Summer Preparedness Plan

2018-19

26 September 2018
ABOUT ERGON ENERGY NETWORK

Ergon Energy Network Corporation Limited (Ergon Energy Network) is part of the Energy Queensland Limited (EQL) Group and manages an electricity distribution network which supplies electricity to more than 746,000 customers. The vast operating area covers over one million square kilometres – around 97% of the state of Queensland – from the expanding coastal and rural population centres to the remote communities of outback Queensland and the Torres Strait.

The electricity network consists of approximately 160,000 kilometres of powerlines and one million power poles, along with associated infrastructure such as major substations and power transformers.

Ergon Energy Network also own and operate 33 stand-alone power stations that provide supply to isolated communities across Queensland which are not connected to the main electricity grid.

ABOUT ENERGEX

Energex Limited (Energex) is part of the EQL Group and manages an electricity distribution network delivering world-class energy products and services to one of Australia’s fastest growing communities – the South-East Queensland region.

Energex have been supplying electricity to Queenslanders for more than 100 years and today provide distribution services to almost 1.4 million domestic and business connections, delivering electricity to a population base of around 3.4 million people via 54,000km of overhead and underground network.
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EXECUTIVE SUMMARY

Ergon Energy Network and Energex as part of the Energy Queensland group have undertaken detailed preparation and planning for the 2018-19 summer season in Queensland. This Summer Preparedness Plan (SPP) has been developed on behalf of both Ergon Energy Network and Energex. This plan provides details of preparations that are carried out for summer 2018-19 to provide Queensland with a reliable network so as to minimise interruptions during extreme weather conditions, and where disruptions do occur, to ensure we keep the community fully informed and respond as quickly as possible to restore supply safely.

Last summer we experienced a total of 13 significant weather events impacting our networks across Queensland. In February 2018, the South East region experienced several significant storms including a severe storm and heatwave in Brisbane impacting 196,039 customers. Also in February 2018, Moranbah was impacted by a major storm, and the Central Coast experienced associated flooding resulting in 71,228 customer outages. Ergon Energy Network also activated its major emergency arrangements in response to three tropical cyclones of which one, Tropical Cyclone Nora impacted remote communities in the Far North.

In total, more than 500,000 customers were impacted by these severe weather events and a combined response effort of 3,000 staff mobilised to respond.

Image 1 - EQL Storm Season 2017-18 Summary
In 2017-18, reliability of supply in our regions outperformed the Distribution Authority’s Minimum Service Standard (MSS) limits for all measures.

Ergon Energy Network’s overall reliability performance has improved since the inception of MSS in 2005 with the duration of overall outages reducing by 40% and frequency reducing by 41%.

The performance results are a reflection of the targeted investment made during the last two regulatory control period towards achieving the regulated MSS standards.

A maximum peak demand of 4,920 MW on 14th February 2018 set a new system demand record for South East Queensland, with the previous record occurring on 18th January 2017. This network system peak occurred at 4:30pm towards the end of the day, reflecting the impact of solar PV reducing the network demand earlier in the day.

Energy usage patterns are changing due to changes in customer behaviour, price, energy efficiency initiatives and the continued rapid deployment of distributed generation such as solar photovoltaic (PV). Solar PV presents a number of technical challenges such as power quality and voltage management. Approximately 23% of customers now source alternate energy supply from solar PV for some period of the day in SEQ. We have progressed a range of innovative solutions such as changing operating times for hot water systems to ensure the network is able to cost effectively manage these challenges. Our focus is also on how to maximise value from its existing assets to the benefit of its customers. This will be achieved by optimising life cycle costs, engaging with stakeholders and customers to further develop appropriate and sustainable demand side management solutions.

In Regional Queensland the network peak demand and energy delivered this year featured fluctuations from previous years. Relatively milder ambient temperatures compared to last year across most of regional Queensland over the summer months, resulted in the Summer System Peak of 2,601 MW at 6:00pm on 15th February 2018 and less than the previously recorded highest system peak (2,637 MW on 13th February 2017 at 7:30pm). However, higher than expected local temperatures were recorded this summer in several regions including Emerald and Rockhampton.

We continue to apply a high level of rigour to planning and managing the network in the event of higher than anticipated peak demand in 2018-19.

Preparations for summer 2018-19 are well advanced with key operational expenditure (OPEX) and capital expenditure (CAPEX) programs underway. The network CAPEX program for 2018-19 is in line with the Distribution Annual Planning Report (DAPR) recommendations and security standards. Of significance, the focus has moved from network capacity activity to maintaining a secure and reliable network.

This plan has been developed as part of a long-term continuous improvement approach. It provides details of the capital and operating programs as well as operational responses, system preparations and planned communication activities.

As part of our ongoing commitment to our communities, a dedicated team leads our Emergency Planning and Response and disaster preparedness activities across Queensland. This team will focus on preparation, planning, resilience, response and recovery improvement opportunities to ensure we minimise the impact of significant events on our network, our communities and our customers.

Preparation for summer 2018-19 has four major areas of focus:

- Pre-summer Network Preparations
- Network Resilience
- Emergency Planning and Response
- Communication.
Finally, but most importantly, we are committed to providing all staff with a safe workplace and the knowledge and skills to work safely, particularly during emergency conditions.

DAVID SMALES
Chief Executive Officer

PAUL JORDON
Executive General Manager
Distribution

PETER PRICE
Executive General Manager
Strategy, Asset Safety and Performance
1. PURPOSE AND SCOPE

In the lead up to the summer storm season each year this Summer Preparedness Plan (SPP) is developed in conjunction with significant preparation activities aligned to four major focus areas:

- Pre-Summer Network Preparations - preparing the network to ensure the capacity and security of supply will meet summer energy and peak demand
- Network Resilience - maintaining the network to minimise the impact of extreme weather events on customers’ electricity supply
- Emergency Planning and Response - planning for, identifying and responding to disruptions, natural disasters and emergencies that impact on customers’ electricity supply
- Communication - continuing to provide timely and accurate communication with Ergon Energy Network and Energex’s stakeholders, customers and the media, in relation to network disruptions.

