Regulatory Investment Test for Distribution

Non-Network Options Report

Reliability of Electricity Supply and Network Asset Risk Management in the Wide Bay Burnett Area

This document describes the *identified need* for investment at Wide Bay Burnett. It includes description of the likely network options and to the extent possible, the characteristics of non-network options which may, either alone or in combination with network or other non-network options, represent a feasible solution for addressing the identified need.

Consultation starts: 16 October 2019

Consultation ends: 16 January 2020

Executive Summary

Ergon Energy Corporation Limited (Ergon Energy) is responsible (under its Distribution Authority (DA)) for electricity supply to the Wide Bay - Burnett area in Queensland.

The existing 66kV M028 feeder forms part of the 66kV subtransmission network supplying the 66/11kV zone substations Degilbo (DEGI), Gayndah (GAYN), Mundubbera Town (MUTO) and Eidsvold (EIDS) as well as the Mount Rawdon gold mine (MORW). Feeder M028 is 92km long, 64 years old and has reached its end of life based on the condition of the 7/.104 HDBC conductor and wooden poles. 37% of the wood poles on this line are the original untreated hardwood poles from the 1960s. Due to the poor condition of the poles and the conductor, and the fact that there is no overhead earth wire for lightning protection, the feeder has extremely poor reliability. Feeder M028 has four times the subtransmission feeder average number of outages, and has become a safety risk to power workers and the public. The Isis – Gayndah 66kV ring which is normally run closed, is voltage constrained during present peak loading and is limited by the thermal rating of the M028 feeder during the contingency loss of the other half of the ring (M049 feeder).

The first objective of the proposed investment is to maintain a safe and sustainable energy supply to customers by reducing the significant safety and environmental risks associated with the aged M028 feeder to as low as reasonably practicable (ALARP).

The second objective is to ensure that there is sufficient capacity in the network to meet existing customer demand and also to enable customers to connect new loads in the future.

The third objective is to provide a secure and reliable energy supply to customers by ensuring that the network meets Ergon Energy's statutory network security and reliability performance standards.

Ergon Energy has proposed to meet these objectives by replacing the entire aged M028 feeder with a new 66kV single circuit concrete pole feeder, strung with Neon conductor and optical ground wire (OPGW), originating from the 132/66kV Isis Bulk Supply Point and connecting Degilbo and Gayndah zone substations by December 2023.

This is a Non-Network Options Report, where Ergon Energy is seeking information from interested parties about possible alternate solutions to address the need for investment.

Submissions in writing (electronic preferably) are due by **16 January 2020 by 4:00 PM** and should be lodged to Ergon Energy's "Regulatory Investment Test for Distribution (RIT-D) Partner Portal". The portal is available at:

https://www.ergon.com.au/network/network-management/network-infrastructure/regulatory-test-consultations

For further information and inquiries please refer to the "Regulatory Investment Test for Distribution (RIT-D) Partner Portal".

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1. Introduction

This Non-Network Options Report has been prepared by Ergon Energy in accordance with the requirements of clause 5.17.4(e) of the National Electricity Rules (NER).

This report represents the first stage of the consultation process in relation to the application of the Regulatory Investment Test for Distribution (RIT-D) on potential credible options to address the identified need for the replacement of the M028 Childers to Gayndah 66kV feeder.

This report:

- Provides background information on the network capability limitations of the subtransmission network supplying DEGI, GAYN, MUTO, EIDS and MORW.
- Identifies the need which Ergon Energy is seeking to address, together with the assumptions used in identifying and quantifying that need.
- Describes the credible options that Ergon Energy currently considers may address the identified need, including for each:
  - Its technical definitions;
  - The estimated commissioning date; and
  - The total indicative cost (including capital and operating costs)
- Sets out the technical characteristics that a non-network option would be required to deliver in order to address the identified need.
- Is an invitation to registered participants and interested parties to make submissions on credible options to address the identified need.

In preparing this RIT-D, Ergon Energy is required to consider reasonable future scenarios. With respect to major customer loads and generation, Ergon Energy has, in good faith, included as much detail as possible while maintaining necessary customer confidentiality. Potential large future connections that Ergon Energy is aware of are in different stages of progress and are subject to change (including outcomes where none or all proceed). These and other customer activity can occur over the consultation period and may change the timing and/or scope of any proposed solutions.

Submissions in writing (electronic preferably) are due by 4pm on **16 January 2020** and should be lodged to Ergon Energy's "Regulatory Investment Test for Distribution (RIT-D) Partner Portal". The portal is available at:

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2. Background

The Upper Burnett River catchment area takes in Eidsvold, Mundubbera and Gayndah and is considered some of the most ideal agricultural areas for grazing and cropping in Queensland, supported by the perennial Burnett River. Eidsvold is the self-proclaimed beef capital of the Burnett, and Gayndah/Mundubbera, the centre of the biggest citrus growing area in Queensland, is considered the orange capital and runs a biennial orange festival. The base load requirements for these towns is irrigation; which is expected to continue into the future with more pressure on agriculture producers to move to more intense farming for higher yield per hectare.

Mt Rawdon Mine, an open pit gold mine owned by Evolution Mining, is the largest employer in the area with 24hr production that has produced 95,000 - 100,000 ounces of gold per year since full production commenced in 2001. In 2018 the mine reached a milestone of achieving fifty tonne total gold output since operations started. *(Source:https://evolutionmining.com.au/mt-rawdon/)*

Degilbo has a 2.79MW hydro generator that operates irregularly for peak energy market events. There is not enough water to run this generator continuously or be relied on for local outages.

