PBSC UPDATE
Powercor REFCL Program

MARCH 2018
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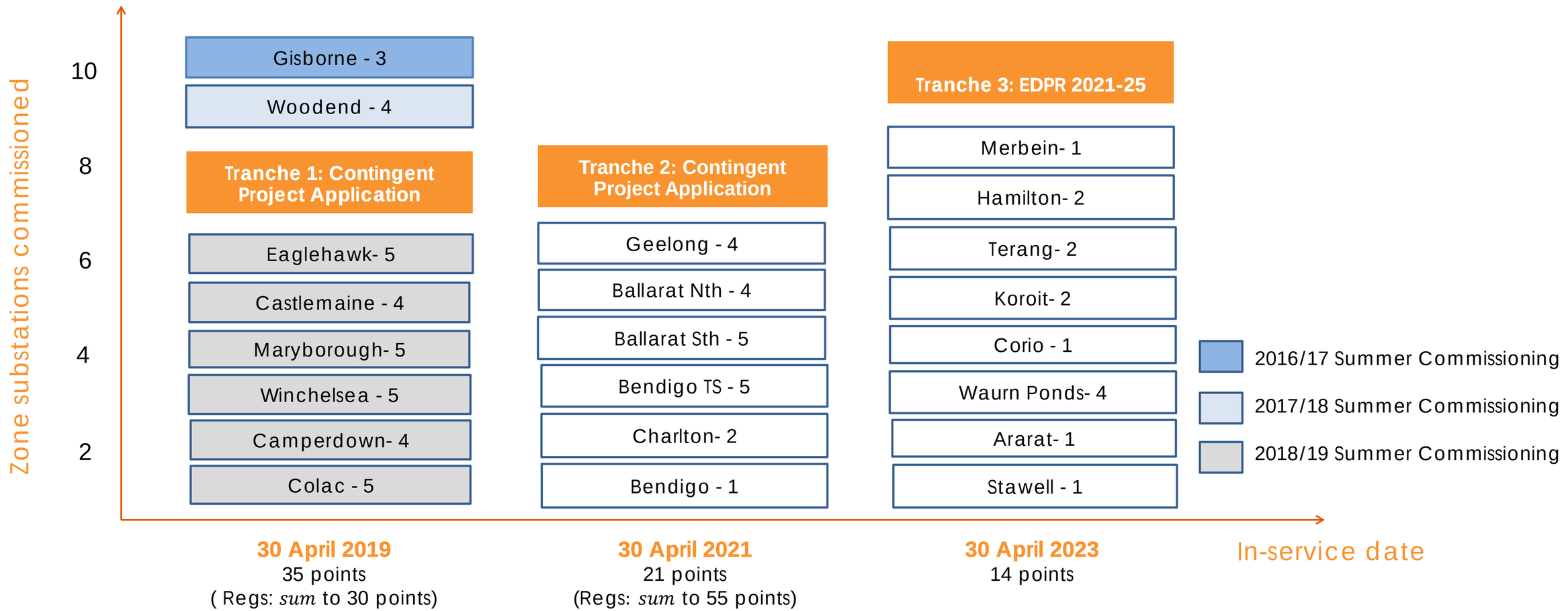
AGENDA

1. REFCL Timetable
2. REFCL Trial sites update
3. REFCL Deployment timetable
4. REFCL HV Customers update
5. REFCL Exemption Requests

1. REFCL TIMETABLE



2. REFCL IMPLEMENTATION UPDATE

GISBORNE

- In service since January 2017, required capacity achieved in April 2017
- No detriment to network reliability
- **Over summer 2017/18, has been available at 'required capacity (0.5 amp)' in the event of a Total Fire Ban day**

2018 Performance

- 13 transient faults cleared without interruption to customers
- 2 permanent faults on 6th January (TFB day)

6th January fault

- GSB REFCL identified a permanent fault (approx 1.8 amps)
- It operated immediately, opening feeder GSB014 CB
- Lengthy restoration due to TFB procedures (initial fault 16:05, full restoration 23:30)
- Traditional earth fault protection schemes only have the capability to detect >9 amps