The SPP addresses these issues in several ways. It describes specific activities, including capital expenditure programs and operational or maintenance expenditure programs that are to be undertaken before the start of summer. Furthermore, the SPP details our capacity to manage and respond to extreme weather events and emergencies through appropriate emergency response programs, customer information systems, public communications strategies and resourcing levels.

The combined EQL electricity network distributes electricity to 3.4 million South East Queenslanders and more than 746,000 regional Queenslanders. More than 70% of the network is located in rural areas with vast distances between many communities. The regional network includes a higher proportion of sub-transmission compared to the South East Queensland network and one of the largest Single Wire Earth Return (SWER) networks in the world. The radial design of the network constrains supply restoration options when responding to disruptions.

The network is impacted each summer by a range of variable weather conditions including severe electrical and wind storms, cyclones, floods and bushfires through to periods of high temperature and humidity. In preparation for this, an extensive pre-summer program is carried out to prepare the network and minimise disruptions to customers’ electricity supply. Customer communications processes are also reviewed to continually improve fault call response times and keep customers informed when such extreme events occur.
2. DEFINITIONS, ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AIIMS</td>
<td>Australasian Inter-Service Incident Management System. AIIMS is based on the principles of management by objectives, functional management and span of control. It is a nationally recognised system of incident management for fire and emergency service agencies.</td>
</tr>
<tr>
<td>AO</td>
<td>Area of Operations - An AO is a geographical area under the control of one Operations Lead in the response and recovery effort following a disruptive event. An AO might be a relatively small geographic area if the event has resulted in significant asset damage or it might be a large geographic area if the damage is lesser but more widespread. The determination of AOs and boundaries will be made by the Emergency Manager and will consider the staff required to recover assets and services.</td>
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<tr>
<td>BAU</td>
<td>Business As Usual – resources and effort are focused on the planned and budgeted work required to operate and maintain electricity infrastructure, its operational functions and capabilities.</td>
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<tr>
<td>CAPEX</td>
<td>Capital Expenditure</td>
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<tr>
<td>Damage</td>
<td>Field activity whereby crews visually inspect network and record defects needing rectification.</td>
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<tr>
<td>Assessment</td>
<td></td>
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<td>DDMG</td>
<td>District Disaster Management Group</td>
</tr>
<tr>
<td>Disaster</td>
<td>A disaster is a serious disruption in a community, caused by the impact of an event, that requires a significant coordinated response by the State and other entities to help the community recover from the disruption (definition: Disaster Management Act 2003, Section 13). NOTE: a disaster can only be declared by a Disaster District or the State Government with the specific approval of the responsible Minister.</td>
</tr>
<tr>
<td>Disaster Management</td>
<td>Disaster management means arrangements about managing the potential adverse effects of an event, including, for example, arrangements for mitigating, preventing, preparing for, responding to and recovering from a disaster (definition: Disaster Management Act 2003).</td>
</tr>
<tr>
<td>Disruption Events</td>
<td>Events that disrupt the normal functions of businesses, the economy and/or communities and include those that are man-made (e.g. terrorist attack, bomb threat) and natural (e.g. storm, cyclone, fire, flood, network or non-network asset failure, influenza pandemic).</td>
</tr>
<tr>
<td>Emergency</td>
<td>A sudden and unexpected event that disrupts the normal operating functions, capabilities, resource and/or people of the organisation and requires an immediate response to prevent escalation of its scale or severity. For example but not restricted to:</td>
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<tr>
<td></td>
<td>- Localised electricity network damage, or potential damage, due to fire, flood, storm or accident etc.</td>
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• Loss of operating facilities and/ or resources
• Loss of ICT operating systems.

Hazard
An event, object or scenario that has the potential to cause harm to people and/or cause damage to property or assets.

LDMG
Local Disaster Management Group

Level 1 Event
Events are routine incidents that are managed as part of normal business operations and are not managed through emergency, crisis or business continuity management arrangements.

Level 2 Event
These events are the first level of non-routine events. They are more complex either in size, resources or risk; and are events that are beyond the capability of normal business operations and require specific command and control arrangements. For example, impacts to EQL’s normal operations may be substantial but may be relatively foreseeable and contained.

Level 3 Event
These events are the most significant. They require substantial effort and resources across different regions/areas of EQL and have the potential to substantially disrupt business operations or significantly harm EQL’s reputation. These emergencies require specific command and control arrangements and resourcing to a much greater degree than level 2 events.

LiDAR
Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges.

Moderate flooding
The area of inundation is substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas removal of stock is required.

MSS
Minimum Service Standards

NOMAD
Mobile substation capable of injecting high voltage to large areas of the network.

OPEX
Operational Expenditure

Pegasus
Mobile generator capable of injecting high voltage into a select area of the network

PowerOn
The South East (Energex) network monitoring system/database

Q100 Flood
Refers to a flood level or peak that has a one in a hundred, or 1%, chance of being equaled or exceeded in any year (also referred to as annual exceedance probability).

Resources
Includes staff, food, any vehicle, vessel, aircraft, plant, apparatus, implement, earthmoving, construction or other equipment of any kind or any means of supplying want or need.

Restoration plan
Prioritised feeder section plan to restore the network.
Risk
Potential impact on objectives (either losses or opportunities) due to a particular event, hazard or scenario. Risk is the product of likelihood and consequence.

SDCC
State Disaster Coordination Centre

SDMG
State Disaster Management Group

Significant Incident
Any occurrence affecting an EQL response and the community – including severe injury or loss of life involving EQL staff or the public, loss or damage affecting EQL or community property, and related matters involving EQL which are likely to attract media or public response.

