Customer Reliability Strategy

2020 – 25

January 2019

ERGON. ENERGY NETWORK | energex

Part of the Energy Queensland Group

Executive Summary

Energy Queensland (EQL), through Ergon Energy and Energex, operates one of the largest, most complex and diverse distribution networks in the world. A key component of our role is to manage and operate these networks to ensure reliable supply to our customers and communities, which in turn underpins continued economic development across Queensland.

Through a number of engagement channels, our customers have told us that they are largely happy with the reliability performance of the Ergon Energy and Energex networks. As network performance has improved over the past decade and customer affordability has become an increasing concern, we have proactively worked with our shareholders to adapt our approach and set maintained rather than improving performance targets. Balancing reliability and affordability remains an ongoing organisational priority and is at the heart of this strategy.

Both networks operate under a national regulatory framework administered by the Australian Energy Regulator (AER) under the National Electricity Rules (NER), with reliability performance managed via the Service Target Performance Incentive Scheme (STPIS). Both networks also have state-based obligations under their Distribution Authority regarding Minimum Service Standards (MSS) and Worst Performing Feeders (WPF). The reliability expenditure in each network is driven by the state based MSS and WPF obligations.

Compared with previous regulatory periods, our focus going forward is the minimum required under the Distribution Authority for Improvement Programs (Worst Performing Feeders).

Linked to our reliability standards are our security standards, which have also reduced over time to better balance network and customer security and affordability.

Reliability obligations cover the physical network performance. A range of other initiatives, such as Guaranteed Service Levels (GSLs) and customer outage information helps inform the customer experience, which customers tell us is as important to them as preventing the initial outage.

Energex and Ergon Energy networks provide connections to both load and generation customers. Our large generator customers, like large load customers, require specific levels of reliability performance to support their operation.

As customers and their technology continue to evolve and with the introduction of technologies such as batteries and electric vehicles, the role of the network in providing customer reliability will change. We will continue to evolve this strategy to support that transformation.

Document Tracking Details

Network and Non-Network Document Hierarchy Reference Number	Regulatory Proposal Chapter Reference	Document	File Name
NET STRAT – 003	7.048	Customer Reliability Strategy	EGX ERG 7.048 Customer Reliability Strategy JAN19 PUBLIC

Contents

1. Introduction

This document outlines alignment between our network performance strategies and customer expectations, guaranteed service levels, management of the relevant network reliability obligations and network securities, emergency response capabilities, penetration of distributed energy resources and transitions to intelligent grids.

Based on historical and projected reliability performance of Ergon Energy and Energex, this document explains the concept of the forward investment approach for network reliability programs to provide an overarching strategy for the period to 2025.

At the core of this strategy is the requirement to meet our obligations under the Distribution Authority licence conditions, namely requirements relating to Minimum Service Standards and reliability improvements for Worst Performing Feeders. The Minimum Service Standard limits for reliability of supply performance for the next regulatory period 2020-2025 have not yet been agreed with the Department of Natural Resources, Mines and Energy (DNRME), however, Energy Queensland is advocating for no change to the existing limits. In addition, investment strategies on reliability improvement of Worst Performing Feeders are based on their current definitions for Ergon Energy and Energex which currently differ and as a consequence drive differences in application. Any changes to the Distribution Authority licence conditions will be addressed in the revised regulatory proposals for Energex and Ergon Energy in late 2019.

2. Overview of Frameworks

2.1 Distribution Authority

Ergon Energy and Energex each hold a Distribution Authority, administered by the Queensland DNRME, to supply electricity using their distribution system throughout Queensland. Energex: Distribution Authority No.D07/98; Ergon Energy: Distribution Authority No.D01/99 [1, 2].

The Distribution Authorities prescribe Energex and Ergon Energy's regulatory obligations in relation to the Guaranteed Service Levels (GSL), Safety Net (security of supply) criteria, Minimum Service Standards (MSS) and the Worst Performing Feeder (WPF) improvement program.

Both businesses are subject to periodic (annual and quarterly) and incident-based reporting to verify compliance with these obligations and to ensure issues are identified and resolved at an early stage.

In addition, the Service Target Performance Incentive Scheme (STPIS), governed by the AER, provides financial incentives to maintain and improve our service performances.

2.2 Guaranteed Service Levels

The Electricity Distribution Network Code (EDNC) sets out Guaranteed Service Levels (GSLs) that relate to the quality of service provided to individual small customers.

Queensland's GSL regime is designed to provide some financial recognition to customers who have received poor reliability or service from their distributor. Both Ergon Energy and Energex are required to meet targets for their quality of service to customers. The targets relate to the frequency and duration of customer outages, as well as things like the timeliness of connections, reconnection and notices of planned interruptions.

2.3 Minimum Service Levels

Minimum Service Standards are applicable to overall SAIDI and SAIFI indices inclusive of both planned and unplanned outages.

The Distribution Authorities (DA) note that Energex and Ergon Energy must use all reasonable endeavours to ensure we do not exceed in a financial year the SAIDI or SAIFI MSS limits as applicable to each of the feeder categories.

The DA's set out that "Exceedance of the same MSS limit (i.e. SAIDI limit or SAIFI limit), three financial years in a row is considered a "systemic failure" and constitutes a breach of the distribution authority".

2.4 Safety Net

From the 1st of July 2014, Distribution Authorities introduced Safety Net as a new security of supply criteria in planning and operating sub-transmission networks. Safety Net provides a 'base-case', or

minimum security criteria against low probability, high impact events to avoid “unexpected customer hardship and/or significant community or economic hardship”. The GSL and MSS provisions still remain and need to be balanced with the change in security criteria.

2.5 Worst Performing Feeders

The Distribution Authorities outline the requirements for Worst Performing Feeder (WPF) Improvement programs for each business. Whilst these programs are not targeted at improving the average system-level reliability, they continue to address the reliability issues faced by a smaller cluster of customers supplied by the poorly performing feeders or a section of these feeders for both the business.

2.6 Service Target Performance Incentive Scheme

The Service Target Performance Incentive Scheme (STPIS) is governed by the AER. The scheme provides financial incentives for Ergon Energy and Energex to maintain and improve our service performance for our customers. The scheme rewards or penalises a Distribution Network Service Provider (DNSP), for its network performance relative to a series of predetermined service targets [3].

The scheme encompasses reliability of supply performance and customer service parameters. The reliability of supply parameters only include unplanned SAIDI and SAIFI, applied separately for each distribution feeder category (CBD, Urban, Short Rural and Long Rural).

2.7 Metrics

Energex and Ergon Energy use the industry recognised reliability indices System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) to report, assess and manage the reliability performance of its supply network [4]. SAIDI represents the total minutes, on average, that customers are without electricity during the reporting period. SAIFI represents the average number of instances each customer’s electricity supply is interrupted during the reporting period.

The SAIDI/SAIFI reliability performance targets for Ergon Energy and Energex, however, differ even for similar feeder categories. This is because the targets have been set based on the historical performance of each of the distribution networks reflective of the uniqueness of network topology (radial vs meshed), customer density (customers/km), average distribution feeder length, geography where the network runs through, impacts of tropical weather, access issues during wet season and other factors and parameters.

3. Customer Feedback

Energex and Ergon Energy are currently completing a comprehensive, phased customer and community engagement program to ensure our future plans are appropriately informed.

- Based on our recent Future Energy Survey we have the following relevant key messages from our customers:
- 83% of our customers are satisfied with the overall reliability or quality of their power supply
- 41% are highly concerned about their ability to pay electricity bill
- 87% said it was important that we modernise our electricity networks to continue to enable customers to take up new technologies
- 69% think they will look into a battery or an energy storage system for their home in the future.

As stated in the corporate strategy, our plans are based on the four core principles: safety, affordability, security and sustainability.

Through numerous forums and engagement activities, our customers have told us that affordability is their core concern – from both a cost of living and business competitiveness perspective. This is driving our goal to support price relief without impacting service standards.

Our customers expect us to be safe, secure and reliable so that they have electricity when they need it. This should not be compromised.

Generally across Ergon Energy and Energex our customers are satisfied with the reliability of supply and with reliability performance now consistently meeting the MSS obligations, both Energex and Ergon Energy do not forecast investing reliability specific capital for the foreseeable future. The majority of Queensland households do not want any change in reliability, with 72% of customers advising that the existing balance of electricity costs and reliability is about right. This further incentivises Energex and Ergon Energy to limit reliability specific capital investment that could bring a step change to the average network reliability.

Our commitment for the future (2025 and beyond) is to maintain the current level of resilience across our network and to levels of our reliability performances while targeting expenditure to improve outcomes for those customers who consistently receive the poorest reliability of supply performance. We will also continue to be there for our customers after the storm events.

Customer feedback is of fundamental importance to our network performance plans. We want to ensure our capital investment, operating and pricing plans for 2020 to 2025 place us in the best position to deliver for Queensland, our customers and our communities into the future.

4. Maintaining Network Performance

This chapter outlines the details of our service obligations to our customers in terms of network reliability, network security, reliability improvement programs and minimum network service levels. These are

primarily covered by the MSS and STPIS for network reliability, Safety Net for network security and Worst Performing Feeder improvement program obligation. Customer expectation for network service levels are covered by GSLs.

4.1 Meeting Minimum Service Standards

The MSS define the average reliability performance levels required of our distribution network, including both planned and unplanned outages, and drive us to maintain the reliability performance levels within the MSS limits. The MSS limits for both SAIDI and SAIFI are applied separately for each defined distribution feeder category (Table 1).

Table 1: Energy Queensland MSS Limits

Reliability Measures	Feeder Categories	MSS Limits Ergon Energy	MSS Limits Energex
SAIDI (mins)	CBD	N/A	15
	Urban	149	106
	Short Rural	424	218
	Long Rural	964	N/A
SAIFI (interrupts)	CBD	N/A	0.15
	Urban	1.98	1.26
	Short Rural	3.95	2.46
	Long Rural	7.40	N/A

Energex and Ergon Energy use all reasonable endeavours to ensure that it does not exceed the SAIDI and SAIFI limits set out in the Distribution Authorities for the relevant DNSPs in a regulatory year. The Distribution Authorities set out that “Exceedance of the same MSS limit (i.e. SAIDI limit or SAIFI limit), three financial years in a row is considered a “systemic failure” and constitutes a breach of the distribution authority”.

In measuring performance against the MSS, the Distribution Authorities has provisions for exclusions of reliability results that are outside of the DNSP’s direct control. These include cyclone type scenarios, failure of transmission grids, generation shortfall etc. Supply interruptions triggered by public safety concerns and customer installation faults are also exempted when measuring network reliability delivered by EQL.

