Attachment 3 - Use of polygons to identify affected areas and assets

ENERGEX COST PASS THROUGH APPLICATION

TROPICAL CYCLONE ALFRED - COST ANALYSIS APPROACH

Item	Description
Document Purpose	To explain the methodology applied by Energex to verify costs captured during restoration efforts, following Tropical Cyclone Alfred (Event), were solely the consequence of the Event and do not include business-as-usual costs.
Data Sources	Major Event Tool (MET) – Web Application • Also known as the Disaster Recovery Analytics Tool (DRAT) • Records the name of the Event • Records the Start and End time of the Event • Records Depots affected by the Event • Records Customer Outage Information Damage Assessment Tool (DAT) – ArcGIS (Survey123) Application • Records the cause of the damage and the type of damage to network equipment. • Records the date when damage occurred to network equipment. • Records the point location of damaged network equipment Repex 5.1 Tool (ArcGIS Web App) • Records Planned Replacement (Repex) Program of Work – Ability to filter by FY • Records Planned Repex Work Request (WR) ID (number), WR created dates, a description of work to be performed. • Visualises polygons representing each planned Repex Works locations. Energex Ellipse (Enterprise Resource Planning System) • Works Request Table (MSF541): Records Repex WR raised date, WR required by date and WR closed dates.
Methodology	This approach involved the generation of spatially explicit shapes (or polygons) which encompass Energex network assets damaged during the Event, resulting in unplanned power outages (Event impacted polygon (EIP)). The EIP was analysed against the geographic locations of Energex's planned programs of work for network replacement or refurbishment (Repex Polygons). <u>Processing Steps</u>: 1. Spatial Processing:

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	• The analysis spatially linked Planned Repex Replacement Work (Repex polygons) to Depots and information recorded in the Major Event Tool (MET). 2. Temporal Processing: • Ensuring that date ranges of Planned Repex work and the Event date range aligns: o Repex Works cannot be closed before the Event start date; o Repex Works planned date cannot be opened after the Event. • Disaster Recovery Work o Recovery works must be related to the same equipment; o Test to make sure the created date of damage is greater than the Event start date; o Test damage created date is from the start of the Event, to the end of the Event, plus 1 month (30-days).
Assumptions	The 30-Day post event period was determined to be a reasonable time period to include any recovery after the Event.
Images	Google Earth Views of Polygons and Assessment Areas The areas impacted by the Event are coloured purple in the picture below. Locations were identified as potential areas of spend overlap and examples of these are in the pictures below.

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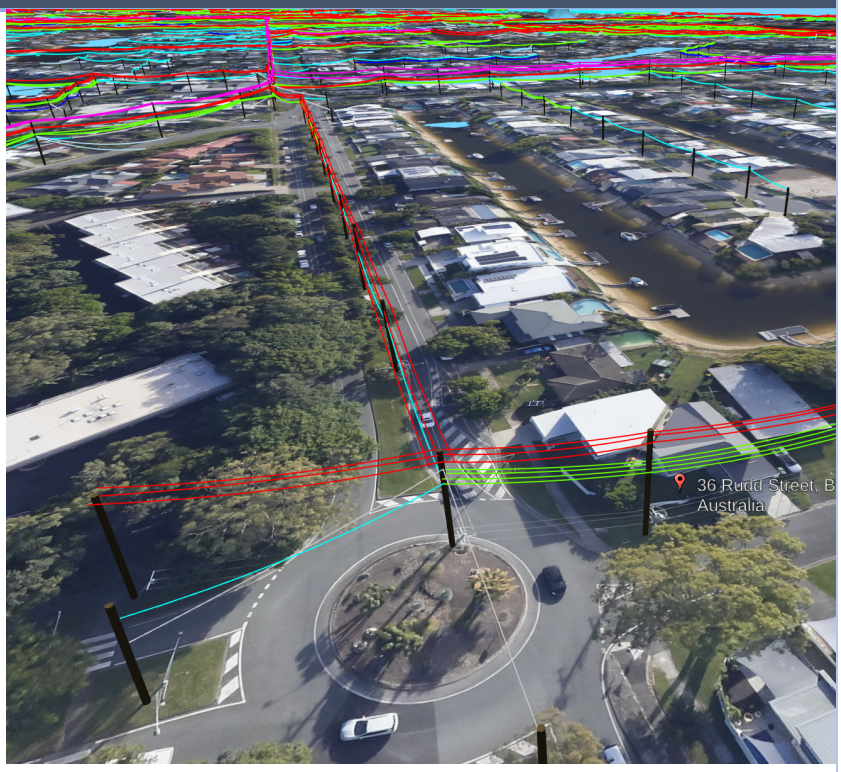
Item	Description
	 11kv switch broken. Lv arm broken-Lv mains on ground pole to pole X74198-A