The 66kV subtransmission supply for this area initiates from T131 Isis Bulk Supply Point (BSP), which was upgraded from a switching station to a BSP in 1987. The original 66kV subtransmission line ran from Isis substation 8km to the north to the township of Childers, then south-west 92km to Gayndah supplying the Degilbo substation on route. A geographical layout of the 66kV subtransmission network for the area can be seen in Figure 1.

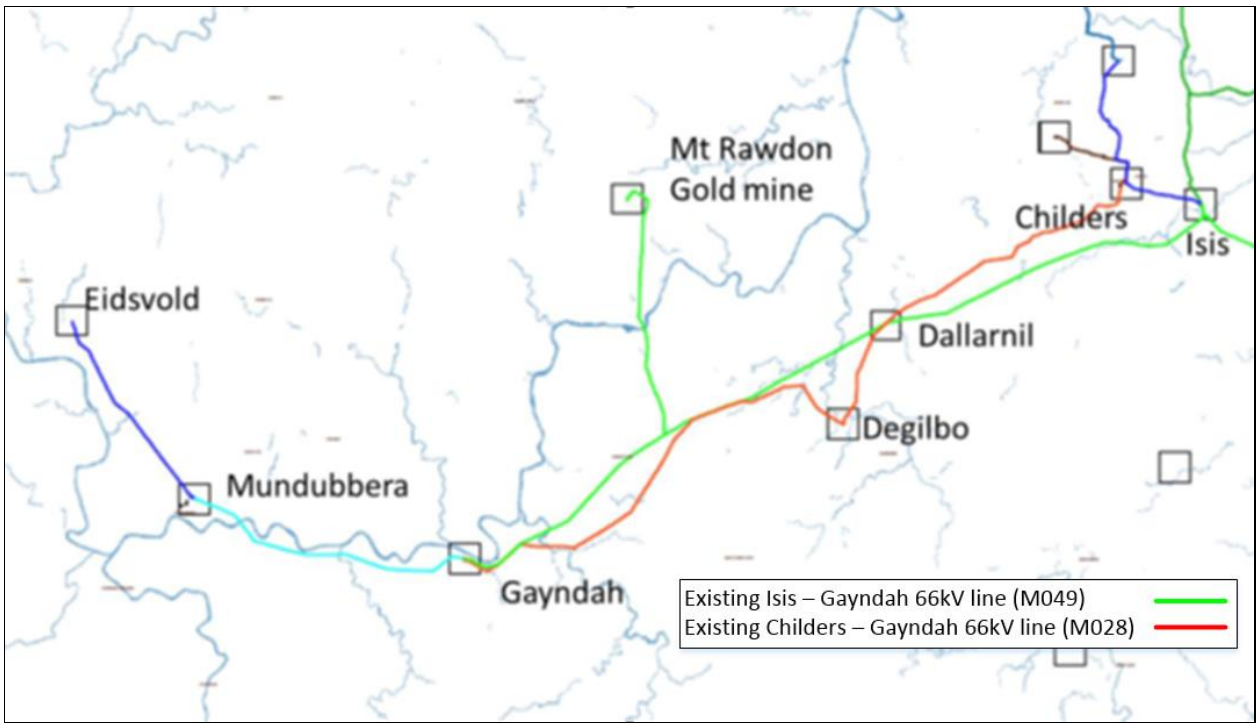

Figure 1 - Upper Burnett River Subtransmission Network Geographical Diagram

The Childers to Gayndah feeder designated M028 was constructed in 1954 with natural untreated bush poles and strung with 7/0.104 Hard Drawn Bare Copper (HDBC) at 50°C for a 15.1MVA summer day rating. In 1986 after the initial requests from the Mt Rawdon Mine, a second feeder (M049) was constructed with pesticide treated wood poles and strung with 7/4.75 AAAC 1120 (Iodine) at 75°C for a 45.6MVA summer day rating. Neither feeder has an aerial earth wire along the full length of the feeder therefore is susceptible to damage and outages due to lightning strikes. This second feeder runs 93km from Isis BSP to Gayndah with a tee off at 65km for a supply to Mt Rawdon Gold Mine, a further 29km to the north of the tee. Feeders M028 and M049 are operated

as a closed ring at Gayndah substation. Figure 2 shows a representative geographic diagram of the area.