In addition, Major Event Days (MEDs), where the daily system SAIDI exceeds a predetermined threshold, are also excludable. For the definition of the MED please refer section 5.3 of the IEEE Guide for Electric Power Distribution Reliability Indices [4].

To address the risk of MSS exceedance in any given year, internal performance targets are set for operational purposes (i.e. the internal targets are not meant to attract any capital investment). The internal targets are broken down between planned and unplanned targets, and by region, to ensure that adequate allowance is included for maintenance, refurbishment and customer and corporation initiated works, along with other forms of planned outages. The internal targets are set based on a few factors such as the average historical performance, the expected volume of planned works on a

particular type of network etc. With compliance to the internally prescribed planned targets, the SAIDI contribution from planned events is considered controllable and hence relatively stable. These targets are also seasonal across the months to make greater allowance for unplanned outages during the storm season, between November and March.

Energex's overall system SAIDI and SAIFI has improved by 32% and 52% respectively over the same period (Figure 1). This is a reflection of the targeted investment made during the last two regulatory control period towards achieving the regulated MSS standards. In the same time, Ergon Energy's overall system reliability performance has improved since the inception of MSS in 2005 with both the duration and frequency of overall outages reducing by 40% and 41% respectively (Figure 2).

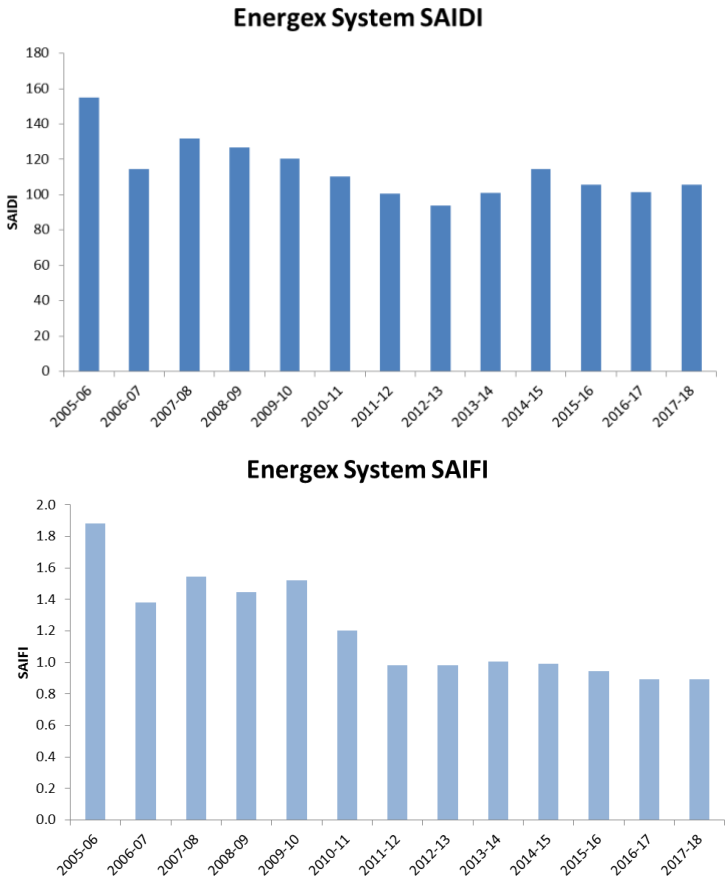


Figure 1: Overall Network SAIDI and SAIFI Improvement for Energex

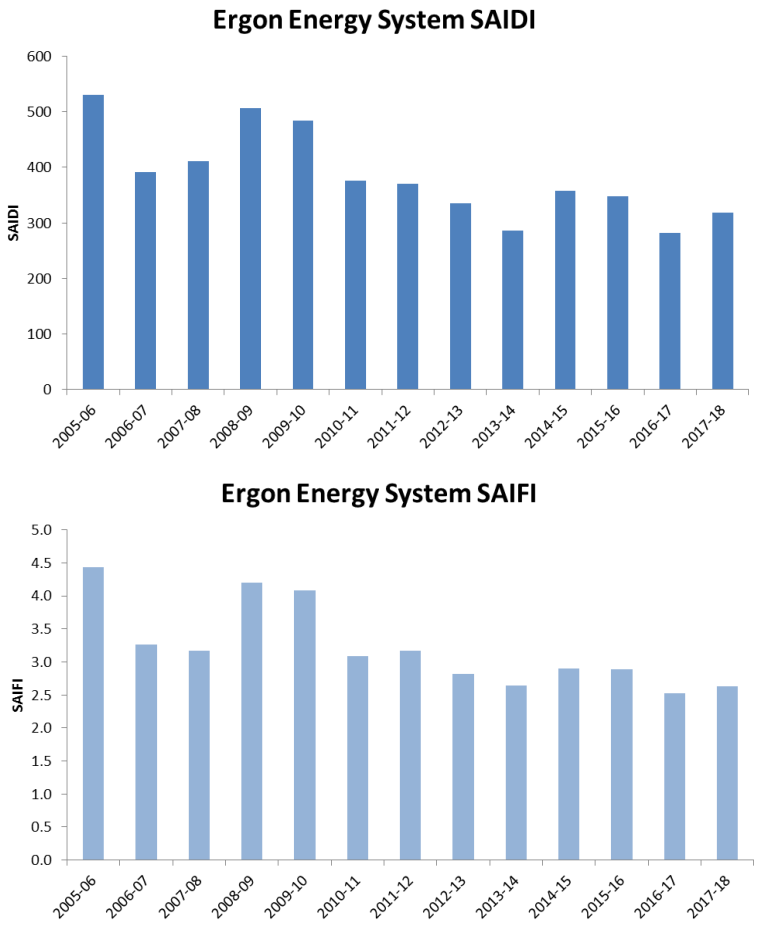


Figure 2: Overall Network SAIDI and SAIFI improvement for Ergon Energy

Network level performance analysis for regional Queensland since 2010/11 has shown that Ergon Energy's sub-transmission network (planned and unplanned outages) on average contributes 18% of total system SAIDI and 32% of total system SAIFI annually (Figure 3).

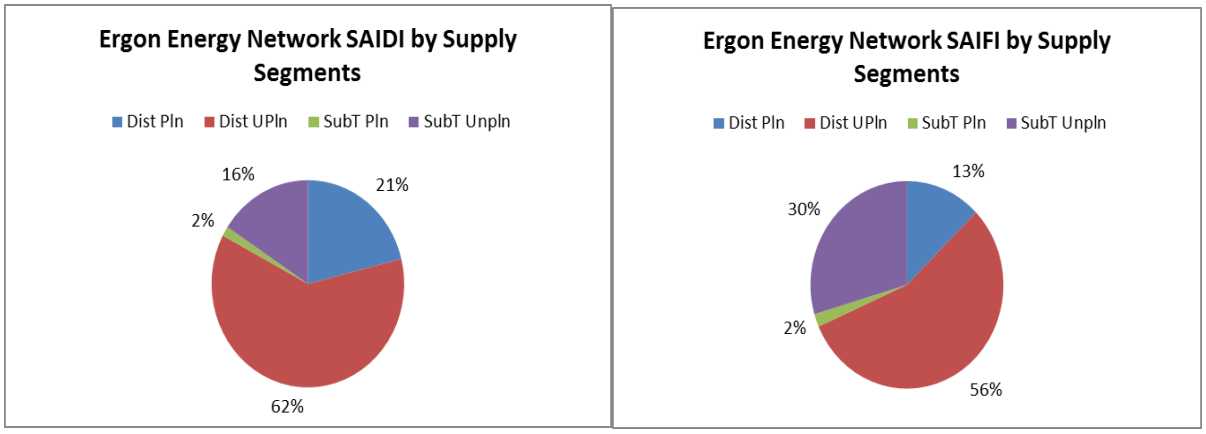


Figure 3: Regional Queensland average network SAIDI/SAIFI impact from network segments

Whilst it is obvious that the distribution network events dominate the reliability outcomes for Ergon Energy (an average of 82% of system SAIDI and 68% of system SAIFI), it is worth noting that the contribution from the sub-transmission network is quite considerable. This is a reflection of the impact of the radial sub-transmission network on the performance of our distribution network, especially in the rural networks. Improving the sub-transmission network impact on reliability outcomes will require significant capital investment on the redundant infrastructure which is not considered prudent and efficient.

In the lead up to the regulatory year 2014-15, and since the advent of MSS, Energex and Ergon Energy have implemented sizeable and targeted reliability improvement specific capital investments on the distribution and sub-transmission networks. Some of these reliability specific programs included the extension of Supervisory Control and Data Acquisition (SCADA) control of key devices on the distribution network and zone substations, installation of intelligent network devices, the establishment of feeder ties, changes in secondary systems setting to reduce the impact of transient faults etc. In Energex, SCADA systems remotely monitor and control the substation primary plants and protection systems to identify equipment at risk from fault conditions, automatically manage overload conditions and manage Volt/VAr regulation and control automation applications for auto-restore. In parallel, the Distribution System SCADA provided remote presence at reclosers, sectionalisers, load break switches and step voltage regulators. In the same time, a new SCADA console has been installed in Ergon Energy improving significantly real-time visibility of our networks, supporting better-informed decisions during switching and outage management operations and consequently improving reliability of supply.

In addition, investment on subsets of distribution feeders which were consistently contributing to high customer minutes and/or interruptions on an annual basis also helped bring step changes in network performance.

Over the years, the risk of MSS exceedance has been further reduced through a combination of targeted network augmentation and asset inspection and maintenance programs. Improved operational practices through advanced tools and technologies over the years on outage management, crew dispatch and severe weather response have also contributed to improvements in network performance. EQL also puts a greater emphasis on returning the key out of service plants to service.

Electricity Network Capital Program Review (ENCAP) and Independent Review Panel (IRP) on Network Cost reviews in 2011 and 2013 respectively and performance outcomes achieved meant MSS limits were flat-lined at 2010-11 levels for both Energex and Ergon Energy for the 2014-15 to 2019-20 regulatory period. The requirements on the WPFs were also introduced in the DA at the same time. Customer surveys conducted for the last AER proposal also suggested that our customers were not willing to pay more for improved reliability. Hence, both Energex and Ergon Energy AER 2015 determination only included capital expenditure to execute the WPF improvement programs.

Figure 4shows the decline in network performance expenditures in the most recent years to the levels of approximately 25% compared with 2010/11 expenditure. The peak in 2014-15 for Ergon Energy

represents the ramping up of the project delivery under the reliability improvement programs for the 2010-15 regulatory control period.

