update Verification Methodology	Annual testing
BWA	3	4	Yes	Yes	O	O	-	-	-	-	O
MYT	3	4	Yes	Yes	O	-	-	-	-	O	O
KMS	3	2	Yes	Yes	O	O	-	-	-	-	O
SMR	5	6	Yes	Yes	O	O	O	-	O	-	O
WN	5	7	Yes	Yes	O	O	-	-	-	O	O
RUBA	4	5	Yes	Yes	O	O	O	-	-	O	O
WYK	5	4									
KLK	4	3									

Awaiting the outcome of the request for time extension. It is assumed the conditions for the time extension will be similar to those for conditional compliance

Legend: O = condition applies - = condition does not apply

3.3 Tranche 1 Conditional Compliance

Current status of technical issues



Technical issue	Current status
Calibration	<ul style="list-style-type: none"> • Technical paper to be prepared setting out why this issue is not significant for the performance of REFCLs in preventing bushfires • Proactive engagement with Swedish Neutral (SN) to address this issue including AusNet Services REFCL specialists and Lead REFCL tester working with SN onsite in Sweden in early June 2019 to review all outstanding GFN technical issues
Inconsistent Admittance Values	<ul style="list-style-type: none"> • Continue to investigate together with Powercor and Swedish Neutral
Harmonics	<ul style="list-style-type: none"> • Technical paper is under development setting out why harmonics are insignificant to bushfire risk • Refer to following slide
Inverter Tripping	<ul style="list-style-type: none"> • This issue has been solved by Swedish Neutral, evidence to be provided to ESV
High Damping	<ul style="list-style-type: none"> • This issue has emerged recently and investigations into potential causes and solutions have commenced • Analysis of network characteristics and damping is underway

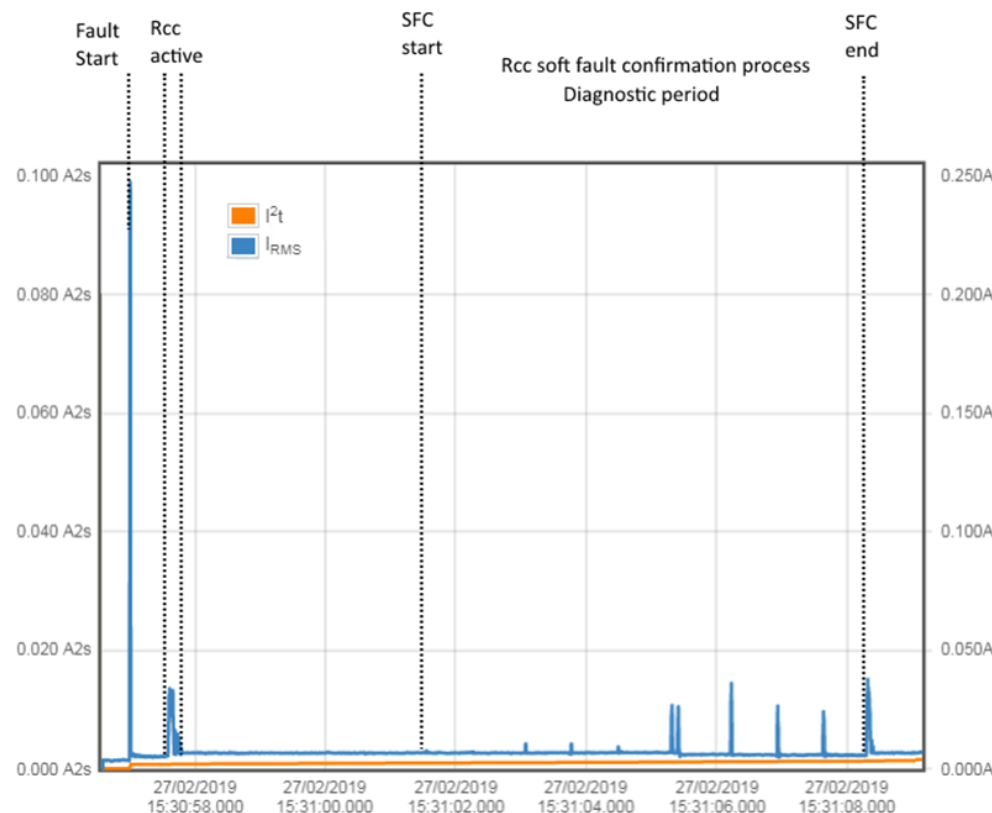
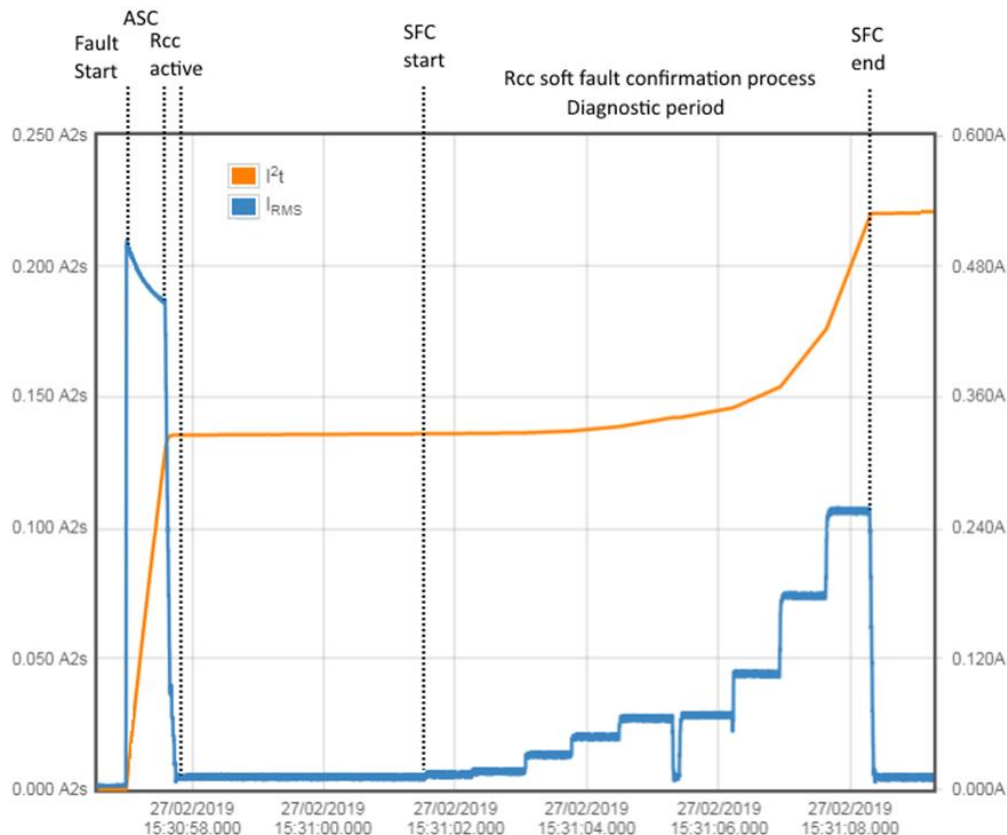
3.4 Tranche 1 Conditional Compliance