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	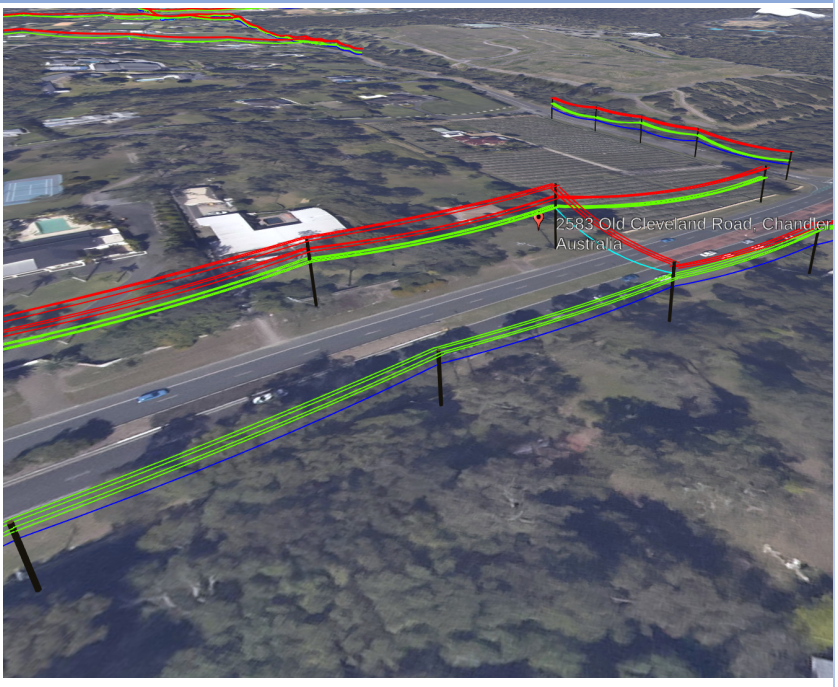 Two phases 11kV down across drive way of no. 583 old Cleveland road. Pin pole either side ok. 2nd 11kV feeder above CL5 is ok. P71114-C