In the context of meeting MSS, Long Rural SAIDI for Ergon Energy warrants a special mention as managing Long Rural SAIDI has been and remains a challenge in regional Queensland's distribution network. The extensive line lengths and predominantly radial nature of Long Rural feeders make them more susceptible to longer outage duration/response times compared to other network types in regional Queensland. Aftermaths of storm season and cyclones are usually prominent for Long Rural feeders due to a lack of available safe access routes. In recent years, Ergon Energy has implemented low-cost reliability improvement solutions to address the longer outage duration on its Long Rural network.

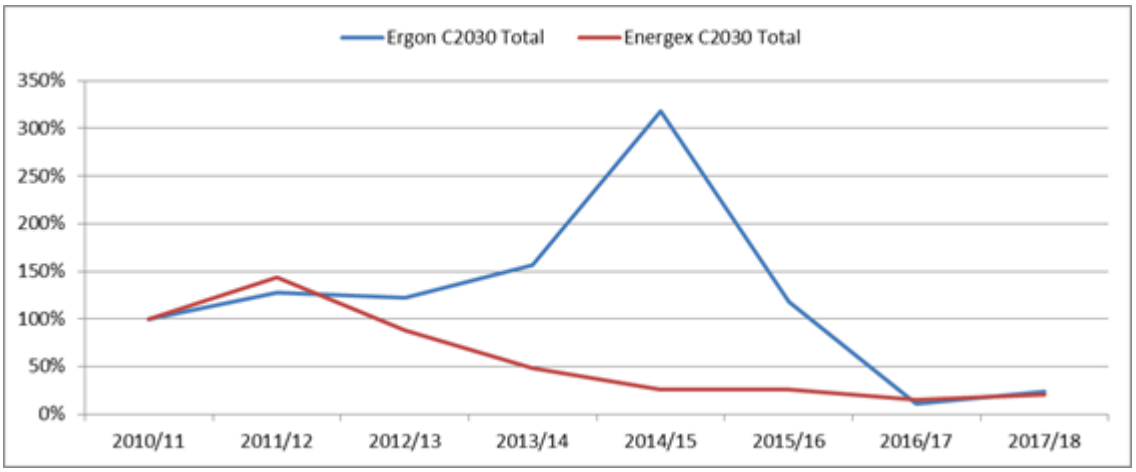


Figure 4: Trends of Energex and Ergon Energy network performance expenditure

Nevertheless, the network level SAIDI/SAIFI trends show that our network reliability outcomes could have reached a plateau, possibly indicating that optimal performance capability of the network, without further reliability specific investment on its infrastructure.

Our reliability specific investment will be limited to the WPF Improvement program (please, refer Section 4.2) with an intent to address the performance experience of the customers supplied by feeders which have had consistently poorer reliability than the network level average. Additionally, Ergon Energy is also in the process of implementing targeted low-cost solutions to improve average outage duration on its Long Rural network which is expected to yield some SAIDI benefits. This program will be concluded by 2020 and will not be extended to 2020-2025.

In addition to the reliability improvement specific works, we will continue to focus on the reliability outcomes from asset maintenance, asset replacement and network augmentation.

4.2 Implementing Worst Performing Feeder Improvement Programs

The Distribution Authorities for both Energex and Ergon Energy outline the separate requirements for

the Worst Performing Feeder Improvement program for the respective businesses (Table 2). The requirements are applicable to the distribution network only and the WPFs are identified and reported annually in the respective Distribution Annual Planning Reports (DAPRs). Performance improvement programs are implemented on the feeders, where opportunities are identified and considered prudent.

While these programs are not targeted towards improving the average system-level reliability, they continue to address the reliability issues faced by a smaller cluster of customers supplied by poorly performing feeders or a section of these feeders for both businesses.

Table 2: Energy Queensland Worst Performing Feeder Programs

ERGON ENERGY	ENERGEX
The Worst Performing Feeder improvement program applies to any distribution feeder which meets the following criteria as defined in Clause 11.2 (c) of the Distribution Authority No.D01/99: i. "The distribution feeder's three year average SAIDI outcome is 200% or more of the MSS SAIDI limit applicable to that category of distribution feeder; and ii. The distribution feeder is determined to be in the 50 worst performing feeders across all feeder categories, excluding feeder with less than 20 customers."	The Worst Performing Feeder improvement program applies to any distribution feeder which meets the following criteria as defined in Clause 11.2 (c) of the Distribution Authority No.D07/98: i. "The 11kV feeder is in the worst 10% of the network's 11kV feeders based on its three year average SAIDI/SAIFI performance; and ii. The 11kV feeder's SAIDI/SAIFI outcome is 150% or more of the MSS SAIDI/SAIFI limit applicable to that category of 11kV feeder."

With the reliability of supply performance across all indices now at a level that is consistently achieving MSS compliance, both Energex and Ergon Energy do not intend to invest reliability improvement specific capital. The exception for both distributors is the continuation of investment in the WPF Improvement program in accordance with our obligations set out in the respective Distribution Authorities.

The reliability improvement solutions identified from the WPF reviews have mainly included low to moderate capital investment options. The low cost, quick win solutions mainly included protection setting changes, installation of Line Fault Indicators (LFIs) with communication and Fuse Savers. The moderate investment options included installation of new Automatic Circuit Reclosers (ACRs), Sectionalisers, Remote Controlled Gas Switches (RCGS) and also relocation and/or replacement of switching devices, with occasional higher investment options including implementation of covered conductors, feeder ties etc.

We will continue to review our WPFs to ensure our worst served customers' experience of network reliability is addressed fairly and timely.

The overall approach for the WPF performance improvement program includes the following in order of

preference and affordability:

1. Improved network operation by:
    - investigating to determine predominant outage cause
    - implementing reliability or operational improvements identified through the investigation of any unforeseen major incidents
    - improving fault-finding procedures with improved staff-resource availability, training and line access
    - improving the availability of information to field staff to assist fault-finding, which could include communications, data management and availability of accurate maps and equipment
    - planning for known contingency risks until permanent solutions are available
    - improving and optimising management of planned works.

2. Prioritisation of preventive-corrective maintenance by:
    - scheduling asset inspection and defect management to poorly performing assets early in the cycle
    - scheduling poor reliability feeders first on the vegetation management cycle
    - undertaking wildlife mitigation (e.g. birds, snakes, possums, frogs) in the vicinity of worst performing feeders

3. Augmentation and refurbishment through capital expenditure by refurbishing or replacing ageing assets (for both powerlines and substations).

4.3 Meeting Service Target Performance Incentive Scheme

Service Target Performance Incentive Scheme is a customer-centric scheme that incentivises a DNSP to improve or maintain reliability based on the economic value that customers place on network reliability specific to unplanned network outages [3]. The scheme allows the total maximum revenue increment or decrement for each regulatory year within a regulatory control period to be +/-5% of the annual revenue (of the application year). Both Energex and Ergon Energy have opted for a low powered scheme (revenue at risk limited to +/- 2%) since the application of STPIS in the 2010-11 regulatory year. With our continued focus on customer centricity, EQL has opted for application of low driven scheme for the 2020-25 regulatory period since the increased revenue cap can have increased price implication on customers if the delivered performance is significantly favourable to the future STPIS targets. Application of revenue cap of +/- 2% has been approved by the AER in their Final Framework and Approach for the next regulatory period.

The incentive rates are calculated and applied individually to service parameters ensuring that the incentives under the STPIS are sufficient to offset any other financial incentive the service provider may have to reduce costs at the expense of service levels.

Energex and Ergon Energy have a strong focus to control STPIS outcomes through increased efficiency in our network operation. This has been achieved through a significant focus on our

operational practices to improve the response time to unplanned outages which involved the implementation of advanced tools and technologies for outage management and more effective dispatch and coordination of response crews. Targeted capital investment towards expanding remote visibility and controllability of our network has also aided favourable STPIS outcomes for SAIDI parameters.

The incentive rates for the reliability of supply performance parameters of the STPIS are primarily based on the value that customers place on supply reliability (the VCR), energy consumption forecast by feeder type and the regulatory funding model.

Table 3 shows the STPIS targets for Energex and Ergon Energy for the 2015-2020 control period. Whilst our targets are based on our 5-year average historical performance, they must be adjusted to account for instances where we have previously exceeded the revenue at risk cap. The methodology for adjusting the 5-year historical performance is still being considered by the AER as part of its STPIS review. We expect to update them in our proposals after the AER completes its STPIS review.

Table 3: Energy Queensland STPIS Targets

Reliability Measures	Feeder Categories	STPIS Targets Ergon Energy	STPIS Targets Energex
Unplanned SAIFI (interrupts)	CBD	N/A	0.0352
	Urban	1.503	0.9081
	Short Rural	3.019	1.8747
	Long Rural	5.348	N/A
Unplanned SAIDI (mins)	CBD	N/A	3.897
	Urban	126.73	60.118
	Short Rural	317.06	144.475
	Long Rural	742.47	N/A

Figure 5 and Figure 6 below show STPIS outcomes and forecasts to 2020 for Ergon Energy and Energex respectively.