Single Wire Earth Return (SWER)
SWER is a single-wire transmission line which supplies single-phase to remote areas. Its distinguishing feature is that the earth is used as the return path for the current, to avoid the need for a second wire (or neutral wire) to act as a return path.
3. REFERENCES

EQL Organisational Resilience Strategy and Framework
Energy Queensland Natural Disaster Working Arrangements
Energy Queensland Union Collective Agreement 2017
Energy Queensland Crisis and Emergency Leadership Team Charter
AS/NZS ISO 31000:2009 Risk management - Principles and guidelines
Electricity Act 1994 (Qld)
Electricity Regulation 2006 (Qld)
Electrical Safety Act 2002 (Qld)
Electrical Safety Regulation 2013 (Qld)
Disaster Management Act 2003 (Qld)
Emergency Management Assurance Framework (QLD)
Queensland Disaster Management Arrangements
Queensland State Disaster Management Plan 2016
4. **PRE SUMMER NETWORK PREPARATIONS**

During 2017-18, network performance has been evaluated and additional planning undertaken to identify parts of the network that warrant augmentation and refurbishment to keep pace with forecast demand increases or improve system reliability, security and resilience. This analysis has resulted in prudent operating and capital programs being established to minimise the impact of summer weather conditions on customers’ electricity supply. The separately published Distribution Annual Planning Reports (DAPR) for both the Energex and Ergon Energy networks provides a five year view of network management strategies.

We are committed to the achievement of best practice asset management strategies to ensure the safe and reliable operation of our network. We manage our assets in a manner that minimises the associated network risk as well as ensuring customer supply reliability during times of severe storms, major flood or bushfires.

5. **CAPITAL INVESTMENT PROGRAM**

We are required to ensure adequate system capacity and maintain an acceptable customer service level under their respective Distribution Authority. Capital investment programs have been developed and implemented to achieve the outcomes end users of electricity seek with regard to the quality and reliability of electricity services. The capital investment programs are based on the following four key criteria:

- Safety Net Targets for restoration of supply following a summer (N-1) event
- Minimum Service Standards (MSS) that set a level of required reliability
- Feeder improvement programs to improve reliability on the worst performing 11kV feeders and
- Other regulatory requirements as per the National Electricity Rules (NER).

6. **NETWORK CONTINGENCY PLANNING**

The specific activities undertaken to prepare the network and improve reliability for the 2018-19 summer season include network capacity and security improvement programs, safety net requirements, plant emergency rating information, strategic spare components, peak load monitoring, temporary load support and demand management.

Contingency plans have been developed to ensure security and encompass a number of aspects:

- Network contingency and load transfer plans to cater for single contingencies (eg. loss of a single major item of plant)
- Strategies for spares and replacement of major plant such as power transformers
- Availability of mobile generators for deployment to provide an emergency supply in situations where practicable
- Availability of two 33/11kV mobile substations in the South East, two 10MVA 66/33/22/11kV mobile substations (NOMADs) in the Southern region and one NOMAD in the Northern region for deployment to provide an emergency supply where practicable noting that they can be moved across Regions and
- Application of available demand management options.

6.1. **Contingency Plans for Summer (System Normal Conditions)**

Each year, the entire network is reviewed to ensure that all substations and feeders can supply a 10 PoE (10% Probability of Exceedance) load for the following summer under system normal conditions i.e. Normal Cyclic Capacity (NCC) ratings.

A process has been implemented to monitor loads during the summer period so that as hot weather develops, emerging “hot spots” where demand growth may have exceeded the previous annual forecasts are identified. In these cases, corrective action to avoid an overload is taken well before a capacity constraint occurs.
The hot weather event experienced during January and February 2018 has provided valuable insights into parts of the system requiring augmentation, and works are well advanced to rectify these network limitations.

6.2. Automatic Under-Frequency Load Shedding (UFLS)

UFLS is an automatic load shedding process that happens almost instantaneously to protect the power system if there is a major unplanned outage in the National Electricity Market. An event such as the sudden failure of a major generator or transmission line resulting in available electricity supply falling below customer demand results in a drop in system frequency and potential instability.

To prevent this, the electricity grid is equipped with strategically located Under Frequency relays. Each relay is programmed to monitor a certain system frequency, from 49 Hz down to 47.9 Hz. In an emergency, as the system frequency gets slower and slower, the Under Frequency relays will progressively trip load until the balance between supply and demand is restored. The relays are grouped into blocks of varying customer types to minimise impact. Like rotational load shedding, critical loads are avoided.

The Australian Energy Market Operator (AEMO) requires Energy Queensland to have 60% of its loads available for Under Frequency Load Shedding. We work closely with Powerlink to review the UFLS blocks. The initial load shedding blocks for our networks include larger industrial and commercial loads.

The increasing level of roof top solar generation is also changing the load on distribution feeders available for shedding if it is required during the day. The feeders included in the load shedding schedules are reviewed to ensure the load shedding blocks remain effective. We have also confirmed a continuous review of load shedding schedules to better understand where significant rooftop solar generation is connected on the distribution network.

Each event which initiates load shedding is quite different and the amount and type of load shed depends on system loading (day of the week, the time of day and season), system synchronous capacity available and the event causing the disturbance. For example, a large industrial load such as a mine may not be operating at the time of the disturbance, and this may require other blocks to be shed. The time required to re-energise and restore electricity supply after UFLS is also variable.

6.3. Contingency Plans for Summer (N-1 Conditions)

Network contingency plans detail the load transfer and load management options available to restore supply following a single contingency event affecting bulk supply substations, zone substations and sub-transmission feeders.

In cases where existing capacity or load transfer capability is not sufficient to enable supply to be restored following a single contingency, more comprehensive plans have been developed depending on the tolerability of the risk level identified. Restoration targets are defined in Schedule 4 of Energex and Ergon Energy Network’s Distribution Authorities “...to the extent reasonably practicable”.

This acknowledges that regardless of level of preparation, there will always be circumstances where it is impossible to meet the restoration targets at the time of an event (for example, if it is unsafe to work on a line due to ongoing storm activity), though these should be rare.

Efficient investments under the Safety Net provisions will provide mitigation for credible contingencies that could otherwise result in outages longer than the Safety Net targets. Safety Net is defined as effective mitigation of the risk of any low probability/high consequence network outages to avoid unexpected customer hardship and/or significant community or economic disruption. Safety Net targets for power restoration times are prescribed for different locations and energy loads at risk.
As part of the implementation of Safety Net, a major review was undertaken of the network’s sub-transmission feeders and zone and bulk supply substations. The capacities of all elements within the applicable networks were examined and network transfer capability confirmed (often requiring extensive network modelling). In many cases transformer cable ratings, bus section capability, breaker capability, network topology and protection schemes were identified as the limiting factor.