2. REFCL IMPLEMENTATION UPDATE

WOODEND

- Required capacity not yet achieved
- Detrimental effect on network reliability
- **Over summer 2017/18, has been available on Total Fire Ban days with single REFCL unit with 1.0 amp sensitivity**

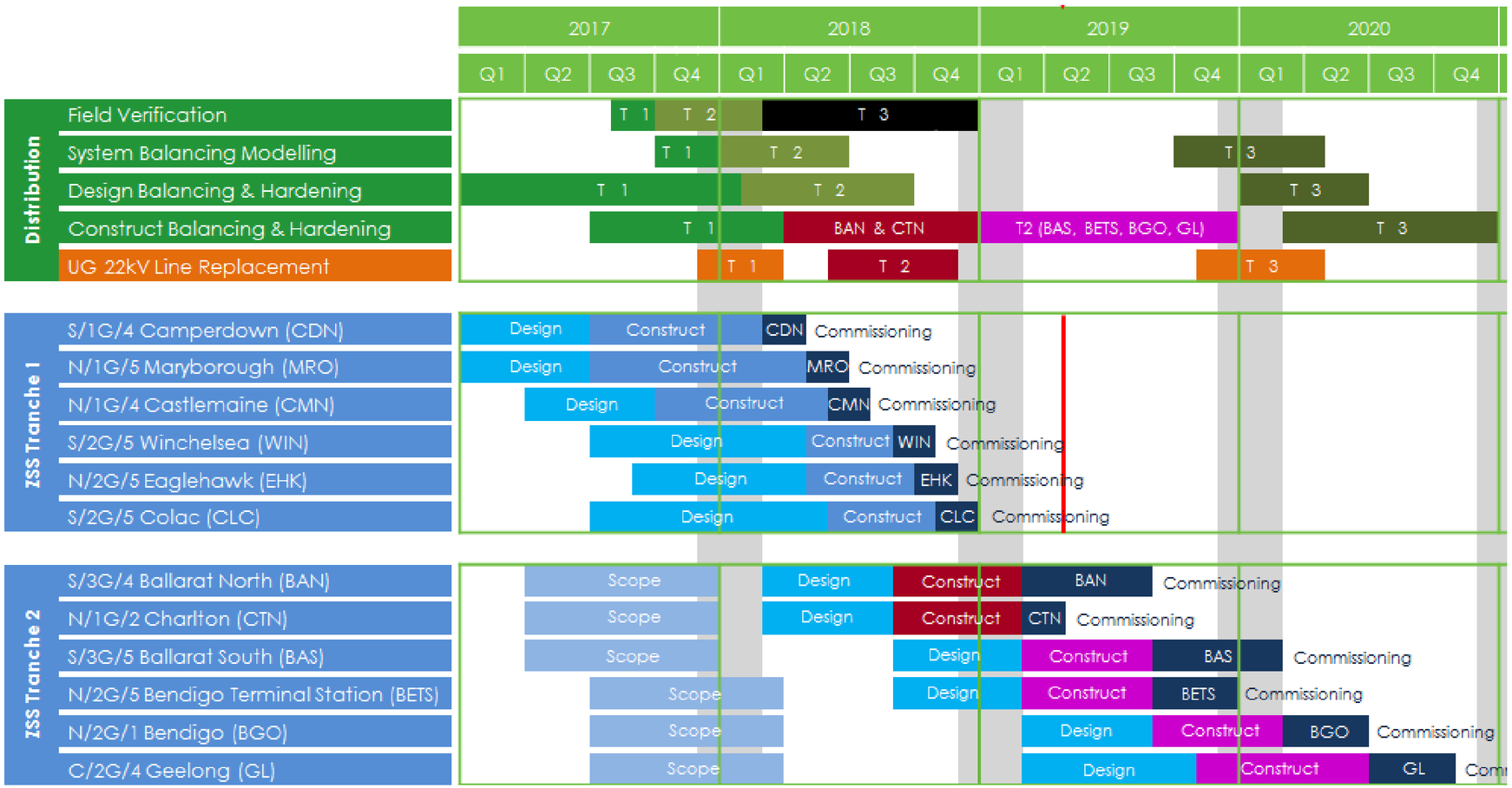
2018 performance

- 52 transient faults cleared without interruption to customers
- 7 permanent faults with low energy and reduced fire risk