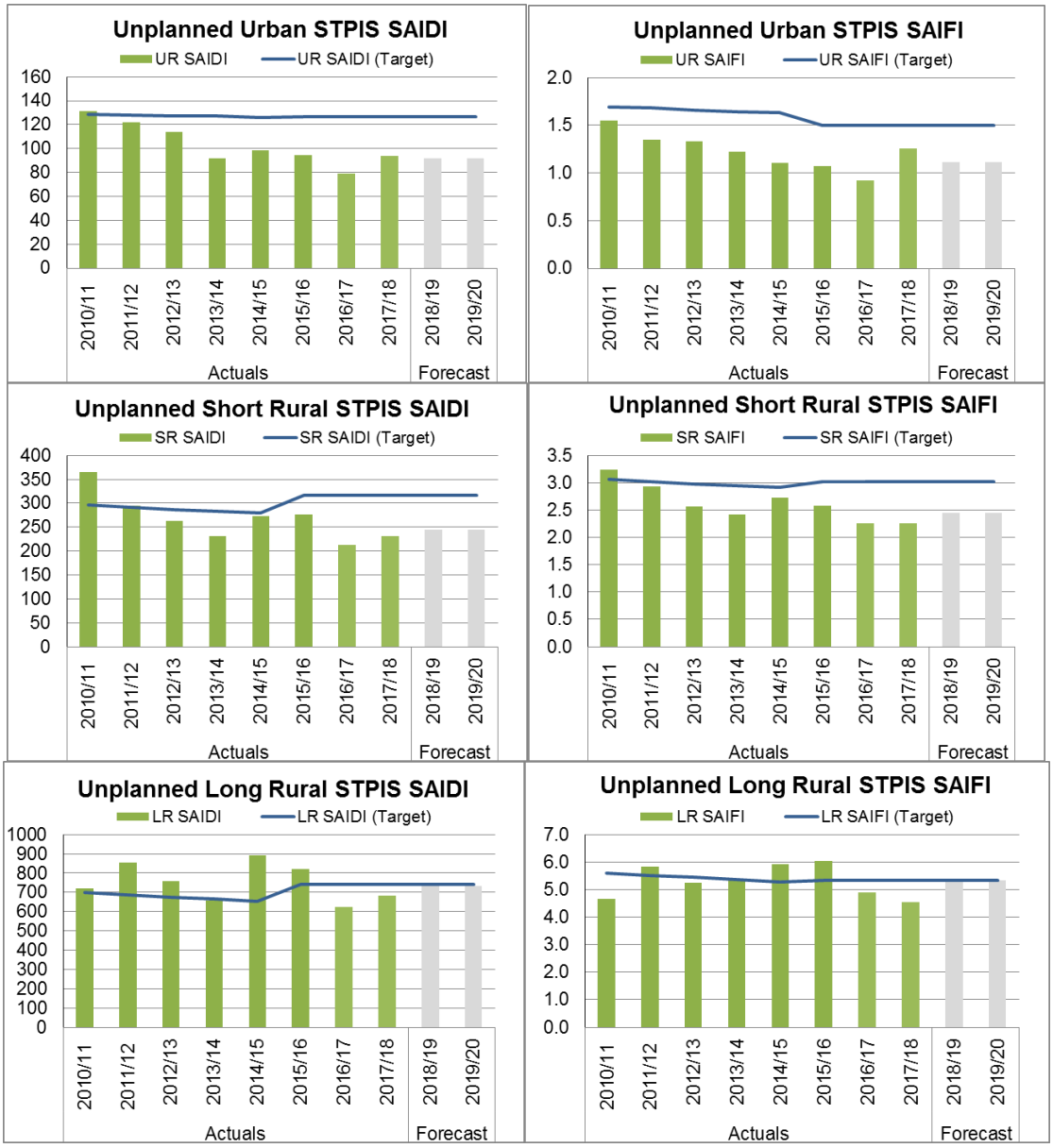


Figure 5: STPIS actual and forecast outcomes for Ergon Energy

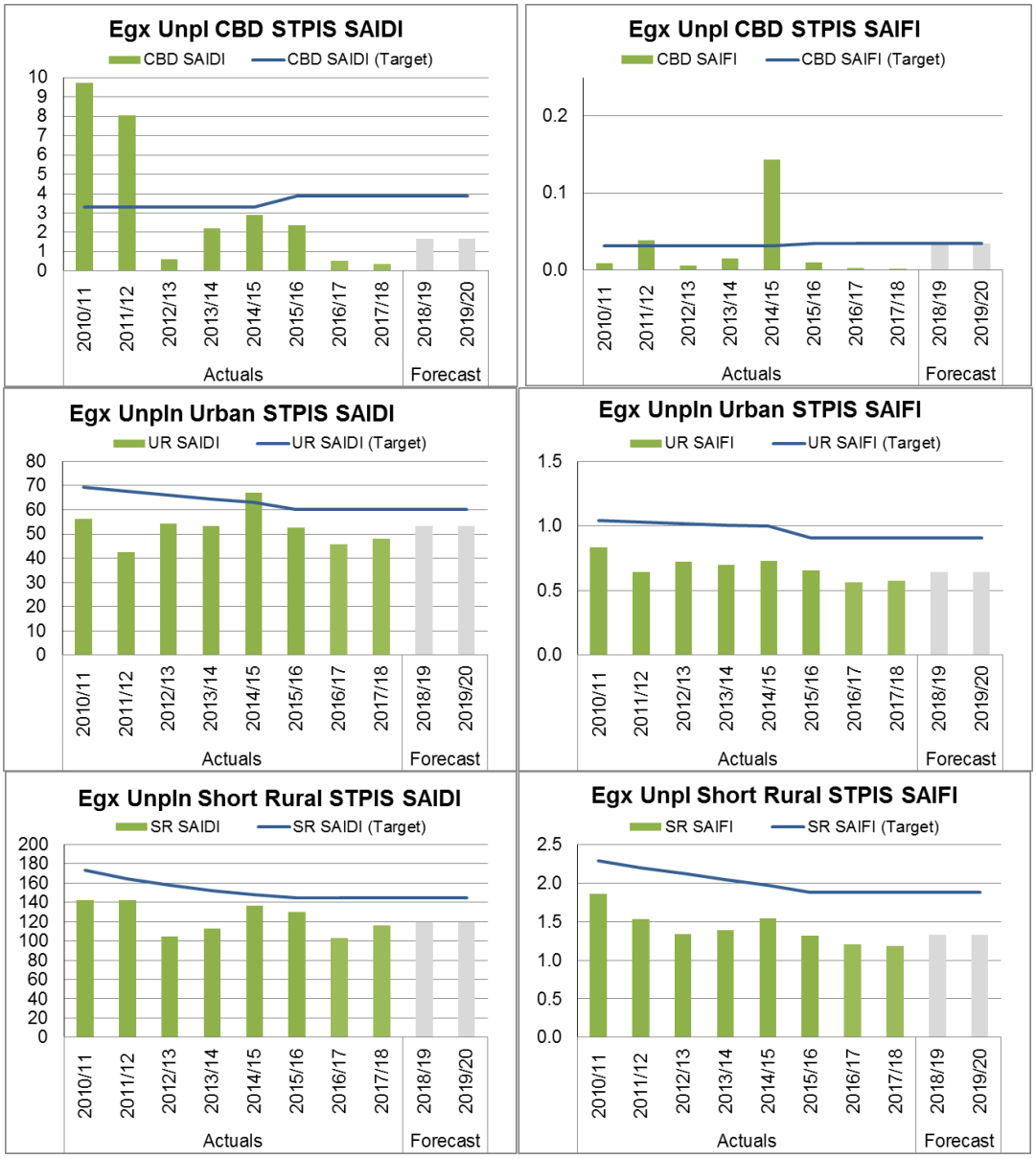


Figure 6: STPIS actual and forecast outcomes for Energex

4.4 Benchmark Performance

As stated in the latest Annual Benchmarking Report [5], the benchmarking measures DNSP productivity and efficiency by comparing the combination of various inputs and outputs (services) to their customer. In general, Energex attributed improved reliability to improvement in the resilience of our network in recent years and moderate weather conditions. In the same time, Ergon Energy attributed to lower reliability inputs due to storm events [6].

The reliability of electricity supply is one of the key dimensions of the outputs of DNSPs. Figure 7

presents the average number of minutes off supply per customer (SAIDI), excluding the effects of major events and planned and transmission outages.

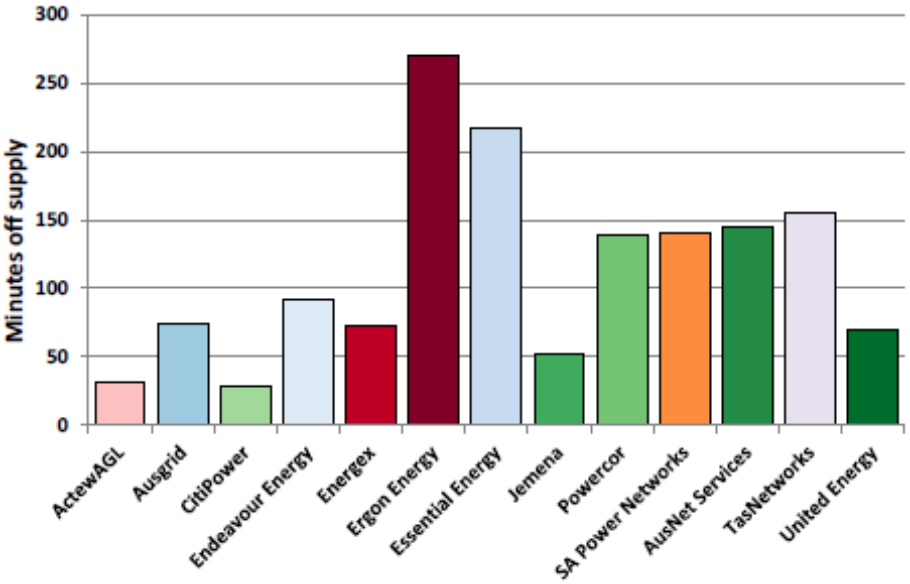


Figure 7: SAIDI per customer (2012-2016)

Figure 8 presents the average number of interruptions to supply per customer (SAIFI), excluding the effects of major events and planned and transmission outages.

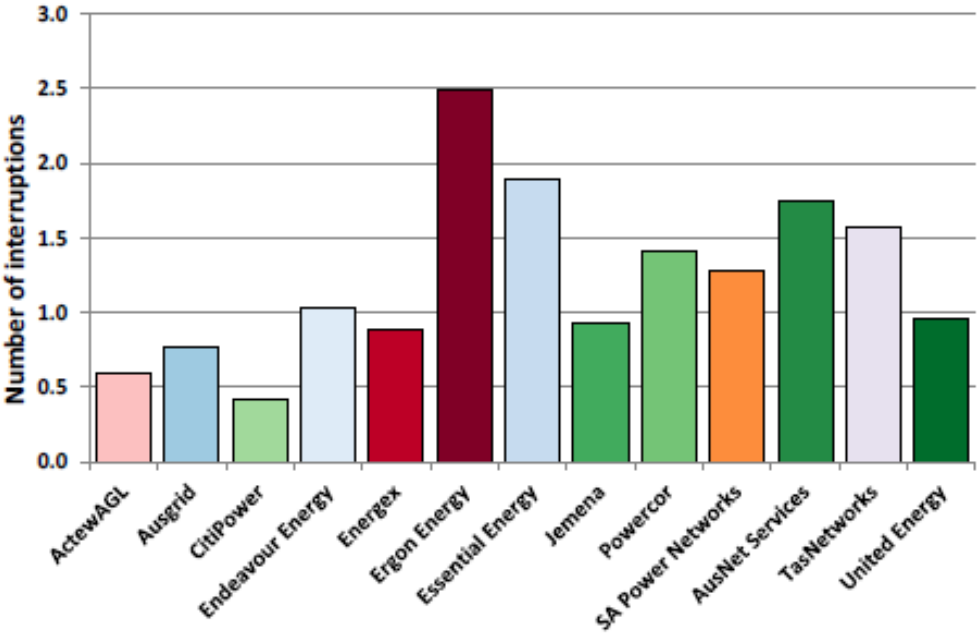


Figure 8: SAIFI per customer (2012-2016)

All twelve MSS were met in 2017-18 for the Energex and Ergon networks. We continue to focus on the

reliability outcomes and expect to see further positive impacts from the asset maintenance and network improvement and replacement strategies.