Since then, work has continued that includes:

- The design and construction of small temporary capital works (e.g. a few spans of overhead mains to allow for temporary rearrangement of the network after a contingency)
- The positioning of spare power transformers at substations considered to be at higher risk (high likelihood or significant consequence) of an extended outage due to a major transformer failure
- Further liaison with field staff to ensure that local issues such as location of field crews, spares, available equipment, access conditions and fatigue management are taken into account
- Initiation of capital works and other actions as specified in the plans to ensure that we are compliant as far as reasonably practicable
- Trialling a number of plans to ensure that they are anticipative, actionable and achieve the desired outcomes.

We continue to review the changing state of the network for Safety Net compliance as part of the normal network planning process, ensuring that care is taken to understand our customers’ needs when considering the competing goals of service quality and reliability against cost of network.

6.4. Strategic Spares

As part of our strategic planning, strategic spares is defined as a major item of plant held in stock that may be required to be used to replace, permanently or temporarily, a critical network or system element that has incurred damage due to a system fault or failure. The strategic spare would only be used where supply to customers cannot be maintained without its use, or if network security would be unacceptably compromised. An appropriate level of strategic spares are maintained throughout the storm season.

The identification and allocation of spare power transformers for contingency events is now addressed within the Joint Strategic Spares Strategy and necessary strategic spare transformers have been identified and held in stock.

6.5. Mobile Generators for Emergency Response

Mobile standby generators are used to provide emergency response to sub-transmission and distribution network faults that cannot be rectified by switching or immediate fault restoration. This assists in restoration of supply in a manner that minimises customer disruption. The fleet of mobile generators also provide flexibility for feeder support during extreme temperature/load events where existing network assets need to be supplemented.

These generators are also pre-emptively deployed to locations likely to be isolated during significant flooding or storm damage.

Our Ergon Energy Network mobile generator fleet is approximately 14.3MVA in total capacity available. The current fleet includes 35 low voltage generators ranging in size from 33kVA to 625kVA, with an additional six containerised low voltage mobile 1250kVA units and five Pegasus 1250kVA HV injection units. These HV injection units comprising of a 1250kVA generator and 1250kVA Pegasus unit, are capable of being directly connected to either the underground or overhead 11kV or 22kV networks. There are several generators currently committed to remote areas of the network.
The Energex mobile generator fleet is 23.3 MVA in total capacity. The current fleet includes 45 low voltage generators ranging in size from 60kVA to 500 kVA and five high voltage mobile 1250kVA units. There are currently 3.25 MVA (4 x 500kVA generators and 1 X 1250kVA generator) committed to network support. A list of mobile generation is included at Appendix 2.

In addition to our own generation equipment, arrangements are in place to hire low voltage generators to ensure adequate feeder support.

6.6. Demand Management Network Support

Each year in preparation for summer, network support agreements are established with customers who are located in network load at risk areas. This initiative commenced during the summer preparedness planning in 2006-07 and is ongoing.

Early planning and identification of load at risk areas for 2018-19 summer preparedness has been completed. As there has been minimal NCC load at risk identified, the amount of network support required is expected to be much less than that for the previous summers. These programs require commercial agreements with customers who have suitable load profiles that could be influenced on exceptional hot weather days. Initiatives include agreements with customers who have:

- Shiftable load
- Private standby generation that can provide network support or
- Agreements allowing generators onsite for network support.


7. NETWORK RESILIENCE

With a large overhead electricity network, traversing long distances in some instances and through dense vegetated areas in rural Queensland, there is a high exposure to the elements and severe weather events have a significant impact on supply reliability. In order to minimise these effects, we have identified and implemented critical maintenance activities, including a vegetation management program and an intense focus on pre-summer inspection and maintenance.

7.1. Vegetation Management

Vegetation encroaching within minimum clearances of overhead powerlines presents safety risks for the public, our employees and contract workers. Vegetation in the proximity of overhead powerlines is also a major causal factor in network outages during storms and high winds.

Ergon Energy Network annually updates its 3D geo-spatial representations of network assets to assist not only with ongoing vegetation management but other aspects of asset inspection. This technology includes predictive capability for vegetation growth rates.

A comprehensive vegetation management program is maintained to minimise community and field staff safety risk and provide the required network reliability. To manage this risk we employ the following strategies:

- Energex Cyclic programs to cut vegetation on all overhead line routes. Energex’s vegetation contractors deliver a cutting program that ensures cycle times set by Energex are met
- Ergon Energy Network cyclic program to cut vegetation on all overhead line routes. Cycle times are varied, based upon LiDAR analysis and network analytics enabling optimisation of field crew dispersion, ensuring the powerline clearance zone is kept clear at all times, and
- Reactive spot activities to address localised instances where vegetation is found to be within clearance requirements or has been reported for action by customers.
We continue to work cooperatively with local councils to reduce future risk of vegetation contacting powerlines. Initiatives include the development of tree planting agreements, specifying requirements for the selection of tree species for use near powerlines and programs to remove existing unsuitable trees and replace with powerline friendly trees. These relationships are now quite mature and are effective in the ongoing management of vegetation.

7.2. Inspection and Maintenance Initiatives

In an effort to make further improvements to the performance of our overhead network, particularly during storm seasons, we continue to implement resilience initiatives as detailed below:

- Conducting inspections of the condition of overhead plant and equipment every five years in the Energex areas and on a risk based four, six or eight year cycle in Ergon Energy Network areas. Included as part of this inspection program is the:
  - Testing of overhead high voltage earthing systems to ensure their effectiveness in the protection of plant and equipment and public and staff safety
  - Visual inspection of water way crossings
  - Visual inspection of underground pillars
  - Visual inspection of a range of other network assets
  - Identification of immediate vegetation risks.