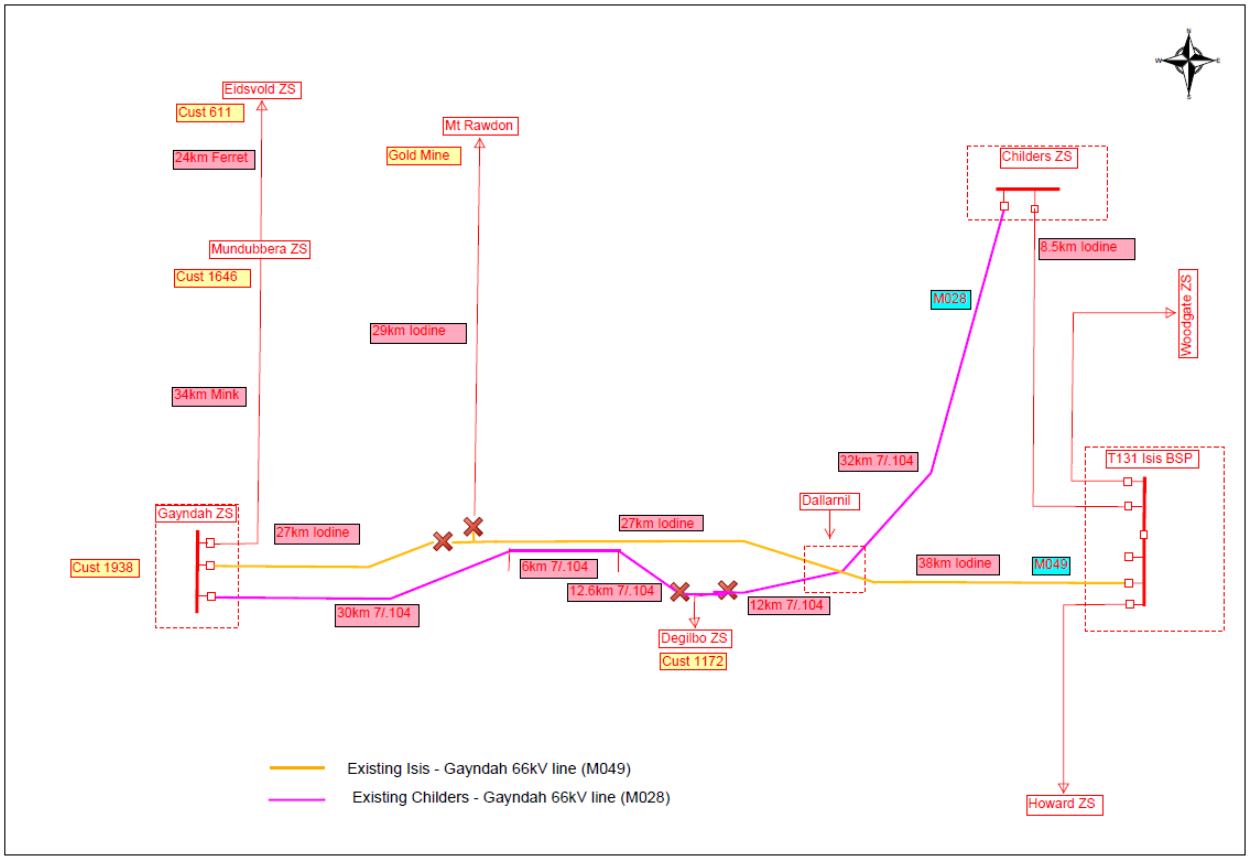

Figure 2 - 66kV Subtransmission Network Representative Geographic Diagram

2.1 Investment Objectives

Any potential credible option would need to meet each of the objectives listed below.

2.1.1 Objective 1

Maintain a safe energy supply to customers by reducing the significant network risks associated with the aged M028 feeder to ALARP.

2.1.2 Objective 2

Ensure that there is sufficient capacity in the network to meet existing customer demand and also to enable customers to connect new loads in the future.

2.1.3 Objective 3

Provide a secure and reliable energy supply to customers by ensuring that the network meets Ergon Energy's statutory network security and reliability performance standards.

2.2 Existing Network

2.2.1 Subtransmission Line Ratings

Feeder M028 Childers to Gayndah 7/.104 HDBC has a Summer Day Rating (SDR) 15.1MVA. If feeder M049 is out of service, M028 only has the thermal capability at peak times to supply Degilbo, Gayndah, Mundubbera and Eidsvold. M028 does not have the thermal capacity to also supply Mt Rawdon gold mine.

The M049 Isis to Gayndah feeder is strung with 7/4.75 AAAC 1120 (Iodine) conductor at 75°C and has a summer day rating of 45.6MVA. If M028 is out of service, M049 has the thermal capability at peak times to supply all the connected substations including Mt Rawdon gold mine. See Table 1 below for network design and thermal details.

Table 1 - Line Thermal Ratings for the Relevant 66kV Feeders.

Feeder	Line Section	Line Length (km)	Conductor	Design Temp. (°C)	Summer Day (09:00-17:00) A (MVA)	Summer Evening (17:00-22:00) A (MVA)	Summer Night / Morning (22:00-09:00) A (MVA)
M049	ISIS - MORW Tee	1.5	19/3.75 AAAC Neon	75	548 (62.6)	579 (66.2)	521 (59.6)
M049	ISIS - MORW Tee	63.2	7/4.75 AAAC Iodine	75	399 (45.6)	415 (47.4)	370 (42.3)
M047	MORW Tee - MORW	30.3	7/4.75 AAAC Iodine	50	193 (22.1)	275 (31.4)	267 (30.5)
M049	MORW Tee - GAYN	26.7	7/4.75 AAAC Iodine	75	399 (45.6)	415 (47.4)	370 (42.3)
M027	ISIS - CHIL	8.5	7/4.75 AAAC Iodine	75	399 (45.6)	415 (47.4)	370 (42.3)
M028	CHIL - DEGI Tee	43.5	7/.104 HDBC	50	132 (15.1)	167 (19.1)	159 (18.2)
M028	DEGI Tee - GAYN	48.3	7/.104 HDBC	50	132 (15.1)	167 (19.1)	159 (18.2)

2.2.2 Voltage Levels

Modelled 66kV system voltages during peak load of the existing system for different system configurations and capacitor bank arrangements are provided in Table 2. The modelling was completed with the peak demand of 33.8MVA. The Substation Forecast numbers are indicating low growth for the Upper Burnett region, while the historical loads suggest there is still load recovery to occur from severe floods in 2010 and 2013. In summary, if loads increase above historic levels, then the existing network will experience more severe voltage limitations (than shown in Table 2) at a number of substations during maximum demand days.

According to National Electricity Rules s5.1a.4, at all times supply voltage must remain between 90% and 110% of the normal voltage, while the target voltages are within 95% and 105%. The following conclusions can be drawn from these assessments:

- With the existing system intact (both feeders M028 and M049 in service) and all cap banks switched in, the network is voltage constrained during peak load periods with 66kV voltages at GAYN reaching 0.89Vpu and MORW gold mine reaching 0.88Vpu.
- With feeder M028 out of service, all cap banks need to be switched in to support system voltages. It is possible to maintain supply, however the voltage at the MORW gold mine reaches 0.85Vpu, GAYN reaches 0.84Vpu, MUTO reaches 0.89Vpu and EIDS reaches 0.88Vpu.