4.5 Guaranteed Service Levels and Customer Information

Queensland's Guaranteed Service Levels (GSL) regime is designed to provide some financial recognition to customers who have received poor reliability or service from their distributor [6]. Both Ergon Energy and Energex are required to meet targets for their quality of service to customers. The targets relate to the frequency and duration of customer outages, as well as factors like the timeliness of connections, reconnection and notices of planned interruptions.

GSLs are a fundamental part of our service commitment to customers and are an important measure for Energex and Ergon Energy to demonstrate successful management of the complex electricity network to meet determined levels of customer satisfaction. We also acknowledge the unique circumstances of some regional customers who are located in areas which experience levels of service which are different to customers in other areas.

The Electricity Distribution Network Code (EDNC) sets out GSLs that relate to the quality of service provided to individual small customers. Should Ergon Energy or Energex not meet these GSL thresholds, the affected small customers may receive a GSL payment.

The customer thresholds related to the reliability of supply GSLs is provided as Table 4. Planned interruptions, where the customers have been notified beforehand, and natural disaster scenarios are exempted from GSL payments.

Table 4: GSL Thresholds

Distribution Categories Entity	Feeder	Number of Interruptions Threshold (per financial year)	Interruption Duration Threshold
Energex	CBD	10	>8 hrs
	Urban	10	>18 hrs
	Short Rural	16	>18 hrs
Ergon Energy	Urban	13	>18 hrs
	Short Rural	21	>18 hrs
	Long Rural	21	>24 hrs
	Isolated	21	>24 hrs

4.5.1 Increase customer awareness of GSLs

EQL broadly supports initiatives to increase customers' awareness of their rights and our network businesses' service obligations, as this improves customers' understanding of our businesses' roles as

well as improving our ability to engage with our customers. EQL is working hard through Energex and Ergon Energy to enhance our communication with customers in all aspects of our businesses' operations to improve engagement with customers to ensure that we are a more customer-centric organisation.

EQL also broadly supports initiatives to improve customers' awareness of GSLs and to streamline the processes associated with the scheme. We are already undertaking significant work in this area, like:

- Automatic payments – in accordance with the EDNC, Energex and Ergon Energy are making automatic GSL payments to eligible customers without the need for customers to submit manual claims. Over 90 per cent of GSL payments are made automatically to customers. This has increased the total amount of GSL payments and reduced the wait time for customers to receive their payments
- Updated websites - GSL-related information on Energex and Ergon Energy's websites have been reviewed to ensure it remains relevant to customers, including clear explanations of distributors' obligations and how customers can make claims
- Communication - social media is enhancing our ability to communicate with customers immediately after major events. This includes statements explaining supply interruptions and potential for GSL liabilities

4.5.2 Outage information

Ergon Energy already provides live information on outages via the "Outage Finder" feature on its website. This tool provides details including:

- Location of outage and area/streets affected
- Start time
- Status (e.g. if field crew is attending)
- Estimated restoration time
- Reason for outage
- Number of customers affected.

Customers may also call Ergon Energy's fault and emergency line which features information delivered by Interactive Voice Response (IVR) as well as the option to connect to the contact centre. IVR is a cost-effective way to deliver information to customers without the need to employ extra staff in the contact centre. In 2016/17, of the 401,667 calls to Ergon Energy's fault line, over two-thirds were resolved without the need to speak to an operator.

Whilst not funded or governed from the Customer Reliability Strategy, it is important to note how the GSL framework recognises and compensates customers impacted by long duration or high frequency of interruption and that continual improvement through innovation in customer information systems is

assisting to reduce the impact for customers resulting from power supply interruption.

5. Security Criteria and Reliability Planning

5.1 Relationship between Security and Reliability

Network Security and Network Reliability are two separate and related functions. Network Security refers to the network's resilience to an event, such as the loss of a single element. High levels of redundancy in network elements and high levels of operational flexibility are generally associated with high-security networks. Network Reliability is the overall average supply interruption performance for the customers serviced by the network. Low frequency and duration of supply interruption are generally associated with high-reliability networks.

The higher security designed into a network, the less likely that a fault or equipment failure will result in supply interruption to the customers serviced by it or through the operational flexibility the duration is minimised.

5.2 Network Security Criteria

There are two widely recognised methodologies for the development of planning and security criteria for power systems:

- Deterministic approaches (e.g. N-1, N-2, etc.) and
- Probabilistic approaches.

In July 2014, the security criteria required under our Distribution Authorities changed from a deterministic approach to a probabilistic approach [7, 8]. The new criteria called Safety Net have shifted the network planning focus away from asset duplication (the deterministic approach) and towards response and restoration management to maintain service levels. It allows us to optimise our network investments to achieve the desired service Safety Net outcomes for customers. Safety Net targets are key inputs into our strategic network planning process, as the purpose of the Safety Net is to seek to cost-effectively mitigate the risk of low probability – high consequence network outages to avoid unexpected customer hardship and/or significant community or economic disruptions.

In essence, Safety Net provides a minimum case security standard for the sub-transmission network to provide protection against low probability, high impact events. Previous security criteria's defined deterministic thresholds beyond which full system element redundancy was required. The probabilistic methodology applies economic and social impact and asses supply restoration timeframes related to the load and number of customers interrupted. In the application of Safety Net in network planning, we are reducing the level of augmentation capital invested in network security and only targeting to invest where operational restoration within the Safety Net timeframes cannot be achieved.

Under Safety Net, utilisation of distribution networks is not changed (e.g. planning threshold of 75% for urban feeders), nor are fault rates, which means there is no change in the distribution feeder contribution to SAIDI and SAIFI. This transition to a lower, probability-based criteria level of security across the sub-transmission element of the supply chain has the potential to degrade reliability of

supply performance.

5.3 Safety Net Targets

Safety Net targets for power supply restoration times are prescribed for different locations and energy loads interrupted. Both Ergon Energy and Energex are expected to ensure as reasonably practicable their Safety Net targets are achieved (Table 5 and 6) and report no compliant events in the respective DAPR.

Table 5: Ergon Energy Safety Net targets

Area	Targets for restoration of supply following an N-1 Event
Regional Centre	Following an N-1 Event, load not supplied must be: Less than 20 MVA after 1 hour; Less than 15MVA after 6 hours; Less than 5 MVA after 12 hours; and Fully restored within 24 hours.
Rural Areas	Following an N-1 Event, load not supplied must be: Less than 20 MVA after 1 hour; Less than 15 MVA after 8 hours; Less than 5 MVA after 18 hours; and Fully restored within 48 hours.

Note: Regional Centre related to larger centres with predominantly Urban feeders, whereas Rural

Areas relates to areas that are not Regional Centres.

Table 6: Energex Safety Net Targets

Feeder Type	Targets
CBD	Any interruption in customer supply resulting from an N-1 event at the sub-transmission level is restored within 1 minute.
Urban – Following an N-1 event	No greater than 40MVA (16,000 customers) is without supply for more than 30 minutes; No greater than 12MVA (5,000 customers) is without supply for more than 3 hours; and No greater than 4MVA (1,600 customers) is without supply for more than 8 hours.
Short Rural – Following an N-1 event	No greater than 40MVA (16,000 customers) is without supply for more than 30 minutes; No greater than 15MVA (6,000 customers) is without supply for more than 4 hours; and No greater than 10MVA (4,000 customers) is without supply for more than 8 hours.

5.4 Reliability-Based Planning

For the purpose of the application of the Safety Net in the network reliability planning processes, asset failures are specified as examples of credible contingencies, like fallen powerlines or loss of a sub-transmission wood or concrete pole. They provide the basis of fault scenarios and guide potential network investment for mitigating failures. Efficient investments under the Safety Net will mitigate credible contingencies that would otherwise result in outages longer than the Safety Net targets if left unaddressed.

The new criteria increase the focus on customer service levels and comprise two parts:

- Mandatory investment, for a base level of network security (Safety Net); and
- Reliability-based investment, for security improvements above the Safety Net requirements, based on a VCR approach.

Security of supply criteria provides a base performance level above which reliability based planning can be applied. The focus of the VCR is on reliability-based planning to utilise VCR metrics to recognise the reliability benefit of an option as part of options analysis or to optimise project timing. It also helps give

focus to the social and economic impact of outages at the planning stage. Typically it is uncommon to justify a project on VCR grounds alone, but it remains a key consideration in the development and optimisation of other projects [9].

5.5 Driving Increased Capacity Utilisation

Capacity utilisation remains a useful measure in assessing the aggregate performance and capability of a network. Network utilisation is described in a number of different ways, with the main reference from a Regulatory Information Notice and reliability perspective relating to Capacity Utilisation. Care must be taken when interpreting utilisation measures as there are a number of factors that can impact utilisation performance such as:

The cost of capacity is not linear- The cost of installing a 10MVA transformer is not half of the cost of installing a 20MVA transformer. The use of standard equipment sizes to enable design and procurement efficiencies may result in a larger equipment size and albeit efficient, adversely impacts utilisation metrics;

Allocation for future growth- Most network assets have long lifespans and a large proportion of existing assets were installed with an expectation of future growth over the life of the asset. The opportunities now available from emerging technologies mean that this is no longer the preferred EQL approach.

However existing network assets which were installed under this strategy will have their utilisation measures impacted throughout their lifespan;

Distributed Generation continues to change the way our network operates, with an increasing prevalence of localised reverse power flows during the day and residential load peaks in the evening. The more that these dynamic power flows change the use of the network, the less relevant a single averaged utilisation figure will become;

Security and Reliability criteria will impact target levels of utilisation at a distribution and sub-transmission level. Redundancy in the network to cater for failures or to enable operational and maintenance efficiencies will place a limit of the maximum achievable network utilisation. The specific network topology, including voltages utilised and how radial the network design is, also have an impact on this measure. This is described further in the sections below.

Capacity Utilisation is essentially the network load divided by the network capacity, typically measured at a zone substation level and aggregated across the network. In the Regulatory Information Notice it is specifically defined as Non–coincident Summated Raw System Annual Maximum Demand provided as per DOPSD0201, divided by the Total zone substation transformer capacity as per DPA0604, not including the Cold Spare Capacity. The major limitation of this metric in how it is calculated via the RIN is that it does not discern the impacts of multiple-step transformations and consequently double counts the transformation capacity required to provide supply from the DNSP connection point to a customer. This issue occurs where multiple transformations of voltages are required to provide supply to customers, such as where Energy Queensland operates Bulk Supply Substations in addition to Zone Substations or maintains multiple distribution voltages due to legacy standards. When accounting for this ‘first-step transformation’, as also captured in the RIN, Energex’s utilisation is at 44.1% and Ergon Energy’s utilisation is at 65.5% which compare favourably to other utilities as below. It is worth noting that many of the Australian DNSPs do not have multiple step transformations in their network, as observed in their RIN data, and hence their capacity utilisation outcomes are not impacted by this

issue.