Technical challenges

- Three (3) key issues preventing attainment of required capacity
  - Software flaw prevents operation across open bus tie
  - Induction during a fault induces a neutral voltage on the healthy bus
  - Fault current measurement accuracy (limited by existing CT capability)
- Updated software to enable dual REFCL operation received from Swedish Neutral this week
- Early testing indicates favourable outcomes

3. TRANCHE 1 and 2 DEPLOYMENT PROGRAM



3. REFCL IMPLEMENTATION UPDATE

CAMPDERDOWN (CDN)

- First T1 site
- GFN on site since November 2017
- All network hardening works completed
- Stress testing to commence after Easter
- Expect fully-commissioned by end of April

4. REFCL TRANCHE 1 – HV CUSTOMERS

Zone Sub	Feeder	Customer	Option	6MVA	3MVA	1MVA kiosk	Other
Camperdown	CDN001	Fonterra	Transfer to adjacent station				Cobden
Castlemaine	CMN005	George Western Foods (Main Factory)[1]	Shared Isolation Substation	1			
Castlemaine		George Western Foods (Secondary Factory)[1]					
Castlemaine	CMN005	Flowserve (Hunter St)	Shared Isolation Substation	1			
Castlemaine		Flowserve (Parker St)					
Castlemaine	CMN004	AGL Hydro	Single Isolation Substation		1		
Eaglehawk	EHK021	Keech Castings	Shared Isolation Substation	1			
Eaglehawk		Motherson Elastomers					
Eaglehawk	EHK031	Coliban Water 1	Single Isolation Substations		1		
Eaglehawk	EHK022	Coliban Water 2			1		
Eaglehawk	EHK022	Hofmann Engineering	Shared Isolation Substation		1		
Eaglehawk		Thales Australia					
Eaglehawk	EHK033	Southern Shorthaul Railroad	LV conversion			1	
Eaglehawk	EHK033	Parmalat Australia	Single Isolation Substation		1		
Eaglehawk	EHK034	Bendigo Health Care	Single Isolation Substation	1			
Colac	CLC011	Regal Cream Products (East Fdr)	Network hardening (tbc)[2]				Harden
Colac		Regal Cream Products (West Fdr)					
Colac	CLC011	AKD Softwoods (7-15 Forrest St)	Single isolation substation	1			
Colac	CLC003	AKD Softwoods (Warrowie Rd)	Single Isolation Substation		1		
Colac	CLC003	Australian Lamb Company	Single Isolation Substation		1		
Colac	CLC003	Regal Cream Products (Lot 2 Forrest St)	Single Isolation Substation		1		

Notes:
1) Prototype site
2) Recent discussions indicate network hardening may be mutually beneficial

5. REFCL EXEMPTION REQUESTS

1. PAL has submitted exemption applications for two HV customer sites related to the underground or overhead insulated polyphase electric lines (PELs) down stream of the isolating transformers. Additional information has been requested by ESV and PAL are preparing to submit applications for all Tranche 1 site in the next few weeks.

2. A future request for a time extension within Tranche 1 remains possible as a result of HV customer connections, including where:
   - The installation of an isolating substation at a HV customer site impacts a service date
   - The ESCV review of the distribution code is delayed or does not provide necessary changes
   - Customer hardening solutions funded by CPPAL or through DELWP HCAP impacts a service date

3. A future request for relief against the performance requirements remains possible, as PAL has not yet been able to achieve required performance at WND despite reasonable endeavours