Harmonics analysis – high impedance faults



Total I²t energy dissipation associated with high impedance faults at KMS

Non-Fundamental I²t energy dissipation associated with high impedance faults at KMS



Key message:

- Our analysis above shows that, for high impedance faults, the energy dissipated as a result of harmonics is less than 1% of the total energy and, therefore, the impact on bushfire risk is negligible

4.0 REFCL Tranche 3 Update



- ▶ **Tranche 3 (T3) contingent project application was lodged with the AER on 31 May 2019**
 - › Includes the five (5) zone substations including Mansfield (MSD) which is being delivered in the Tranche 2 timeframe

- ▶ **The most complex site is Kalkallo (KLO)**
 - › It is located in a high growth area
 - › Has a significant amount of underground cable on its network which results in high network capacitance
 - › Three (3) of the seven (7) 22 kV feeders are owned by Jemena
 - › CPA3 has assumed the construction of a new zone substation to offload the existing underground feeders and the installation of multiple isolating transformers to further reduce the network capacitance
 - › A joint AusNet Services/Jemena network planning engagement is underway to determine the most appropriate solution to comply with bushfire safety regulatory requirements on an ongoing basis

- ▶ **Excluding the 3 Jemena 22 kV feeders, there are four (4) HV customers in T3**
 - › These customers have been formally advised of a REFCL readiness date of 30 June 2022

Key messages:

- The biggest challenge for Tranche 3 is Kalkallo (KLO)
- CPA3 has assumed the construction of a new zone substation to offload underground feeders from KLO and the implementation of five (5) isolating transformers to isolate underground residential estates from REFCL operations

5. ACR Program



➤ **Completed December 2015**

Fire Consequence Level	# Devices Highest Risk Areas	# Devices Remaining Risk Areas
TFB/Code Red	165	900

6.1 Powerline Replacement

Powerline Replacement Fund

- 1,680km in 'codified' areas
- 147km replaced; cost \$70.9M
- 25.3km in progress; cost \$11.4M
- Scheduled completion Nov 2019

AusNet Services' Program

- Conductor condition good
- Risk Based Modelling
 - Vegetation
 - Reliability
- No contingent projects identified
- Approx \$500-600M investment

6.2 Overhead Line Construction Areas Update

Conductors volumes, km