- With feeder M049 out of service, MORW gold mine cannot be supplied due to insufficient system voltages. Even with MORW switched off, a further 5MW of load needs to be shed from GAYN/MUTO/EIDS/DEGI in order to maintain adequate voltage levels.
- With most transformers at the zone substations at maximum boost tap, and unable to further support voltages, it is clear that the network is voltage constrained both in system normal and contingency scenarios. Future large customer connections may not be possible or may only be possible with restrictions e.g. limiting operation to off-peak times or utilising peak lopping generators.

Table 2 - Network Voltages of the Existing Network with Designated Assets in Service

Network Configuration	MORW Load ON?	GAYN Cap Bank IN?	MUTO Cap Bank IN?	DEGI	GAYN	MUTO	EIDS	MORW
M028, M049 in service	Yes	Yes	Yes	0.94	0.89	0.94	0.93	0.88
M028, M049 in service	Yes	Yes	No	0.92	0.86	0.88	0.87	0.86
M028, M049 in service	Yes	No	Yes	0.93	0.88	0.92	0.91	0.87
M028, M049 in service	Yes	No	No	0.91	0.84	0.86	0.85	0.85
M028, M049 in service	No	No	No	0.94	0.90	0.93	0.92	0.93
M049 in service, M028 out of service	Yes	Yes	Yes	-	0.84	0.89	0.88	0.85
M049 in service, M028 out of service	Yes	Yes	No	-	0.77	0.78	0.77	0.79
M049 in service, M028 out of service	Yes	No	Yes	-	0.82	0.86	0.84	0.83
M049 in service, M028 out of service	Yes	No	No	-	0.73	0.73	0.72	0.77
M049 in service, M028 out of service	No	No	No	-	0.84	0.87	0.86	0.89
M049 in service, M028 out of service	No	Yes	Yes	-	0.92	0.95	0.94	0.95
M049 out of service, M028 in service	Yes	Yes	Yes	No convergence in load flow				
M049 out of service, M028 in service	No	Yes	Yes	No convergence in load flow				
M049 out of service, M028 in service 5MW load shed to maintain voltages	No	Yes	Yes	0.93	0.85	0.91	0.90	0.85

2.2.3 Feeder Condition

The M049 Isis – Gayndah feeder which was constructed in 1987 with pesticide treated wood poles and strung with 7/4.75 AAAC 1120 (Iodine) conductor at 75°C with no aerial earth wire, is showing degradation typical of a 31 year old feeder. M049 feeder is inspected every 4 years under the pole inspection program and has a standard number of pole replacements, pole nailing, cross arm replacements, insulator and support replacements for an asset of this age. The conductor is not in need of replacement.

M028 Childers to Gayndah feeder constructed in 1954 (pre-treated poles period) and strung with 7/0.104 Hard Drawn Bare Copper (HDBC) conductor at 50°C with no aerial earth wire, is showing standard degradation for a feeder of 64 years old.

Both feeders do not have aerial earth wires over the length of the feeders, which makes these assets susceptible to lightning strikes and coinciding damage. Lightning damage happens at any time between inspection cycles and makes the feeder susceptible to unassisted pole failure which

creates dangerous situations for the public and crews, and can create significant damage and long outages for the customers during repairs. M028 still has 37% of the original untreated wood poles.

Since 2010, Ergon Energy performed approximately 110 termite treatments on poles on the M028 feeder. To further manage the associated safety risk of termite pole failures on this feeder, Ergon Energy is proposing to proactively treat any remaining untreated poles.

The aged copper conductor on M028 is in poor condition, suffering damage over the 64 years from natural aging, lightning strikes, fault currents and 'work hardening' at suspension clamps. Laboratory analysis of conductor samples has confirmed that the line does not always meet minimum load break requirements. The line has reached the end of its useful life.

2.2.4 Reliability

M028 Childers to Degilbo to Gayndah feeder is having on average six unplanned outages per year, which has accumulated 1.8 Million customer minutes in the previous four years (see Appendix Table 6). As this section of subtransmission network is a ring, most customers can be restored, but the 1172 customers supplied from DEGI experience power interruptions for every outage until the feeder is repaired. If the fault is beyond DEGI, DEGI can be reenergised via manual switching. Over the last four years, Degilbo customers have experienced on average six and half hours of supply outages per year. The reliability for M028 is around 6.4 faults/100km/year that is more than four times Ergon Energy's average outage rate of 1.4 faults per 100km per year typical for subtransmission wood pole feeders.

As shown in Appendix Table 7, M049 Isis – Mt Rawdon – Gayndah feeder, even though it is half the age at 31 years old, is averaging 4 outages per year and has accumulated over 2.3 Million customer minutes over the same 4 year period. This equates on average to over two hours per year in supply outages. The biggest impact from an outage of M049 feeder is the interruption of supply to Mt Rawdon Gold Mine which has a 24hr operation. Mt Rawdon Gold Mine is the biggest employer in the area, and is considered for reliability purposes the same as a single residential dwelling, or one customer. The reliability for M049 is around 4 faults/100km, which is 250% worse than Ergon Energy's average outage rate for subtransmission wood pole feeders.

The fact that neither M028 or M049 feeder have aerial earth wires, combined with the fragility of the poles and wires, makes these feeders susceptible to lightning strikes and storms. Unplanned outage data shows a high correlation with the spring/summer storm season.

For reliability comparison, a concrete pole feeder with an aerial earth wire, has an average 0.25 faults per 100km, this is 24 times and 16 times better reliability than experienced by the customers on feeders M028 and M049 respectively.