- In the high rainfall areas in Far North Queensland, detailed Pole Top inspections are also carried out on selected feeders on a four year cycle (mid cycle from the main asset inspection program)

- Thermal surveying inspections of bulk, zone and distribution substation sites and plant

- Routine inspections of substation equipment are completed dependant on equipment types, classification and condition

- Annual aerial LiDAR inspections are conducted over the entire network. With this capability 3D geo-spatial representations of network assets are displayed in a geo-spatial visualisation application to assist with vegetation management and asset maintenance. This provides information about defects and is contributing to reduced maintenance and planning costs, and increased safety and reliability of supply for our customers and communities. The data captured is processed to enable measurement of the network and surrounding objects such as buildings, terrain and vegetation. To assist in major emergency events, this service provides post-event data capture flights to improve visibility of the impacted environment and extent of damage to assist with Restoration Plans

- A pre-summer program of targeted helicopter patrols on high risk feeders is completed each year. These patrols are used as a proactive measure to identify potential maintenance requirements and potentially undetected threats to the network. Energex also conduct aerial patrols using high resolution photography in urban areas throughout the year however are limited in scope by imposed flight restrictions and safety aspects. Some vehicle patrols may be required in special circumstances

- Helicopter patrols are utilised to locate faults after storm events where required

- In addition to these specific activities, our aim is to provide a resilient network in preparation for the summer storm season through a detailed annual program of work to improve, develop, maintain and operate the network.

7.3. Installation of LV Fuses

To improve network reliability and safety during storm season we have a progressive capital investment program to install LV fuses on distribution transformers. This program involves the installation of low voltage high rupturing fuses on pole mounted transformers. The objectives for the LV fusing program are to:

- Provide optimum safety to employees and community in the event of a LV fault and aligned to industry standards
- Provide adequate protection for LV faults and ensure safe outcomes to the community
- Comply with the Energy Networks Australia (ENA) National Low Voltage Protection Guidelines, and
- Reduce the safety risk for a low voltage fault incident to “as low as reasonably practicable” (ALARP).

### 7.4. Feeder Improvement Program

Ergon Energy Network and Energex are ensuring that the investment in the Feeder Improvement program is prudently spread across different feeders and regions.

Ergon Energy Network distribution feeders are ranked (status assigned) according to their three year average System Average Interruption Duration Index (SAIDI) performance over that time against the Minimum Service Standards (MSS). Feeder rankings are defined below:

- Green feeders have a three years’ average SAIDI ≤ MSS
- Yellow feeders have a three years’ average SAIDI > MSS < 150% MSS
- Amber feeders have a three years’ average SAIDI > 150% MSS < 200% MSS
- Red feeders have a three years’ average SAIDI > 200% MSS.

During the regulatory period the highest ranked 50 feeders are included as part of the feeder improvement program. The reliability improvement solutions identified from the feeder reviews conducted in this regulatory period have mainly included low to moderate capital investment options. The low cost quick win solutions mainly included network protection setting changes, installation of Line Fault Indicators with and without communication and Fuse Savers. The moderate investment options included installation of new Automatic Circuit Reclosers, Sectionalisers Remote Controlled Gas Switches and also relocation and/or replacement of switching devices.

The program aims to deliver tailored solutions based on an assessment and understanding of the drivers for inadequate performance on the distribution feeder.

The Energex network is required to improve 11kV feeders where their performance meets the following criteria:

- The 11kV feeder is in the highest 10% of the network’s 11kV feeders based on its three year average SAIDI/SAIFI performance, and
- The 11kV feeder’s three year SAIDI/SAIFI outcome is 150% or more of the MSS SAIDI/SAIFI limit applicable to that category of 11kV feeder.

The Feeder Improvement Program is expected to yield improved feeder performance by cost effectively adopting one or more of the following options:

- Remote controlled protection devices and switches
- Covered conductor
- Fuses and fault indicators on the feeder, and
- New ties to adjacent 11kV feeders.

The identified solutions are well progressed will continue to be reviewed during 2018-19.

### 7.5. Bushfire Risk Mitigation

Bushfires are an inherent part of the Queensland environment. The vastness of the land, community centres and the resulting electricity network increases the risk of potential impact to the network. Failure of components of an overhead electricity reticulation system may also present a potential source of ignition and combined with unfavourable environmental conditions may increase the risk of a bushfire.

We are committed to the achievement of best practice asset management strategies to ensure the safe and reliable operation of our network.
This includes the establishment of a Bushfire Management Planning Committee and the development and application of a Bushfire Risk Management Plan to target issues and initiatives relating specifically to bushfires.

A key component of the plan is to outline how assets are managed to minimise the risk of bushfires to the network, maintain customer supply reliability and ensure a high level of safety for the community during times of bushfire.

The Bushfire Risk Management Plan is published in August each year and contains a list of programs and specific bushfire initiatives for the next bushfire season. Programs include replacement of aged conductors, installing gas insulated switches in lieu of air break switches, replacement of sub optimal pole top constructions and utilises sparkless fuses in high bushfire risk areas. Pre-summer inspections are conducted in bushfire risk areas and high priority defects identified on the patrols are identified for rectification. The plan also identifies the requirement to report and investigate suspected asset related bushfires.

Geographical spatial systems and publicly available mapping layers are made available to the response staff to identify high risk bushfire zones to assist in planning and mitigation strategies as well as response activities.

Collaboration with Queensland Fire and Emergency Service (QFES) at both Local and District Disaster Management Groups in regional Queensland assists to identify and reduce bushfire threats. We have a responsibility to manage any risks associated with our network to ensure the safety of our customers, the general community and the security of electricity supply.

Energex has active participation with QFES on the Regional Inter-Departmental Committees for the North Coast Region (incorporating Sunshine Coast and Gympie) and South East Brisbane Region (incorporating Brisbane, Redlands and Gold Coast).

Our regional teams engage with Rural Fire Brigades and the public to raise awareness of the importance of protecting the electrical network assets when conducting planned burns, as well as general electrical safety during firefighting activities. Additional mitigation measures, introduced in higher risk areas, include creation of firebreaks around poles, trials of fire retardant painting of wood poles and replacement of specific Expulsion Drop-Out (EDO) fuses and fuse carriers with current standard components that meet Spark Production Class A requirements as defined in AS1033.1.

