

United Energy EDPR Information and Consultation ES&L Programs

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Agenda



2011-2015 Environmental Safety and Legal Program

What has changed?

2016-2020 Environmental Safety and Legal Program

Original ES&L Program



Program	AER Allowance \$M (2010)
Replace non-preferred services (including for height)	\$ 34
Replace crossarms	\$ 93
Replace poles, stake poles	\$ 15
Replace pole top structures - HV fuse, surge diverter	\$ 5
Replace conductors - HBRA	\$ 12
Replace crossarms and insulators - pole top fire mitigation	\$ 10
Removal of public lighting switch wire	\$ 1
Replace existing SWER lines with 22kV overhead bare conductor	\$ 8
Installation of GFN and associated equipment at zone substations	\$ 11
Installation of HV and LV ABC in HBRA	\$ 6
Installation of backup protection schemes	\$ 1
Service line clearance - requiring relocation or undergrounding	\$ 2
Overhanging trees (underground, line relocation, ABC etc)	\$ 7
TOTAL	\$ 214

Original Program Background



This program has been forecast at \$175M predominantly due to:

- Crossarm condemnation rates lower than forecast (\$27M)*
- Vegetation clearances delivered more through opex (\$18M)
- GFN and SWER delays (\$15M)

So we have added new programs during this period to complement the program

* Likely smaller shortfall

Added New Safety Programs & Directions 2011-2015



Overhead Switch replacement - \$6M

Underground supply in Doncaster - \$5M

Early Fault detection, LiDAR and Fuse Saver pilots - \$2M

Earthing, security, low height, environmental, animal proofing, DC management - \$18M

Clashing Mitigation and armour rod, dampers - \$6M

Total ES&L program 2011-2015 tailored to current risks now forecast **\$212M**

What changes for the future 2016-2020?



Most of the current investment reflect normal “replace on condition” programs

- Crossarms
- Poles
- Surge diverters & fuses
- Conductor

These have been moved to the “Reliability Maintained” category

Some previous “programs” were a provision set aside for “fix as found” work, not actual programs (to be measured by ESV)

- Clashing mitigation, armour rods and dampers, switch wire removal

Some will be completed by 2015

- Back up protection systems

New ES&L Program for 2016-2020 based on real safety programs

2016-2020 Environmental Safety and Legal Program (\$53M)



Complete the Doncaster Pillar replacement program from 2011-2015 (\$16M)

Complete the GFN program from 2011-2015 (\$12M)

Complete the SWER replacement program from 2011-2015 (\$18M)

Other minor works that may not be completed by end of 2015 (\$7M)

- Planned non-preferred service replacement
- Low transformer height replacements

Considerations of bushfire risk work

ES&L Program 2016-2020



Service Pillars in Doncaster Area



Service Pillars in Doncaster Area



Drivers

- There were approx 1700 service pillars in nature strips supplying residential customers in Doncaster area
- Pillars are metallic construction typically in excess of 35 years old and reaching end of life
- Insulation degradation in pillar internals can render pillar cover live
- Pillars are rusting and becoming structurally unsound and may expose the public to live cables inside
- Known incident of electric shock to member of public. Formal UE Safety Assessment indicates pillars pose a HIGH safety risk to the public
- Pillar in ground support is a buried asbestos pipe. Risk of liberating asbestos fibre in an exposed asbestos pipe from “whipper snippers” exists

Service Pillars in Doncaster Area



Options

Do nothing

- No maintenance or replacement will render pillars non functioning and expose people to electric shocks

Current Practice

- Replace on failure with service pit will take approx 15 years to eradicate all pillars leaving a known potentially unsafe network element within public access for a long period of time

Proactive Replacement Program

- This is a proactive program to eliminate all service pillars in the Doncaster area in a defined timeframe

Service Pillars in Doncaster Area Proposal



Continue a proactive replacement program to remove service pillars from the Doncaster area and replace them with current standard buried service tee joint and service pit

The program runs over 5 years with approximately 340 pillars replaced each year

This program improves safety to the general public through fast tracking of potentially dangerous pillars