DISTRIBUTOR	UTILISATION
Power and Water	28.1%
Essential Energy	29.9%
Tas Networks	34.4%
Ausgrid	41.5%
Energex	44.2%
ActewAGL Distribution	46.6%
Endevour Energy	47.9%
AusNet	50.8%
CitiPower	51.8%
Jemena Electricity	58.8%
United Energy	61.8%
SA Power Networks	64.0%
Ergon Energy	65.5%
Powercor Australia	74.3%

Figure 9: DNSP capacity utilisations adjusted for multiple step transformations

Part of the difference between the Energex and Ergon Energy measures are the more progressed transformer replacement programs in Energex during the current and previous regulatory control period, having already replaced many aged transformers with standard sizes. Energex also operates more 132/11kV and 110/11kV transformers which are built to a larger standard size based on the voltage.

The specific transition from deterministic N-1 criteria to probabilistic security criteria in Queensland has been a major step towards improving the capacity utilisation of the network whilst managing performance outcomes. Ongoing application of these criteria to the network, particularly in replacement projects, will continue to drive increased capacity utilisation and avoid any overinvestment in the network. The increase in capacity utilisation since the introduction of these criteria can be seen in the attached Energex and Ergon Energy utilisation graphs in Figure 10 and Figure 11 which demonstrate the point at which the new Safety Net security criteria commenced from 2014. Introduction of these criteria is consistent with Energy Queensland's strategy to ensure a sustainable program of work into the future and there are a number of examples where we have replaced our network to a lower standard based on the application of these criteria. Despite sustained population growth forecasts across Queensland, the strategy across the network is to maximise the already installed network

capacity and to continue to utilise non-network solutions to help enable this.

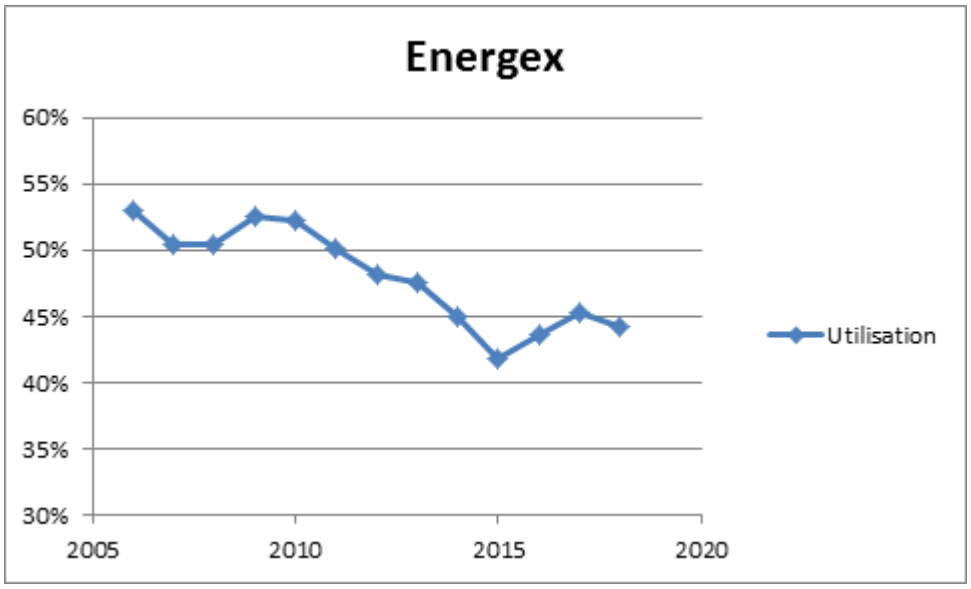


Figure 10: Energex network utilisation

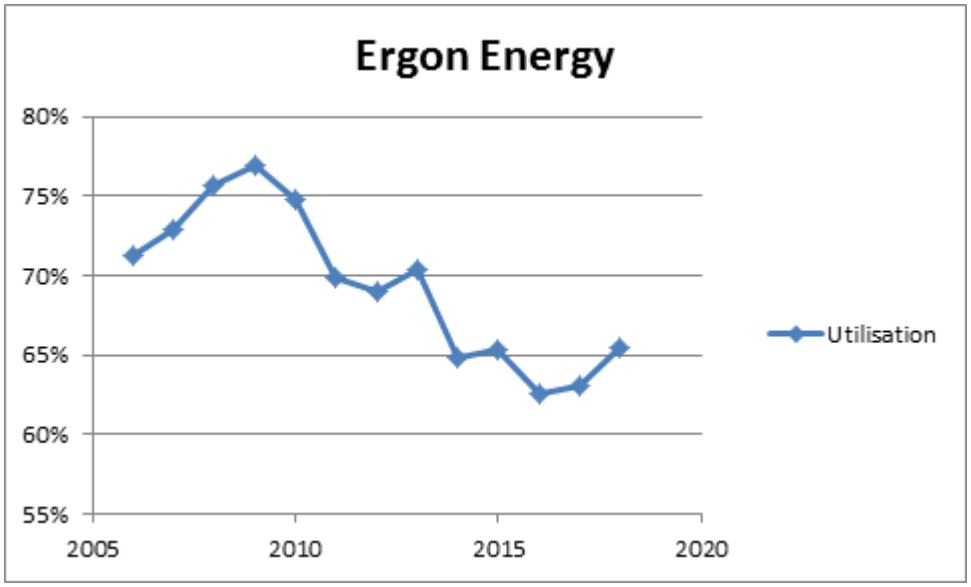


Figure 11: Ergon Energy network utilisation

There have been no recommended modifications to the utilisation targets of the distribution network despite a number of reviews. This is due to the fact that the current levels of utilisation are already high and are required to support credible failures under the existing security criteria through localised distribution load transfers. This is also due to the fact that the majority of faults originate in and impact the distribution feeder network, with feeder utilisation as an impact on network performance and MSS. More information on the distribution planning criteria can be found in the Distribution Annual Planning

report.

Going forward Energy Queensland will continue to manage its capacity utilisation, considering the impact of new technologies and in line with customer and performance expectations.

6. Network Reliability Strategy 2020-2025

6.1 Retain Current Levels of MSS

With reliability of supply performance now consistently meeting the MSS obligations, both Energex and Ergon Energy currently do not intend to invest reliability improvement specific capital on their infrastructure for the foreseeable future.

This investment approach is aligned with our customers' expectations and their feedback gathered through engagement activities. Customers have consistently informed us that they value price and affordability over performance. In representing our customer's values and preferences we are recommending to the DNRME that the current limits for MSS are maintained for the 2020-25 regulatory control period. This will remove any immediate need for investment to improve the network reliability performance in order to meet regulatory obligations over the next regulatory control period.

This also aligns with EQL's policy of prudent and efficient investment focusing on reducing electricity prices.

6.2 Continuing WPF Program and Align the Approach

In the 2020-25 regulatory period, we intend to continue reviewing feeders defined as meeting the WPF criteria defined in the Distribution Authorities to ensure our worst served customers' experience of network reliability is addressed fairly and timely. Hence our reliability specific expenditure will be limited to WPF improvement programs only for both businesses. As outlined, there are fundamental differences in how WPFs are identified by the two DNSPs and we see an opportunity to align them and ensure that they are meeting the intended objectives and aligning to the national direction and framework.

EQL is currently in the process of recommending that the DNRME review the criteria for WPF improvement program for Ergon Energy and Energex based on the following:

The Worst Performing Feeder improvement program applies to any distribution feeder which meets the following criteria as defined in Clause 11.2[c] of Distribution Authorities for Ergon Energy and Energex:

i. *"The distribution feeder is in the worst 5% of the network's distribution HV feeders based on its 3-year average SAIDI/SAIFI performance, and*
ii. *The distribution HV feeder's SAIDI/SAIFI outcome is 200% or more of the MSS SAIDI/SAIFI limit applicable to that category of the feeder".*

We advocate that the revised criteria should allow for consistency in implementation of WPF improvement programs across EQL without compromising the potential outcomes for the worst served customers on similar distribution feeders in the two networks. We have built the submission considering these changes will be implemented as part of our prudent, efficient and reduced capital expenditure, especially for the Energex South East Queensland WPF improvement program, sought from the

AER2020 reset.

6.3 Improve Consistency between MSS and STPIS

The AERs consultation on revisions to its STPIS scheme (draft, Dec 2017) has proposed a number of changes to align with the AEMC recommendations for a national reliability framework. Once finalised, and if applied to the DNSPs at the next reset, the new STPIS will most likely result in changes to parameter definitions relating to STPIS reliability calculations, which will create conflicts with (similar) MSS reliability measures and feeders (definitions/calculations).

Whilst the changes are not expected to result into material differences in reliability indices reported at network levels, they will require adjustments to reporting systems and processes and potentially additional resources to manage different obligations for performance reporting between DNRME and AER.

EQL believes that it is necessary to align the SAIDI/SAIFI measure definitions, exclusions and reporting criteria between MSS and STPIS regulatory regimes to maintain reporting efficiency and network operation decisions. We are in the process of recommending to the DNRME that the reliability reporting under the MSS adopts the same proposed changes in the National STPIS by the AER to align the underlying requirements/parameters for network performance reporting.

It will be recommended that:

1. *The MSS scheme also implements changes to the associated DA Clauses 9.3(a) and 9.3(b) "Exclusions for MSS" to align with the proposed National STPIS Clause 3.3 (a) "Exclusions" and to exclude "an interruption with a duration of 3 minutes or less", to support the AEMC recommendations.*
2. *The definition of an urban feeder for MSS reporting is aligned with the revised feeder definition in the proposed National STPIS. The revised STPIS proposes to define urban feeder as a feeder, which is not a CBD feeder, has a 3-year average maximum demand over the 3-year average feeder route length greater than 0.3MVA/km.*
3. *The Major Event Day Threshold (tMED) calculation and MED assessment under the MSS be aligned with the STPIS and make it based only on the unplanned interruption performance. This would mean the removal of planned outage performance from the daily SAIDI for the purpose of determining the tMED and for the purpose of assessing the daily performance against the tMED. This will allow us to have a single threshold across both schemes and ensure that the performance impact of a day is removed or included from both schemes. Currently, we have different thresholds as a result of differences in exclusions which results in days being excluded from one scheme and not the other.*
4. *Clause 9.3 (d) in both Ergon Energy and Energex DAs be amended as per below to clearly allow exclusion for scenarios where customer requests the isolation from the network to perform maintenance/repair works on their assets/installation.*

Clause 9.3.(d) an interruption caused by a customer's electrical installation, a customer's request to be

disconnected to isolate their installation or the failure of that electrical installation.