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	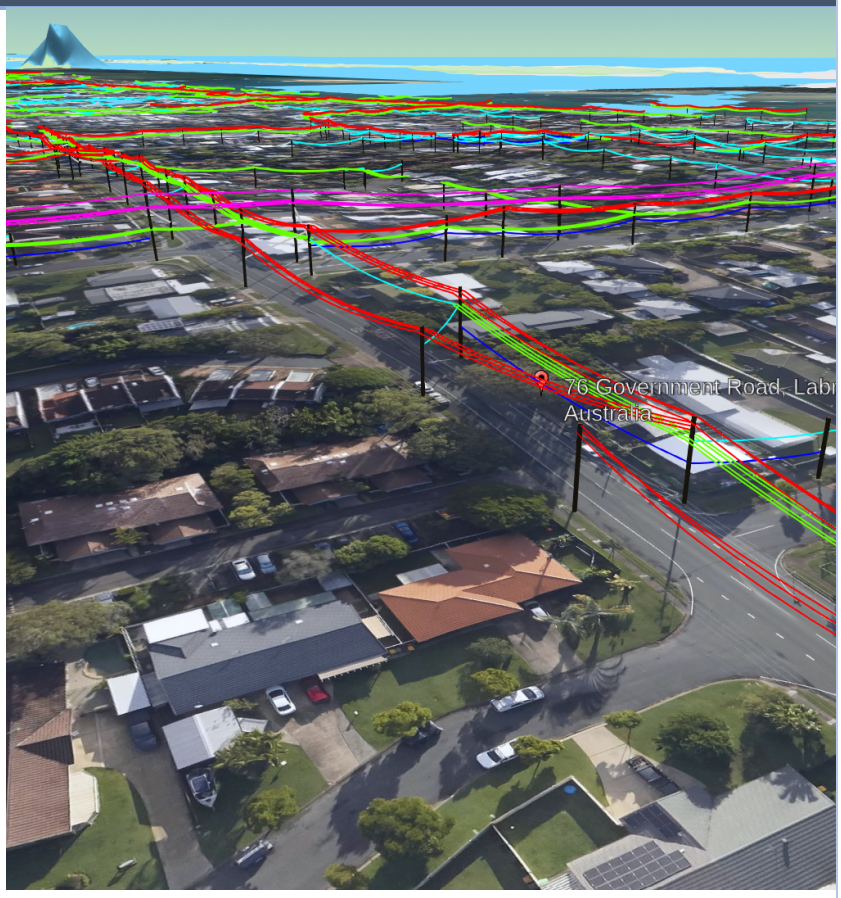 Two span of 11kV and LV Mains are damaged. Some 11kV on the ground. Second span branches on 11kV/LV hanging low due to trees on the mains. -Crimps let go at X site. CCT Mains. --X11175-F

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Table 1 provides the assessment results.