ES&L Program 2016-2020



**Fire Starts from
Electricity Assets –
SWER and GFN**

Mitigation – GFN (REFCL) Technology



Fault energy fault proportional to I^2t

Reducing fault current reduces risk of arcing

Ground fault current on solid earth systems can be as high as 13kA

Post Ash Wednesday, resistors (NERs) were installed in HBRA

- Ground fault current on resistance earth systems < 2kA

Opportunity for GFN to improve

- Ground fault current on resonant earth systems < 30A
- Fitted with residual current compensators, fault current < 1A



Benefits – GFN (REFCL) Technology



Reduced fire start risk

Improve step & touch potentials for public safety

Reduce flash burn and conductor swing safety risk for live line work

Improved power quality with no voltage sag

Improved reliability with self-clearing faults

Victorian Bushfire Royal Commission recommended undergrounding, HV ABC, or other technologies to reduce risk of fire starts.

Combined GFN and improved line design to reduce phase-phase faults (such as steel x-arm, longer insulators and spreaders) could be a viable alternative to undergrounding or HV ABC at much reduced cost

Recent GFN Research Project



Effectiveness of a GFN at reducing the risk of fire ignition from phase to earth faults on overhead networks evaluated as part of a research program

DSDBI (formerly DPI) has oversight of the research program with the support of Energy Safe Victoria (ESV) and each of the Victorian electricity distribution businesses

Testing finished in June 2014

The research team successfully proved that GFN technology can significantly reduce the risk of powerline faults starting bushfires

Involvement of manufacturer has improved the product reliability

GFN Proposal



Install the balance of the program beyond 2016

Barriers – Remnant SWER

GFN technology only works on 22kV system – not on SWER because of separate earthing system

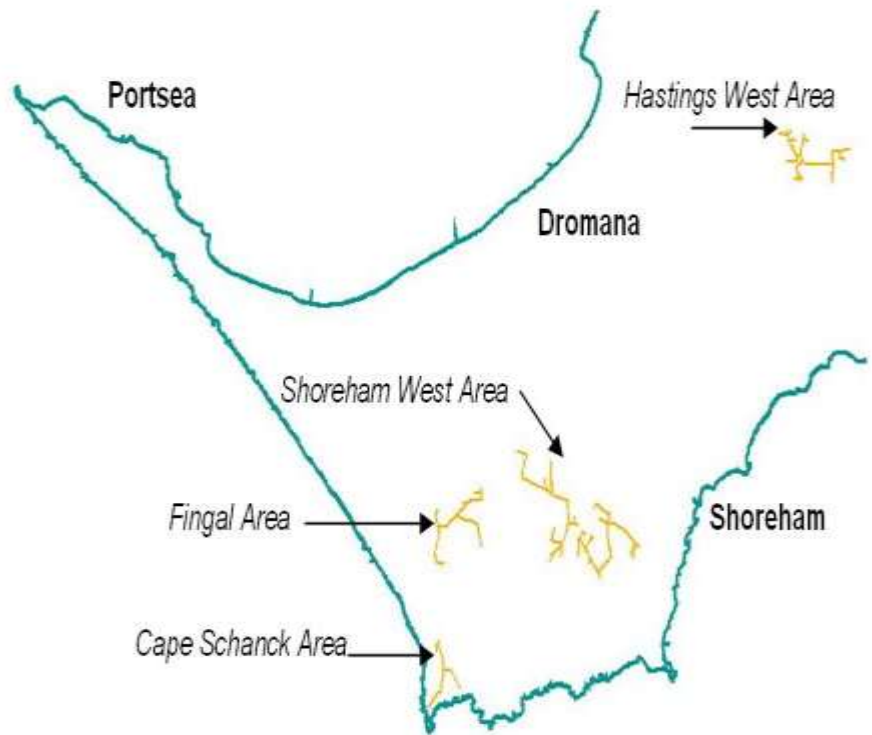
44km of SWER remains in UE service area

Replacement of SWER to 22kV would allow GFN protection coverage for these areas too

Other constraints in SWER system are also driving SWER replacement including capacity, power quality, asset condition, protection sensitivity, and standardisation



Remnants of SWER in UED Service Area



SWER Progress



SWER planning in progress (some projects in construction)

Most lines have no easement or insufficient for single/three phase lines

- Long, difficult and costly negotiations
- Relocate to road reserve
 - costly and ongoing tree clearing
- Legislative assistance for deemed easements