2.2.5 Value of Customer Reliability

Energy Queensland utilises the AEMO 2014 Value of Customer Reliability (VCR) as a market benefit in its investment and project planning analysis. VCR is an economic value applied to customers' unserved energy for any particular year and is intended to represent customers' willingness to pay for their reliability of electricity supply. VCR is used to supplement Ergon Energy Jurisdictional Security Criteria requirements by helping compare project options in a project business case or RIT-D, where reliability is assessed to have a material impact. VCR analysis can also be used to demonstrate the customer benefits of investment above mandatory requirements, to achieve an improved, efficient customer reliability outcome, but in practice this application is very rare. Detail about how VCR is applied in investment analysis is included in Ergon Energy's Distribution Annual Planning Report (DAPR) under section 6.4 on Network Planning Criteria[1].

[1] https://www.ergon.com.au/network/network-management/future-investment/distribution-annual-planning-report

Analysis has shown that the overwhelming contribution to the total amount of unsupplied energy in the system, due to unplanned events, was the reduction in MORW load. This is due to momentary events (such as lightning strikes to the line or auto-reclose of the feeder CB) tripping off significant amount of load at MORW. Once tripped off it takes a significant amount of time (typically 2-3 hours) for the full load to come on again.

Over the past three years, the average unsupplied energy at MORW is calculated to be 266MWh/year. Assuming a VCR of $39.71/kWh, this equates to $10.6M per annum as the cost of unsupplied energy for this one customer.

2.2.6 Safety Net

Applied Service Standards

The applicable service standard for this planning proposal is Safety Net[2] which is "a strategy to avoid unexpected customer hardship and/or significant community or economic disruption by mitigating the effects of credible contingencies largely on the sub-transmission network, which have a low probability of occurring and result in high consequence network outages and loss of supply to many customers. Safety Net provides a 'base-case' security level to cater for Low-Probability High Impact events". It is included in Ergon Energy's Distribution Authority and is therefore a mandatory business requirement.

Safety Net Security Criteria

To address the low probability high impact risk for feeder outage contingencies, the Safety Net Security Criteria is applied to restore supply within the allowable timeframe. The safety net criteria are classified into Regional Centre and Rural Area, each with a different timeline as follows:

Safety Net – Load not supplied and maximum restoration times following a credible contingency	
Regional Centre	**Rural Areas**
Less than 20MVA (5000 customers) after 1 hour; Less than 15MVA (3600 customers) after 6 hours; Less than 5MVA (1200 customers) after 12 hours; and Fully restored within 24 hours.	Less than 20MVA (7700 customers) after 1 hour; Less than 15MVA (5800 customers) after 8 hours; Less than 5MVA (2000 customers) after 18 hours; and Fully restored within 48 hours.

It is noted that each of the zone substations supplied from M028 and M049 are classified Rural Area for Safety Net purposes, therefore requiring full supply to all customers to be completed within 48 hours.

It should also be noted that since MORW is connected to the sub-transmission network, its load does not count towards Safety Net load-at-risk calculations[3]. Mt Rawdon's load does however apply in calculating reliability measures such as VCR (see above).

Safety Net Assessment – Existing System

Each of the individual substations (DEGI, GAYN, MUTO and EIDS) are deemed to be Safety Net compliant.

When M028 Childers to Gayndah feeder, M049 Isis to Gayndah feeder and connected substations are considered under Safety Net as a system, the network is only **JUST** Safety Net compliant. As would be expected, for the 93km and 92km, respectively, M028 and M049 transverse through hilly

[2] *Safety Net Application, Evaluation and Economic Investment Manual,* purpose of Safety Net, p.6.
[3] In accordance with the Ergon Energy document "Safety Net Application Guideline".

and forested terrain that makes access for repairs challenging and restoration times could approach 18 hours.

If M049 incurred a low probability outage during peak load days, rotational load shedding of 5MW on GAYN/MUTO/EIDS substations would be required until the repairs are complete. Since the load shedding required is 5MW to maintain network integrity, these events will meet safety net. If the load increases into the future, even by 1MW, then M028 and M049 as a system will no longer meet the Safety Net Security Criteria.

In summary, with existing loading, the system is right on the verge of being Safety Net compliant and that any further growth will lead to Safety Net non-compliance.

2.2.7 System Loading

Daily Maximum Demands for M049 and M028 66kV feeders from 2015 to 2018 is shown in Figure 7, illustrating a system peak of 30.8MVA which occurred at 19:30 on the 12/02/2017, aligning with other substation peaks across Ergon's network. The load split was 10.5MVA on M028 and 20.5MVA on M049. The peak day (12/02/2017) load profiles for the connected substations are shown in Figure 3. Individual substation forecasts are provided in the following section with commentary on the historic and future forecast.