NOTE: The 2020-2025 STPIS has not been finalised at the time of drafting this document. It is expected the exclusions criteria changes detailed above will be specified in the 2020-25 STPIS and applied to the regulatory determination process.

6.4 Impact of Safety Net

As network load grows and the lower security standard is applied to investment decisions, there is a potential for reliability performance degradation which may trigger a requirement for a category of reliability maintenance investment in future regulatory submissions, which is something that we will continue to monitor.

Due to the existing level of redundancy built from long-run application of the deterministic criteria, the degradation in reliability of supply performance has not been evident since the 2014 transition to Safety Net. However, across the 2020-2025 regulatory control period, we will monitor the balance in customer outcomes achieved from reduced expenditure in a lower security standard and the reliability of supply performance degradation.

6.5 Maintain the Performance of Ageing Networks

The electricity network in Queensland was initially constructed around the 1950s and has continued to evolve and develop to meet customer needs through to today. Many of the assets that were installed in the early development of the network are still in service today, however, after decades of use, these assets are now approaching end of life.

One of our organisational challenges going forward is managing this ageing network. Network equipment, such as power transformers, overhead lines, underground cables and circuit breakers can operate successfully for long periods of time when maintained correctly. These assets, however, still have a finite life and as they age the risk of failure increases which has a corresponding impact on the security and reliability of our networks.

The reliability performance of our aged rural networks is especially sensitive to the influence of asset failure. Rural networks are predominately radial (both sub-transmission and distribution) with little to no alternate supply arrangements. A single asset failure in that radial network can result in supply interruption for an extended period until replacement is affected. This period can be extensive if the cause is failure of critical assets, such as power transformers.

Maintenance and asset replacement at end of life are essential in supporting sustainable network performance. Asset performance is continually monitored and reviewed to ensure that asset management objectives including network performance are delivered in accordance with the Strategic Asset Management Plan. Our strategies for managing specific asset classes and optimising the asset lifecycle are outlined in our Asset Management Plans. These plans include detail on performance, current and emerging issues and the future innovation and improvements being undertaken in order to

manage asset life more efficiently and effectively.

When asset end of life is determined and we are required to remove the asset from service, we utilise our integrated capital planning process that assesses the network requirements and may replace to a lesser standard than like-to-like, or not at all. An essential part of the capital planning process is to evaluate the corresponding performance impact or risk of each project and to monitor overall system performance impacts. An example of where this may be applicable may be a rural substation in Ergon networks supplying a number of long rural feeders. Replacing these substation assets to a lower standard may have a large impact on our Long Rural feeder performance and as such needs to be assessed as part of the investment analysis.

We will continue to monitor asset performance to ensure asset management objectives are met and customer outcomes are achieved.

6.6 Future of Network Reliability Planning

In the Electricity Network Transformation Roadmap [10], the five key focused areas of transformation are customer oriented electricity, carbon abatement, incentives and network regulations, power system security and intelligent network and markets.

Customers are placed at the centre of our future electricity system, empowered with greater choice, control and autonomy. Supported by options for maximising capacity utilisation, the transformed electricity system will be positioned to efficiently maintain system reliability, support low emission energy technology growth and achieve zero net carbon emissions by 2050. In the same time system safety, security and reliability are a central focus and customer distributed energy resources are enabled to become an integral part of network optimisation and whole-of-system balancing.

In essence, these are the main orienteers in the future of Network Reliability Planning. In alignment with these, the corporate strategies and economic and regulatory changes, Network Reliability Planning will continue to evolve. In analysing the relationship between reliability investments and improvement of our network performances we will also assess socio-economic efficiencies of our network reliability planning.

By implementing more sophisticated modelling techniques and integrating them with other network analysis, we will excel and extend our capabilities in the field of probabilistic network reliability assessment of existing and future networks, including systems with high penetration of renewable generation, battery energy storage and electric vehicles.

At the same time, our strategy is to explore a variety of asset, customer, energy and load related reliability indices which will provide a more detailed understanding of the performance of our networks, unsupplied energy and customer experiences.

6.7 Expand Performance Monitoring

Over the past two regulatory control periods, both Ergon Energy and Energex have delivered programs

to install network power quality monitoring devices across the distribution networks. Power Quality (PQ) monitors (Figure 12) are used to provide regular reports for internal and external use, including monitoring and forecasting power quality and specific network reliability performances. The monitoring and data trend analysis also assist to identify in near-real time emerging equipment failures and defects, specifically wires down, blown fuses, load and voltage unbalance, broken or high resistance connections and outages often before the customers are aware and have made reports. In addition, power quality monitoring equipment with other control and data acquisition systems provide a reliable source of real data for validating network models, which will improve the confidence levels for future network investment decisions. The data returned from the PQ monitors allows for geographical visual representation of where network issues and constraints exist. By displaying this information visually it becomes much easier to determine whether issues are systemic to a network section or an isolated issue and make effective decisions about how to resolve these issues more efficiently (Figure 13).

Figure 12: Our PQ monitoring devices (left to right) – PQ monitor, PQ analyser and Investigation PQ meter

connected to transformers or on power lines

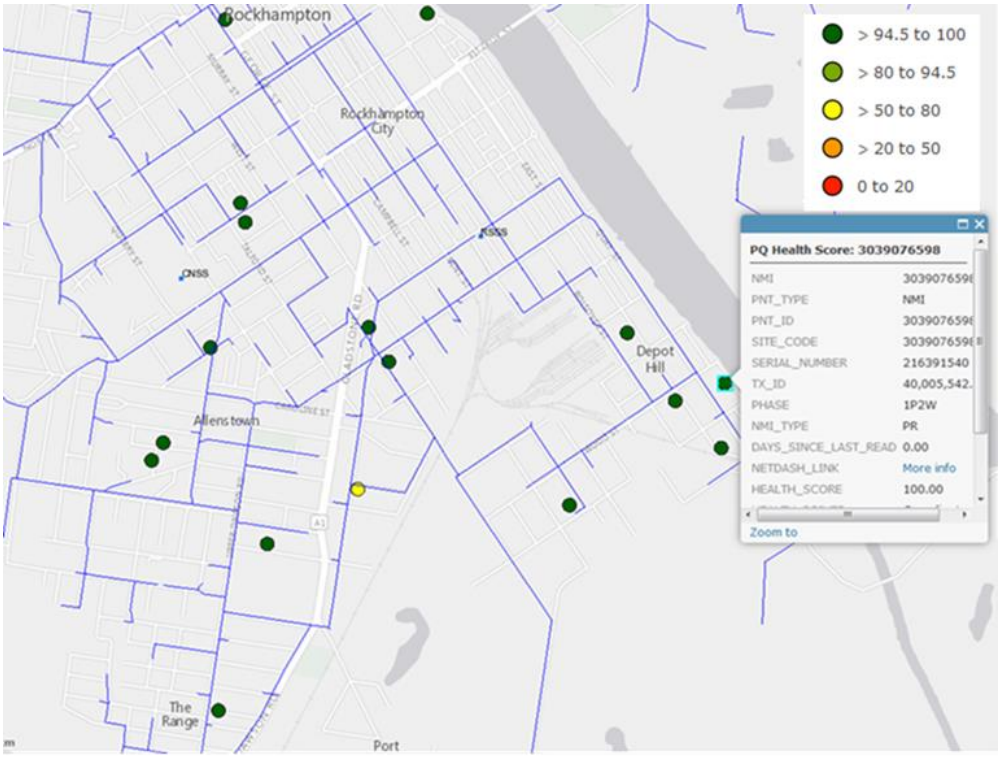


Figure 13: PQ monitors help to localise network issues

PQ monitoring has also been beneficial in identifying sites with repetitive transient faults which lead to momentary supply interruption. Generally, a momentary interruption is a brief loss of electricity supply to a customer caused by the opening and closing of a switching device. It is not uncommon for an auto-recloser or distribution automation system to require more than one attempt to restore supply to affected customers. In this case, the affected customers experience a series of momentary interruptions before supply is restored. A series of one or more such momentary interruptions is defined as a momentary interruption event and the most commonly used measures are momentary average interruption frequency index (MAIFI) and MAIFI-event (MAIFIe). The MAIFIe measures the average frequency of momentary interruption events experienced by customers during the reporting period. Where one or more unsuccessful attempts to restore supply occur, which results in a sustained interruption, the associated momentary interruption event is not included in the calculation of MAIFIe [11].

Energy Queensland is currently not required to report on MAIFIe, however, we are in the process of building this capability into our recording and reporting systems. This involves the monitoring, collection and collation of historical data for MAIFIe measures, in preparation for analysis performance reporting and proposed MAIFIe targets which we expect the AER to introduce for the 2025-2030 regulatory

period.

Reliability performance continues to be monitored and reported using the current measures of SAIDI and SAIFI. The next 2020-2025 regulatory period will see a change to the definition of a momentary outage, with the length of a momentary outage changing from less than one minute, to less than 3 minutes. Our performance targets will be adjusted in accordance with this change in definition.

7. Emergency Response and Network Contingency Management

As our investment in reliability improvement stabilises, Energex and Ergon Energy will continue to improve our response to emergency events into the next regulatory period. We are committed to the achievement of the best practice Asset Management strategies to ensure the safe and reliable operation of our networks during emergency responses and prioritise the following:

- Ensuring personal safety – both public and EQL employees
- Protecting equipment and infrastructure from damage; and
- Efficient supply restoration – including meeting communication requirements of customers and emergency service agencies.

We are focused on managing our assets to minimise the associated asset risk and availability of supply to the customers and the network reliability during times of severe storms, major floods or bushfires.

Network contingency plans are developed to ensure availability and security of supply. These plans encompass load transfer plans, strategies for spares and replacement of a major plant (such as power transformer), emergency response procedures, availability of mobile generators and mobile substations and application of available demand management options.

We have processes in place 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 [12]. In these cases, corrective action to avoid an overload is taken well before a capacity constraint occurs. In addition, network contingency plans detail load transfers and load management options to restore supply following a single contingency event affecting bulk supply substations, zone substations and sub-transmission feeders.