An aerial monitoring program is conducted using LiDAR technology which is contributing to understanding and identifying bushfire risk through capturing the condition of clearances between the overhead network and vegetation, ground and structures and capturing major defects that have potential to ignite fires.

### 7.6. Flood Risk Mitigation

Many Queensland towns and cities are located within catchment areas, along major waterways and the east coast areas.

Queensland has many climatic zones across the state and as such experiences a range of storms, tropical lows and cyclones. The increase in rainfall and run off from these systems may have an immediate or delayed flood impact on population centres or electrical assets.

The Flood Risk Management Plan details information available to assist in the mitigation, planning and response to potential flood events. The plan includes the communication of safety related information for employees and the community to ensure a high level of safety for the community in the event of damage. A consolidated mapping system utilising internal collated data relating to asset impact in previous events and externally sourced information from government organisations assists to improve our knowledge, planning and response activities.

The following measures have or are being undertaken to manage flood events and improve the flood resilience of network assets:
Review of existing Flood Risk Management Plan by 30th October 2018 which covers major flood events across Queensland and having the greatest impact on the electricity network and continuity of electricity supply to customers. This includes learnings from ex-TC Debbie flooding in April 2017 and North Queensland in March 2018, and

- Upgrades to the flood resilience of selected bulk and zone substations affected by the January 2011 flood event.

Flood mitigation works have previously been implemented in regional Queensland to minimise impacts for flood areas in cities such as Rockhampton, Mackay and Bundaberg following several major flood events.

These works include HV and LV isolation points to assist in isolating impacted areas as flood waters rise or where rising flood waters breach regulated line clearances. Sufficient isolation points were created so the isolation areas were kept to a minimum. Our regions have flood levels available in our geospatial systems to identify plant that needs to be de-energised at specific flood heights.

In some circumstances, supply is required to be isolated to areas which are not inundated but flood waters impact neighbouring areas supplied by the same system. This has caused considerable concerns for these customers. For these areas, where feasible, alternate supplies have been constructed to maintain supply.

Liaison officers work with the Local and/or District Disaster Management Group to implement any proactive or reactive isolation required.

8. EMERGENCY PLANNING AND RESPONSE

In the lead up to the 2018-19 summer storm season preparations have been undertaken to ensure our ability to respond to short notice and escalated severe events in a safe, efficient and effective manner. These include:

- Implementation of a best practice emergency response framework
- Preparing comprehensive contingency plans for improving how we prioritise and schedule work during major or widespread outages
- Implementing emergency response procedures covering management of major network incidents
- Development of a detailed Emergency Response Plan
- Ensuring appropriate resources and skills are available to respond to an emergency or disruption event
- Development of a mobilisation and resourcing strategy for maximum response efficiency
- Enhancing our use of technology to gather, analyse and disseminate critical information
- Training, annual scenario planning and conducting simulation exercises to test the effectiveness of the response during different conditions
- Proactive monitoring of weather patterns and forecasting, and
- Establishing and maintaining relationships with Disaster Management Groups at Local, District and State level.

8.1. Emergency Management

A comprehensive approach to emergency management has been adopted incorporating the Queensland Disaster Management guidelines emergency management phases of Prevention, Preparedness, Response and Recovery.

These plans align with the Queensland Disaster Management Arrangements framework and are enacted for major events when required to enable us to respond efficiently and effectively in order to minimise electricity supply disruption across our service area.

We use an emergency framework that can be utilised for all hazards and emergencies. The framework is based on the Australasian Inter-service Incident Management System (AIIMS) that is commonly used by emergency services agencies and other large organisations. It also meets the good practice attributes of the Queensland Emergency Assurance framework. The framework provides a structured, yet flexible and adaptable approach, able to be scaled to suit an event and provide effective and efficient control of incidents. It ensures an improved inter-agency cooperation and use of common terminology.

The emergency framework has been tailored for our business and integrated into a wider resilience framework to ensure there are clear triggers to escalate from routine incidents and events through to large scale emergencies.

8.2. Prevention

Our response planning is based on an all-hazards risk assessment of potential events and associated business impacts. Where practicable, we endeavour to design, construct and maintain the electricity distribution system to mitigate loss of supply resulting from a disaster or other event and conduct regular analysis of the network to identify requirements. Additionally, post-event reviews are undertaken at all levels to analyse our response and identify improvement opportunities.

8.3. Preparedness

Disasters or emergencies may occur at any time, with little or no warning from major storms or advance warning from larger events (e.g. bushfire, cyclones and floods) and the response framework is structured to be flexible to able to attend to all.

A Summer Preparedness Steering Committee and a Summer Preparedness Working group have been established to ensure our business units have conducted sufficient preparations in the lead up to the summer storm season, providing a safe and robust network, sound emergency response procedures and safety awareness to the community. This includes outworking a detailed action plan to prepare the business for the Summer Storm Season and has representation from across the business.

To further enable us to manage disaster events, an annual review of response plans and processes, training and exercising key staff is undertaken. These are required for completion by 30th September each year. In addition, an independent review is being conducted to ensure the adequacy of the plans, its implementation and summer preparations.

8.4. Response

Response to any major disruption event will be tailored to the location and severity of the situation. The structure adopted recognises different levels of response depending on the seriousness of the incident’s real or potential impact, and the level of resources and expertise required to manage the event.

We have three levels of response with a structured escalation process to ensure an appropriate and measured approach occurs.

For level one and two events we follow an escalated fault response model for small scale or short notice events. This model allows for flexibility in command and control structures, as well as the ability to escalate for additional resource support when required.

When an emergency escalates to, or a predicted emergency is identified for a level three event, a common framework is activated under the Emergency Management Plan.
For predicted level three events with lead times, the business will advise of its response status utilising phases aligned with Queensland Disaster Management Arrangements (Alert, Lean Forward, Stand Up and Stand Down). When any event is sudden or unexpected, the response may move rapidly through the relevant phases, while still ensuring that all actions to establish response teams, response centres, mobilise resources and communicate to all stakeholders are completed. The phases allow for the timely and coordinated effort to establish an appropriate response.