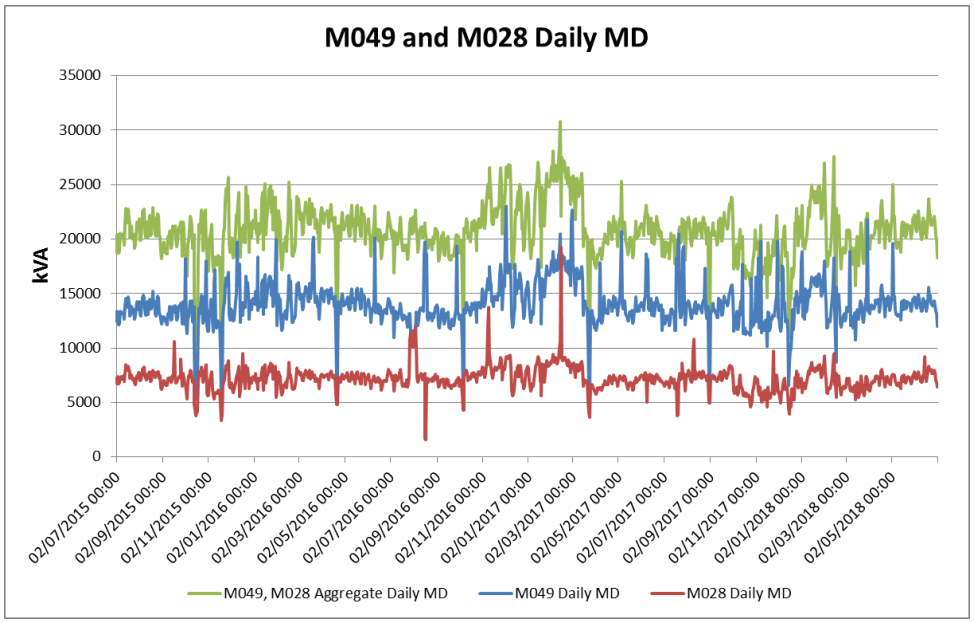

Figure 3 - Daily Maximum Demands for M049 and M028 66kV feeders from 2015 to 2018

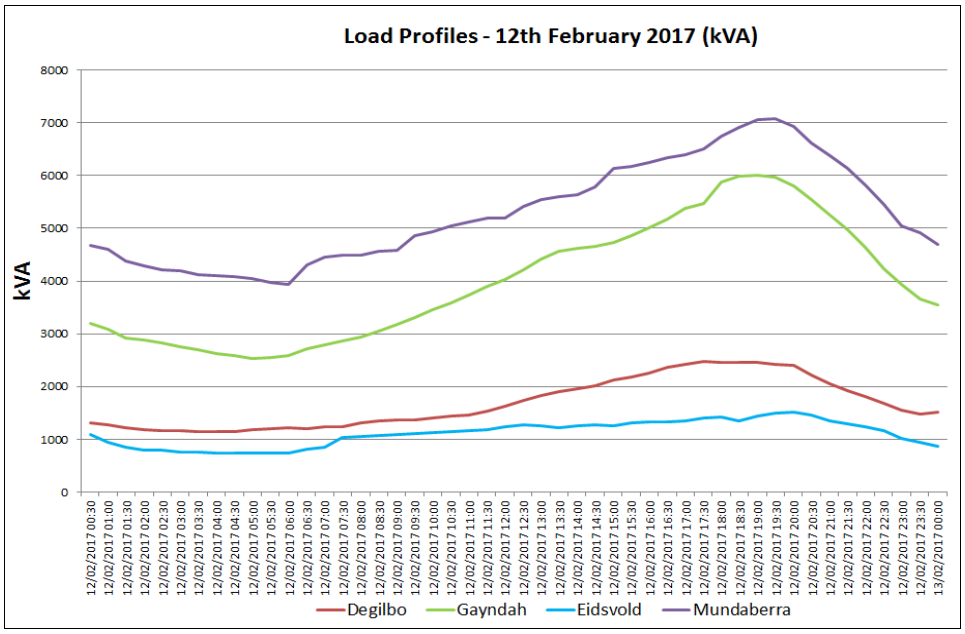

Figure 4 - Substation Load Profiles for Maximum Demand Day 12 February 2017

2.2.8 Substation Forecast

Figure 5 and Figure 6 below display the 50POE and 10POE historical yearly maximum demands and future forecasts. The impacts of severe flooding of the Burnett River in 2010 and 2013 (and subsequent closing down of a number of farms and orchards) can be seen in the drop in historic loads at Mundubbera.