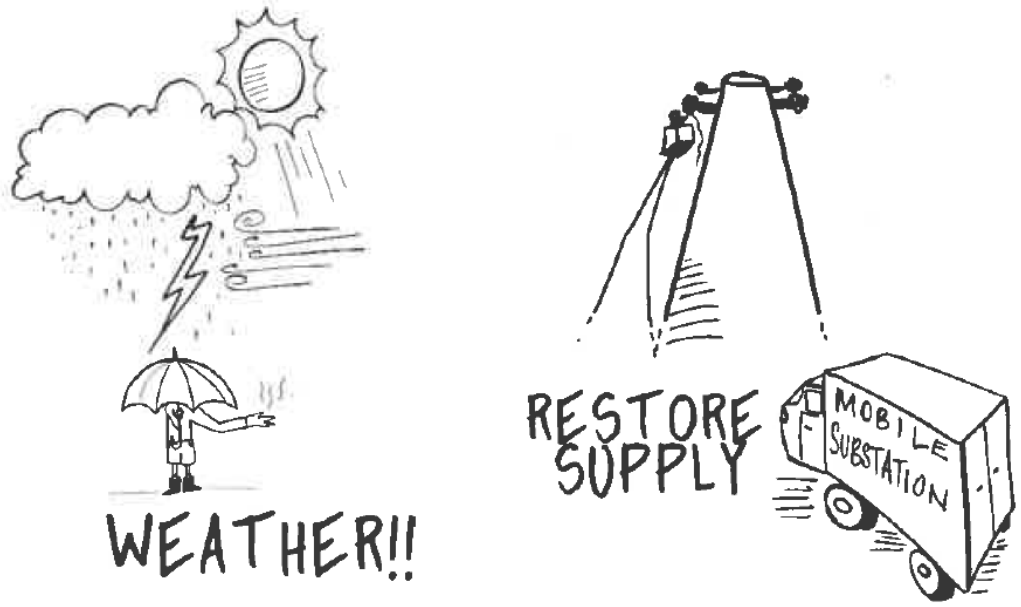
Efficient investments under the Safety Net provisions provide mitigation for credible contingencies that could otherwise result in outages longer than the Safety Net targets. We continue to review the changing state of the network for Safety Net compliance ensuring that care is taken to understand our customers’ needs when considering quality, availability of supply and reliability against the costs of network augmentation.

We also have mobile standby generators and mobile substations that are used to provide emergency response and restore supply to minimise customer inconvenience. This fleet of mobile generators also provides the flexibility for feeder supply support during extreme temperature/load events where existing network assets need to be supplemented. In addition to own equipment, we hire Low Voltage generators to ensure customer’s availability of supply. Strategic spares are held in stock to be used to replace, permanently or temporarily, a critical system element that has failed.

To support our customers during contingency events, we have Demand Management Plans that involve working with our customers and industry partners. For example, Energex and Ergon Energy

have successfully undertaken hot water and pool pump load control for many years. We will continue to optimise our Load Control System and provide incentives to customers and communities during times of peak conditions or extreme weather, preventing area problems and network outages.

In addition to direct load control, we negotiate network support agreements with customers located in network load risk areas. The majority of contracts allow the network to request support from large embedded generators when required. Direct load control, PeakSmart air conditioners, contracted demand response and network mobile and embedded generators are called up in EQL Summer Preparedness Plan and contribute to overall improvement in reliability and security of power supply in a cost-efficient manner.



8. Large Load and Generator Performance

Our networks supply electricity to different categories of customers. For the perspective of network reliability performances, MSS limits and STPIS targets are specified based on distribution feeder categories as CBD, Urban, Short Rural and Long Rural. In reliability performance terms, a residential and an industrial customer are treated as equal, although the economic impact on a commercial or industrial customer from an outage is more significant than a residential customer.

As we connect an increasing amount of commercial and utility-scale renewables to the Ergon and Energex networks, the use of these networks and hence reliability requirements continue to evolve. Large generator connections are considered as a single customer for the sake of MSS or STPIS schemes, with their reliability requirements negotiated through their connection agreement and subsequent network arrangement, as part of the connection process.

In parallel, large renewable generators have a significant impact on network performances and reliability. Power system transient and dynamic stability, frequency regulations, Volt/VAr regulation, protection coordination, islanding and ability to restore system from outage are specific technical challenges. They require an integrated system planning to determine the best network topologies suitable for a large number of spatially distributed energy resources and transfers of a large amount of variable power between interconnected systems on short and long distances.

Although this will make the performances and reliability problems more challenging, it will also provide opportunities for planning and designing networks that can out-perform traditional networks.

In close co-operation with Australian Energy Market Operator (AEMO) and Powerlink, we will continue to evaluate network security and stability. Also, we will amend Standards for Network Performances to address the minimum reliability (and power quality) standard that our customers connected to the Energex and Ergon Energy networks with high penetration of renewable energy resources can expect.

9. Transitioning to an Intelligent Grid

Over the past decade, Queensland has seen a 1000-fold increase in the number of Distributed Energy Resources (DER), a significant change in demand profiles, advancement of customer- and utility-side technologies, sizable shifts in regulations, new market entrants and business models. The impacts of this transition are becoming increasingly visible, and reviews into market design, system operation, customer interactions and standards are establishing the guiding frameworks which will dictate the future energy ecosystem.

While there are a number of scenarios that could eventuate, it is certain that in the immediate period (up to 2025) and ultimately at least the next two decades, will see significantly higher levels of intermittent and controllable DER, new and increasingly active energy service providers, and an increased emphasis on the role of distribution networks on overall energy system and market operation.

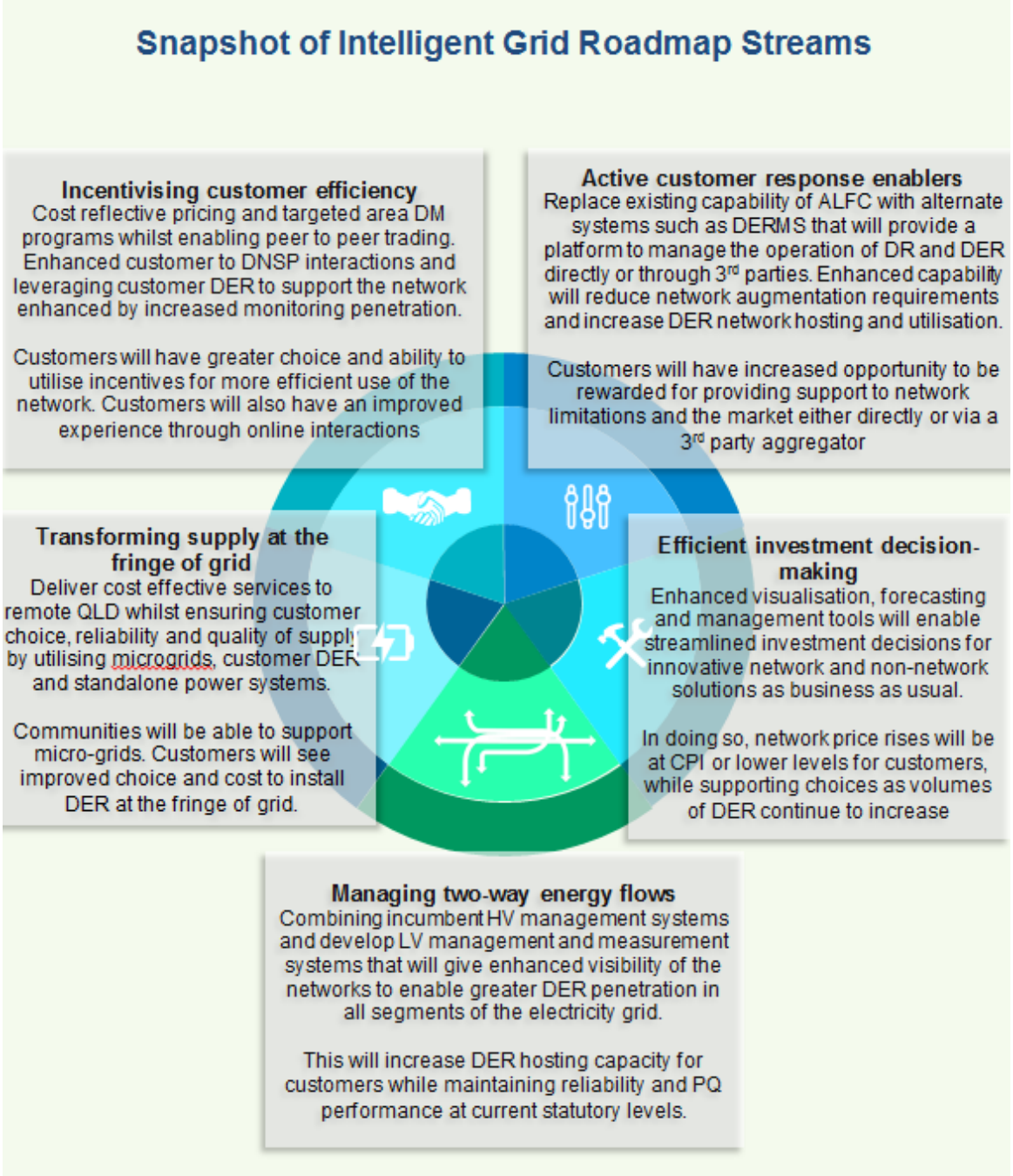
To respond to this challenge, EQL has developed the Future Grid Roadmap. This roadmap provides a guiding, holistic pathway for transforming Energex and Ergon Energy network businesses to have the capability necessary to:

- Support affordability while maintaining security and reliability of the energy system.
- Ensure optimal customer outcomes and value across short-, medium- and long-term horizons – both for those with and without their own DER.
- Support customer choice through the provision of technology neutrality and maintaining open access to the distribution network.
- Ensure the adaptability of the distribution system to new technologies; and
- Promote information transparency and cost reflective price signals that enable efficient investment and operational decisions.

This document has been developed in alignment and support of the Future Grid Roadmap. As the roadmap highlights, customer use and interaction with the network is changing. This includes the ability for customers to locally generate, store and potentially export their own electricity. Over time, this technology will change the level of reliability customers expect from the grid. Between now and 2025, Energy Queensland will assess how this expectation is taken into consideration for future reliability frameworks.

The implementation of this roadmap means we will no longer simply manage energy grid costs. Instead, we will manage these together with customers to reduce electricity prices and have a network that is smarter and more resilient and reliable. A connected future, with increasingly community-based energy solutions and rewards for individuals who provide services that optimise the use of the network

is key in keeping electricity prices affordable and delivering benefits for all.



APPENDIX 1 – DEFINITIONS, ABBREVIATIONS AND ACRONYMS

Abbreviation or acronym	Definition
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CBD	Central Business District (feeder)
DAPR	Distribution Annual Planning Report
DER	Distributed Energy Resource
EDNC	Electricity Distribution Network Code
EQL	Energy Queensland Limited
GSL	Guaranteed Service Level
HV	High Voltage (35kV – 230kV AC)
IVR	Interactive Voice Response
MAIFIe	Momentary Average Interruption Frequency Index Event
MED	Major Event Day
MSS	Minimum Service Standards
NSP	Network Service Providers
PQ	Power Quality (of the network)
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
STPIS	Service Target Performance Incentive Scheme
VCR	Value of Customer Reliability
WPF	Worst Performing Feeder

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