The main priorities immediately following the impact of an event is safety of employees and the community, identifying the number of customers affected, extent of damage, types of customers and availability of staff in terms of repair and network switching work. This information allows review and refinement of resourcing and restoration strategies and plans. Initially making the network safe for staff and the public occurs before restoration activities commence. Prioritisation of our restoration work is managed within the context of the relevant business operational plans. Where there are multiple interruptions to the network, the priority for restoration is to emergency services including as hospitals, police, ambulance and essential utilities.

We continue to enhance our mobile and digital technology platforms to assist in improving our ability to respond, analyse damage and perform repairs including the capture of near real time intelligence through our Field Force Automation, LiDAR and geospatial mapping systems.

8.5. Recovery

Recovery is the coordinated process to permanently restore the operational capability, the network infrastructure or electricity supply to the community. This is usually conducted in parallel with the emergency response and these activities may occur in the Stand Up and Stand Down stages. Follow on recovery activities can also be triggered when further permanent works have been identified to be completed after the emergency event during planned programs of work.

8.6. Resourcing Levels to Support Contingency Plans

A diverse range of skilled resources are available to be engaged both internally and externally:

- A field workforce of approximately 4,400 (including design, construction, maintenance, inspection and vegetation workers)
- Access to a significant external resource base for construction and maintenance, and vegetation management activities,
- Staff resources to provide safety advice, stakeholder and community engagement and logistics including accommodation coordination, field catering, stores and fleet support, and
- Leave rosters that are managed to ensure adequate availability of field resource for the summer period.

The geographic spread of our depots and resources assists in our response to network events. We are able to mobilise our resource capability across the state to meet the demands of any particular event.

8.7. Other Distribution Network Service Providers Assistance

At times, additional resources may be required to assist with a large scale response. Memorandums of Understanding (MoU) have been developed with Essential Energy, Endeavour and Ausgrid outlining the key principles and arrangements between the companies. As part of the annual preparation, a review of the MoU’s is conducted. We also have arrangements in place for assistance from approved contractors.
8.8. Powerlink Joint Response
A MoU is maintained with Powerlink and includes protocols for the joint response to disasters or significant incidents where the assets of each organisation are impacted. During a significant network emergency, each emergency management team may need to consider common issues and priorities to determine the optimum overall response.

8.9. Queensland Fire and Emergency Services
MoU’s have been developed with the QFES State Incident Management Team outlining agreed approaches relating to bushfires, confirming contacts, communication protocols and also relating to the sharing of data. These are reviewed annually as part of the bushfire mitigation management actions.

8.10. Liaison with Disaster Management Groups
Outside of disaster situations, our representatives liaise with and attend periodic meetings scheduled by DDMGs and LDMGs, providing input and advice on key issues such as emergency response, critical infrastructure, business continuity and the impact of planned disconnection of supply.

During disaster situations, our representatives liaise and co-ordinate responses with the State Disaster Coordination Group (SDCG) and District and Local Government Disaster Management Groups (DDMGs/LDMGs), whilst independently maintaining a focus on restoration and safety of the electricity network. A Distribution Network representative and the Customer, Brand and External Relations group will liaise with government departments and the SDCG.

8.11. Forecasting of Extreme Weather Events
Specialist weather forecasting arrangements are in place to provide a range of services to assist in preparation for severe weather events. The data is provided on a specific internet website and includes:

- Current wind speed, wind direction, temperature and humidity conditions
- Historical observations of this weather data
- Comments on observed data and weather patterns specific to our network areas
- A five day high resolution forecast of temperature and wind speed
- General forecasts and weather warnings
- Links to satellite and radar information and displays, and
- Longer term climate outlook forecast.

Access to this type of information, particularly days in advance or short notice for a pending severe weather event, enables us to make informed decisions on the potential impact of the threat, and prepare the necessary organisational response.

Annual pre-storm season briefings are also provided to key staff to assist in understanding the driving factors and potential impacts of the impending season.

9. COMMUNICATIONS
We are committed to keeping customers and stakeholders informed and engaged in the preparations for the summer storm season and during emergency events.

9.1. Customer Operations Planning and Improvements
In preparation for the 2018-19 storm season Customer Operations has continued to improve how we support, advise and respond to customers during these potentially difficult times.

This will be facilitated through a number of initiatives including improved Interactive Voice Response (IVR) responses, additional information on the web based outage finder and for the
9.2. Marketing and Customer Communications

For many years, both Energex and Ergon have used advertising to communicate with customers about how to prepare for storm and cyclone season, and how to be safe around fallen powerlines. This Summer, the Energy Queensland marketing team has built on this solid groundwork to release a new campaign called ‘Take Care. Stay Line Aware’, which unifies these messages across both Ergon and Energex territories. This activity is focussed on the following areas:

- **Keeping our customers safe** – ‘Take Care. Stay Line Aware’ media campaign. This mainstream activity promotes important messages to help educate customers about the dangers of fallen powerlines and the need to be prepared for storms and cyclones. Advertising is placed in various channels including television, digital, cinema advertising, press and social media. It helps reinforce awareness of the dangers of fallen powerlines during storms, staying clear of fallen powerlines and contacting emergency services or Energex/Ergon to report the danger.

- **Keeping our customers informed** – We will primarily use digital channels to promote the use of the Outage Finder tools for customers to stay informed, and connected for up-to-date information over the summer period - particularly in the event of an unplanned outage.

In addition to these advertising messages, our direct customer communication channels, IVR messages and external facing websites content (ergon.com.au and energex.com.au) - will be focussed on these key areas over the summer period.

9.3. Media and Community Relations

We use strong, locally-based media and community stakeholder relationships to keep the important storm season messages ‘top-of-mind’ throughout this period.

These messages are delivered through media releases and targeted stakeholder engagement to raise community awareness of weather-related issues, such as cyclone preparation and electrical safety.

This includes ensuring our customers and local stakeholders know how and who to contact in Ergon Energy Network or Energex in the event of a major outage or event. The communications effort will focus on setting customer expectations, including early identification of damage to the network and an estimation of how long it might take to restore supply.

The media and community engagement team has locally-based corporate communications advisors in the major centres of Queensland that enable fast, accurate and targeted communications to internal and external stakeholders before, during and after major weather events. This can include ‘live to air’ media communications providing timely, up to date information to impacted customers and communities. Where possible and safe to do so, we look for opportunities to provide face to face support and information to remote or isolated communities.