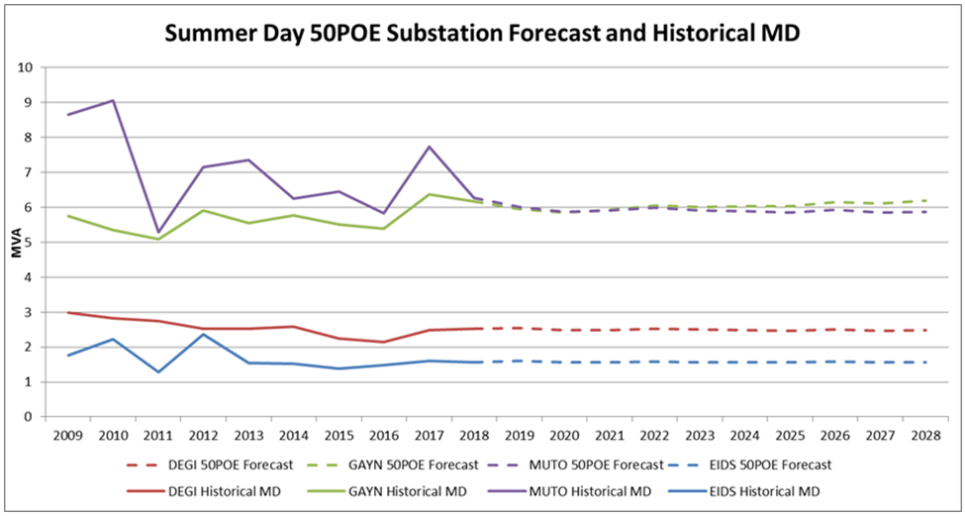

Figure 5 - Summer day 50POE zone substation forecast

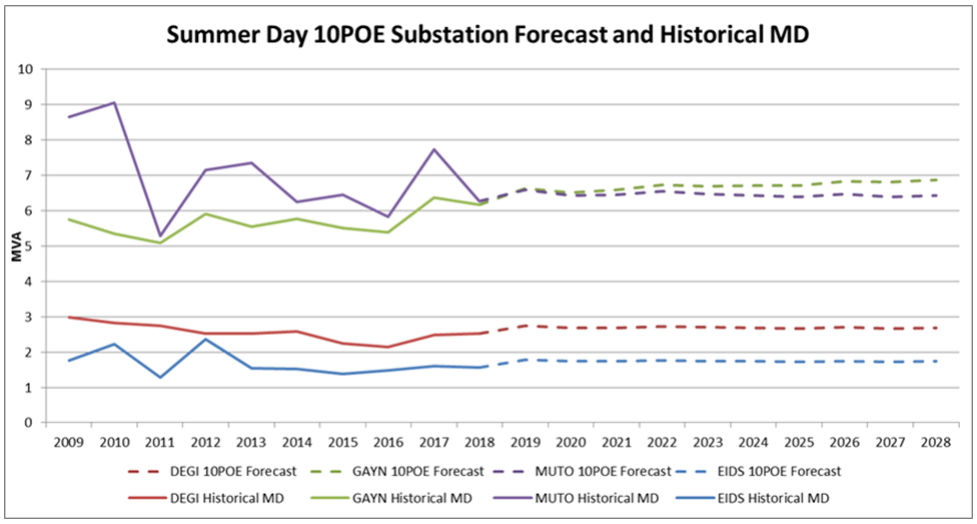

Figure 6 - Summer day 10 POE zone substation forecast

2.2.9 Future Growth

There are a number of Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) initiatives proposed for the region being monitored by Ergon Energy's Major Customer group. The ability to supply potential new loads should be considered when assessing options for M028 and the Upper Burnett network.

2.2.10 Risk Assessment

Table 3 summarises the network (business) risks associated with the aged M028 line that the organisation would be exposed to if the project was not undertaken. The Inherent Risks are not deemed to be ALARP. The preferred solution will reduce Ergon Energy's risk exposure by reducing all risks to ALARP.

Table 3 – Summary of M028 network risks

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Public Safety Impact - Conductor/pole failure in a public access area results in single fatality.	Safety	5 *(Single fatality / incurable fatal illness)*	3 *(Moderate Exposure)*	**15** ***(Moderate)***	2019
Worker Safety Impact – Failure of an aged copper conductor during re-tensioning results in loss of control of conductor striking a worker causing single serious injury.	Safety	3 *(Single serious injury / illness)*	5 *(Very High Exposure)*	**15** ***(Moderate)***	2019

Bushfire Impact – An energised conductor fails and falls to ground starting bushfire resulting in medium-term disruption to eco-system. Area surrounding M028 Feeder classified as bush fire prone with 'high' to 'very high' bushfire potential.	Environment	4 *(* *Medium term disruption to eco-system)*	3 *(Unlikely)*	**12** ***(Moderate)***	2019
Asset Impact – Interruption to a single large-scale business (Mt Rawdon Gold Mine) for >12 hours leads to shut down process and involves rolling load shedding at DEGI, GAYN, MUTO and EIDS while the line is repaired.	Customer	3 *(Disruption to single large-scale business)*	4 *(Likely)*	**12** ***(Moderate)***	2019
Asset Impact – Limitations on maintenance works program leads to potential load shedding at DEGI, GAYN, MUTO and EIDS due to ban on live line works resulting in interruptions >12 hours	Customer	3 *(Interruption >12 hours)*	4 *(Likely)*	**12** ***(Moderate)***	2019
Compliance Impact – Failure to meet EQL policies or external standard AS C41 -1968**.**	Business	3 *(Compliance breach with Energex / Ergon policies or external standards)*	5 *(Very likely)*	**15** ***(Moderate)***	2019
Customer & Political Sensitivity- Continued inability to maintain this feeder in accordance with EQL standards leads to ongoing interruption and adverse regional media attention.	Customer	**3** *(Adverse regional media attention)*	3 *(Unlikely)*	**9** ***(Low)***	2019

3. Technical requirements of the solution

A suitable solution needs to meet the investment objectives detailed in Section 2.1. It is expected that any proposed solution is in accordance with good electricity industry practices, such that a reliable, safe and secure solution is delivered.

3.1 Network Risk

A suitable solution would need to reduce the network risks detailed in Section 2.2.10 to ALARP.

3.2 Network Capacity

A suitable solution would need to provide enough network capacity to meet existing and future network loads.

3.3 Service Standards

A suitable solution would need to meet Ergon Energy's service standards as described below.

Minimum Service Standards

Under its DA licence conditions, Ergon Energy is responsible for electricity supply to the Wide Bay - Burnett area. The DA requires that Ergon Energy must:

- Comply with the Guaranteed Service Levels regime notified by the Queensland Regulator which includes reliability of supply to customers;
- Plan and develop its supply network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services;
- Use all reasonable endeavours to ensure that it does not exceed in a financial year the Minimum Service Standards (System Average Interruption Duration Index and System Average Interruption Frequency Index limits) applicable to its feeder types; and
- Ensure, to the extent reasonably practicable, that it achieves its Safety Net targets (refer to Section 2.2.6).

4. Feasible vs Non Feasible Options

4.1. Potentially Feasible Options

The primary investment drivers for this project are safety and reliability arising from the poor condition of feeder M028. A successful Non-Network Solution may be able to reduce the scope of the internally identified option; however, the non-network alternatives will not be able to impact the project timing due to the risks posed by aging equipment. Solutions that cost-effectively address the network risk, capacity, security and reliability objectives given in Section 2.1 are likely to represent reasonable options.

An example of a potentially feasible option is:

- Radial ISIS-GAYN configuration: Decommission feeder M028 and building a new section of 66kV line from M049 to Degilbo. It is expected that significant levels (>10MW) of demand management and/or generation would also need to be implemented for peak load lopping and Safety Net compliance.

4.2. Options that are unlikely to be feasible

Without attempting to limit a potential proponent's ability to innovate when considering opportunities, some technologies/approaches are unlikely to represent a technically or financially feasible solution. Unproven, experimental or undemonstrated technologies are unlikely to be feasible.