SWER Proposal



Continue the program with balance of replacement due beyond 2016

Bushfire Considerations



**Fire Starts from
Electricity Assets in HBRA**

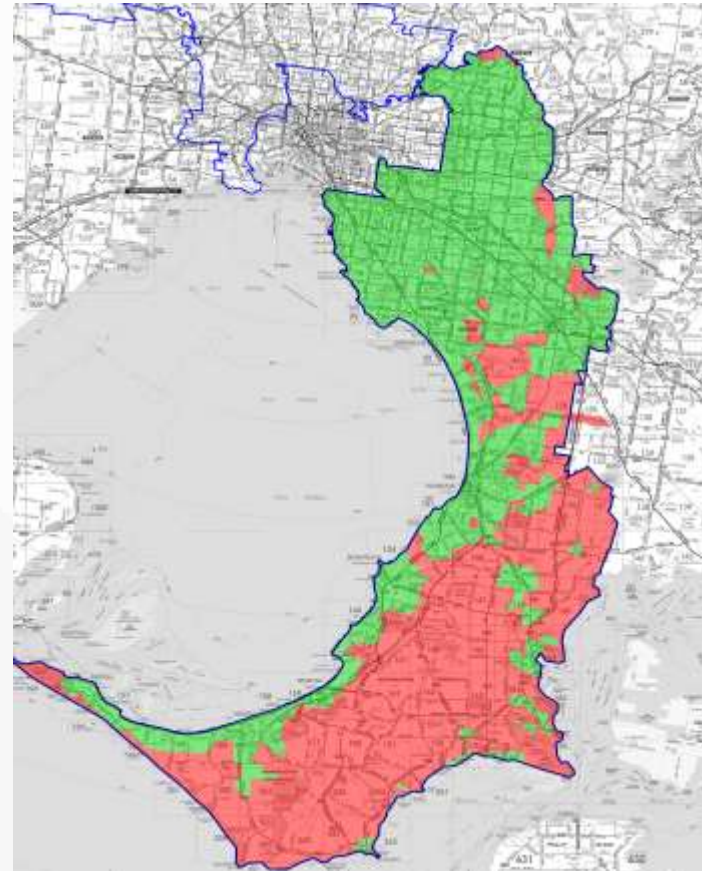
UE Network – High Bushfire Risk Area



Approximately 40% of the UE geographical network area is within the High Bushfire Risk Area (HBRA)

Approximately 19,500 poles out of a population of 200,000 are within the HBRA as are approximately 2,300km of overhead lines out of the total of 24,000km

Within the HBRA the majority of the conductor is of bare construction which has a higher risk of starting fires than insulated conductor construction such as Aerial Bundled Conductor (ABC)



Recent Drivers for Aerial Bundled Conductor



Reduction in bushfire risk

- Risk quantification method incorporates the overall UE network bushfire risk as well as the specific risk factors of individual projects

Reduced vegetation management operational expenditure

- ABC can realise savings as the vegetation corridor is reduced compared to bare conductor and the Regulations allow trees to overhang ABC

Avoided capital expenditure

- When the installation of ABC is targeted to a route where the existing conductor or supporting assets are in poor condition and require replacement, the ABC replacement project will avoid these costs

Improved customer reliability

- ABC typically has better reliability than bare conductor as it eliminates or reduces the number of fault causes

Recent History – Aerial Bundled Conductor



However.....

It has been identified that earlier non-metallic screened HV abc has become problematic

- AusNet Services have identified problems with earlier HV abc and are reportedly to replace 66km in Dandenongs
- Western Power have replaced all HV abc
- UE is starting to see HV abc failures on Mornington Peninsula (recent failures were installed in 2006!)
- Currently HV abc failures are the major contributor to ground fires in UE HBRA territory

Fire mitigation currently considering



HV abc replacement program in HBRA (~\$20M)

Revising design standards in HBRA to reduce fire start risk

Local mitigants in areas of highest fire loss consequence (Mornington)

- Arborist's inspection of trees outside regulated clearance, but that could impact lines if they failed
- Additional pole top inspection, thermal surveys
- Bird and possum proofing
- Consider minor exposed lines for abc, CCT, undergrounding
- Modify/increase protection systems for fault energy reduction

Conclusions



2011-2015 Environmental Safety and Legal Program
Changes

2016-2020 Environmental Safety and Legal Program
Considerations of bushfire risk work