9.4. Social Media and Other Online Communications

We continue to improve how we engage and inform customers via social media, especially during an emergency response. The Ergon Energy Network Twitter and Facebook sites were extremely successful in supporting our traditional customer communication channels during cyclones Debbie (2017), Marcia (2015), Oswald (2013) as well as for smaller events and day to day operational engagement.
Energex social media channels were critical in keeping customers informed and safe in the aftermath of the February 2018 storms as well as other significant events. We will continue to invest resources and focus at these growing and evolving social platforms.

A Storm Centre webpage is available for customers which provides important information on preparations, what to do during major storms and cyclones, and the general process we follow to restore supply to its customers in impacted areas. During major events the site is updated regularly with the latest information on restoration work.

10. OUR SAFETY COMMITMENT

We continue to be committed to ensuring the health and safety of our people and the community and on being a leader in safety – to take performance into the top quartile of industry-recognised benchmarks.

This has meant placing a priority on developing a sustainable safety culture across the business, a culture where safety is inherent in everything we do.

Our Summer Preparedness Plan has included scenario planning and reviewing all emergency response aspects and continued refinement of safety systems, such as fatigue management and driving plans.

Our commitment to safety is also demonstrated by our determination to get our safety messages heard through our Community Electrical Safety Awareness Plan (CESAP). Underpinned by a detailed analysis of annual incident data, CESAP has evolved each year to address known community electrical incident problem areas using awareness campaigns targeted at industry sectors or extreme risk activities. This has seen a continued decline in community electrical safety incidents. These engagement efforts, and the specific communication activities discussed in this plan, are about ensuring that the risks associated with electricity are well understood.
APPENDIX A. OPEX AND NETWORK CAPACITY AND SECURITY PROGRAM

Table 1 – Energex Network Capacity & Security Program, Pre-Summer 2018/19

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Project Name</th>
</tr>
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<tbody>
<tr>
<td>C0539363</td>
<td>PPE - Capacity improvement PPESA &amp; PPE6A</td>
</tr>
<tr>
<td>C0539346</td>
<td>PPE - New 11kV feeder works PPE13A &amp; PPE17A</td>
</tr>
<tr>
<td>C0517157</td>
<td>SFC - Establish new feeder to de-load SFC11A and STC7</td>
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Table 2 – Ergon Energy Network Capacity & Security Program, Pre-Summer 2018/19

<table>
<thead>
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<th>Project Number</th>
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<tr>
<td>1163884</td>
<td>Safety Net Implementation Central Stage 2</td>
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<tr>
<td>1177745</td>
<td>Safety Net Implementation Central Stage 4 - THEO FA0652 PROT UPGRADE</td>
</tr>
<tr>
<td>1177748</td>
<td>Safety Net Implementation Central Stage 5TIER MIDD MOTORISED ISOLATOR</td>
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<tr>
<td>1177749</td>
<td>Safety Net Implementation Central Stage 6COME CM-T1</td>
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<tr>
<td>1180987</td>
<td>FD AUG SW Comms Enable Reg Yandilla Strategic Comms Enable Reg Program</td>
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<td>1121168</td>
<td>FD AUG STTO F3060 Design Temp Increase</td>
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<td>FD AUG FARN FF-C Quart Pot OH Rating Inc</td>
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<td>FD AUG FARN FF-E Kowbi OH Rating Inc</td>
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<td>1170557</td>
<td>FD AUG EABU FD-1476 Install 2x200A Reg</td>
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<tr>
<td>1170743</td>
<td>FD AUG EABU FD-1481 Rerate Wasp to 75deg</td>
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<tr>
<td>1171227</td>
<td>FD AUG MOSI F376S Install 2x100A Reg</td>
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<td>1215183</td>
<td>FD AUG CUNN Eulo North SWER Volt Imp Reg</td>
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<tr>
<td>1215827</td>
<td>PB-B_FD AUG PB-B FDR TIE Install 11kV mains</td>
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<tr>
<td>1050191</td>
<td>GLSO - Briffney 11kV FDR 6021 - CH Energise 6021 at 11kV</td>
</tr>
</tbody>
</table>
APPENDIX B. MOBILE GENERATION

The following mobile generation is located across Queensland and may be available for use in an emergency event (if not in use for planned events).

Additional mobile generation assets may be hired from external providers using pre-arranged agreements for emergencies. These will be subject to availability.

Table 3 – Mobile Generation - Ergon Energy Network

<table>
<thead>
<tr>
<th>Genset_ID</th>
<th>Generator Size (kVA)</th>
<th>Location</th>
<th>Additional Details (generator controller)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG-33-001</td>
<td>33</td>
<td>Cairns</td>
<td>Skid mounted, Black changeover</td>
</tr>
<tr>
<td>MG-60-001</td>
<td>60</td>
<td>Cairns</td>
<td>Trailer mounted, InteliGen</td>
</tr>
<tr>
<td>MG-60-002</td>
<td>60</td>
<td>Townsville</td>
<td>Trailer mounted, InteliGen</td>
</tr>
<tr>
<td>MG-60-003</td>
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<td>Mackay</td>
<td>Trailer mounted, InteliGen</td>
</tr>
<tr>
<td>MG-60-004</td>
<td>60</td>
<td>Bundaberg</td>
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</tr>
<tr>
<td>MG-60-005</td>
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<td>Rockhampton</td>
<td>Trailer mounted, InteliGen</td>
</tr>
<tr>
<td>MG-60-006</td>
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<td>Toowoomba</td>
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<td>Cairns</td>
<td>Skid mounted, InteliGen</td>
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<td>MG-150-004</td>
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<td>Maryborough</td>
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<td>Container, InteliSys</td>
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Table 4 – Mobile Generation – Energex Network

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<tr>
<th>Genset_ID</th>
<th>Generator Size kVA (all trailer mounted)</th>
<th>Location</th>
<th>Additional Details (generator controller)</th>
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<tr>
<td>MG-1250-004</td>
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Check this is the latest version before use
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