Table 1: Major Event Tool Assessment Results

DMG_comment	DMG_status	DMG_task	DMG_cause	DMG_damage	DMG_object	DMG_comp	DMG_voltag	DMG_site
Pole has leaned significantly creating ground clearance issue for coms and 11kV. Services adjacent are very tight due to movement.	PACKAGED	4|Recorded	M0013|Wind|S-NSPOLE	M0032|Lack of Ground Clearance|S-NSPOLE	M0393|Bare Al. Alloy Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	11	P38428-E
Broken LV spreader	COMPLETED	4|Recorded	M9999|Unknown|S-NSPOLE	M0001|Broken|S-NSPOLE	M0144|Wood Pole Beyond 2m|S-NSPOLE	POWO|Pole-Wood|S-NSPOLE	0.415	P25348-D
Bollard pole rotated significantly causing high tension to house service. Pole deteriorated as well.	PACKAGED	4|Recorded	M0013|Wind|S-NSPOLE	M0001|Broken|S-NSPOLE	M0150|Wood Pole Below Ground|S-NSPOLE	POWO|Pole-Wood|S-NSPOLE	0.24	P38430-C
11kv switch broken. Lv arm broken-Lv mains on ground pole to pole	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0204|Switch, Unknown|S-NSPOLE	SW|Switch|S-NSPOLE	11	X74198-A
Lv mains broken and on ground. -Tc required. -Busy round about-	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0010|Bare Cu Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.24	P43935-C
New 11LBSPTFFIS required-11kv currently earthed.--New LVP required and conductors 3 spans. --UG terms and cable appear ok.-	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0204|Switch, Unknown|S-NSPOLE	SW|Switch|S-NSPOLE	11	X74198-A
MEN cable supports on cross arm broken, LV service wires disconnected and hanging at head height	COMPLETED	4|Recorded	M9999|Unknown|S-NSPOLE	M0001|Broken|S-NSPOLE	M0404|LV Cable|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.24	P82238-B
Two phases 11kV down across drive way of no. 583 old Cleveland road. Pin pole either side ok. 2nd 11kV feeder above CL5 is ok.	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0009|Bare Al. Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	11	P71114-C
Tree branch on11kV mains and air break.	COMPLETED	4|Recorded	M9999|Unknown|S-NSPOLE	M0052|Damaged|S-NSPOLE	M0401|Air Break Switch, Unknown|S-NSPOLE	SW|Switch|S-NSPOLE	11	X11415-G
A neutral tail is dangling from the neutral conductor. Unable to determine if this is off one of the service conductors	COMPLETED	4|Recorded	M9999|Unknown|S-NSPOLE	M0001|Broken|S-NSPOLE	M0013|LV ABC|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.415	P76387-B
Looks broken still tied in on insulator	COMPLETED	4|Recorded	M9999|Unknown|S-NSPOLE	M0001|Broken|S-NSPOLE	M0091|Pin (Intermediate) Insulator|S-NSPOLE	INS|Insulator/Insulation|S-NSPOLE	0.415	X385-D
Tree on conductors. 11kv cct on ground, open wire lv on ground	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0393|Bare Al. Alloy Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	11	P18632-E
Two span of 11kV and LV Mains are damaged. Some 11kV on the ground. Second span branches on 11kV/LV hanging low due to trees on the mains. -Crimps let go at X site. CCT Mains. --	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0009|Bare Al. Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	11	X11175-F
A phase broken and on ground. Tree branch across B and C phase.	COMPLETED	4|Recorded	M0037|Hazard on Line|S-NSPOLE	M0001|Broken|S-NSPOLE	M0010|Bare Cu Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.24	P8186-D
Lv mains down pole to pole.-Lv mains down across Tallebudgera creek rd-Multiple crews required. -Tree removal from mains required, will need crane. 15 m gum on mains	COMPLETED	4|Recorded	M0040|Tree|S-NSPOLE	M0001|Broken|S-NSPOLE	M0010|Bare Cu Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.24	P26945-C
Full gum on 11 kv mains. -Pole has moved in ground significantly -Lv mains broken and on ground-33sua-11s, 11t - term broken-Lvs lvt - term broken-Cct mains 11kv-Pluto mains 33-7/14 Lv cu on ground. -Stay supporting tree. -Bollard pole moved in ground-	COMPLETED	4|Recorded	M0036|Footing Failure|S-NSPOLE	M0003|Leaning|S-NSPOLE	M0144|Wood Pole Beyond 2m|S-NSPOLE	POWO|Pole-Wood|S-NSPOLE	33	P26943-C
Lv on ground pole to pole.-Lvp needs replacing	COMPLETED	4|Recorded	M0013|Wind|S-NSPOLE	M0001|Broken|S-NSPOLE	M0010|Bare Cu Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.24	P47897-D
11kv overheads mains brought down by tree, tree has been cleared. Overhead mains need to be strung between poles10413 to P31122-c via P10414-g.X-arms are ok on this pole. Traffic control required. Earths already in place.	COMPLETED	4|Recorded	M0013|Wind|S-NSPOLE	M0001|Broken|S-NSPOLE	M0144|Wood Pole Beyond 2m|S-NSPOLE	POWO|Pole-Wood|S-NSPOLE	11	P10413-I
LV main broken.	COMPLETED	4|Recorded	M0013|Wind|S-NSPOLE	M0001|Broken|S-NSPOLE	M0010|Bare Cu Conductor|S-NSPOLE	COND|Conductor/Conductive|S-NSPOLE	0.415	P8069-C
Lots of splitting of pole. Missing bolt on cable guard.	COMPLETED	4|Recorded	M0013|Wind|S-NSPOLE	M0021|Split|S-NSPOLE	M0147|Wood Pole Up To 2m|S-NSPOLE	POWO|Pole-Wood|S-NSPOLE	11	P60252-D

The results of the spatial polygon analysis confirmed that there was overlap of unplanned emergency works performed in areas where planned Repex works were scheduled. All emergency works were undertaken to safely restore power to impacted customers.