Options will also be deemed unfeasible if they:

- Do not satisfy all of the objectives stated in Section 2.1
- Require a completion date beyond December 2023.

- Do not meet or are unable to demonstrate they can meet the Service Standards of Ergon Energy.

4.3. Timing of feasible options

The consequence of not addressing the ageing assets of feeder M028 is significant. As a result of this it is expected that for an option to be considered feasible it will be required to be completed, commissioned, accepted by Ergon Energy, and fully operational by December 2023.

5. Preferred Internal Network Option Identified

In the process of determining the most cost effective solution to address the identified network limitations, Ergon Energy has sought to identify a practicable range of technically feasible, alternative options that could satisfy the network requirements in a timely and efficient manner. Ergon Energy's preferred internal network option is to replace the entire M028 feeder with a new 66kV single circuit concrete pole (SCCP) feeder, strung with Neon conductor and optical ground wire (OPGW), originating from the 132/66kV Isis Bulk Supply Point and connecting Degilbo and Gayndah zone substations by December 2023. This will address all network risk, capacity, security and reliability objectives.

Table 4 provides the approximate anticipated cost for the proposed solution. It is noted at the time of writing the RIT-D more detailed cost estimates are being performed which may cause some change to the below figures.

Table 4 - Ergon Energy's internal cost for the preferred option

Preferred Internal Network Option	Build a new 66kV SCCP feeder from Isis to Gayndah and decommission feeder M028
Total Estimated Direct Contract Value (DCV)	$52.4M
Total Estimated Approved Value (AP)	$74.2M

6. Submission and Next Steps

6.1. Submissions from Solution Providers

Ergon Energy invites written submissions to address the identified need in this report from registered participants and interested parties. With reference to Section 3 all submissions should include sufficient technical and financial information to enable Ergon Energy to undertake comparative analysis of the proposed solution against other options. The proposals shall include, but are not limited to, at least the following:

- Full costs of completed works.
- Whole of life costs including losses.
- Project execution strategy including design, testing and commissioning plans.
- Engineering network system studies and study reports.
- Verified and approved engineering designs.
- Manufacture and supply of all plant, equipment and materials.

- Delivery to site, receiving and off-loading of all plant, equipment and materials.
- Assembly and installation on site.

Ergon Energy will not be legally bound in any way or otherwise obligated to any person who may receive this RIT-D report or to any person who may submit a proposal. At no time will Ergon Energy be liable for any costs incurred by a proponent in the assessment of this RIT-D report, any site visits, obtainment of further information from Ergon Energy or the preparation by a proponent of a proposal to address the identified need specified in this RIT-D report.

The RIT-D process is aimed at identifying a technically feasible non-network alternative to the internal option that has greater net economic benefits. However, the selection of the solution provider to implement the preferred option will be done in accordance with Ergon Energy's standards for procurement.

Submissions in writing are due by **16 January 2020 by 4:00 PM** and should be lodged to Ergon Energy's "Regulatory Investment Test for Distribution (RIT-D) Partner Portal" through the link:

https://www.ergon.com.au/network/network-management/network-infrastructure/regulatory-test-consultations .

6.2. Next Steps

Ergon Energy intends to carry out the following process to assess what action should be taken to address the identified need in the Wide Bay Burnett supply area:

Table 5 - Timetable for this RIT-D

Step 1	Publish Non Network Options Report (this report) inviting non-network options from interested participants	Date Released: **16 Oct 2019**
Step 2	Consultation period	**16 Oct 2019 – 16 Jan 2020**
Step 3	Deadline for Submission of proposals for non-network alternatives	**4pm 16 Jan 2020**
Step 4	Release of Draft Project Assessment Report (DPAR)	Anticipated to be released by: **7 Feb 2020**
Step 5	Consultations in response to the Draft Project Assessment Report	**7 Feb 2020 – 27 Mar 2020**
Step 6	Publish the Final Project Assessment Report (FPAR)	**30 Mar 2020**
Ergon Energy reserves the right to revise this timetable at any time. The revised timetable will be made available on the Ergon Energy RIT-D website.		

Ergon Energy will take all reasonable efforts to maintain the consultation schedule listed above. Due to various circumstances the schedule may change, however, up-to-date information will be available on the Partner Portal.

During the consultation period, Ergon Energy will review, compare and analyse all internal and external solutions. Detailed economic options analysis and comparisons of expected market benefits will be undertaken during this time. At the end of the consultation and review process Ergon Energy will publish a final report which will detail the most feasible option and proceed to implement that option.

7. Glossary of Terms

Abbreviation	Description
10POE	Peak load forecast which has a 10% probability of being exceeded in any year
50POE	Peak load forecast which has a 50% probability of being exceeded in any year

ALARP	As low as reasonably practicable
DEGI	Degilbo substation 33/11kV
EIDS	Eidsvold substation 33/11kV
GAYN	Gayndah substation 33/11kV
HDBC	Hard Drawn Bare Copper
MORW	Mt Rawdon gold mine
MUTO	Mundubbera Town substation 33/11kV
RIT-D	Regulatory Investment Test for Distribution

Appendix

Reliability Data

Table 6 - Unplanned outages on Childers – Gayndah 66kV line M028, Dec 2014 – Nov 2018

Event No.	Feeder	Date	Customers	Customer Minutes	Outage Duration (min)
14WB9492	Childers - Degilbo - Gayndah T/line	8/12/2014	1126	34925	31
14WB9508	Childers - Degilbo - Gayndah T/line	8/12/2014	1126	43332	38
15WB10649	Childers - Degilbo - Gayndah T/line	28/10/2015	779 *	506765	450
15WB10761	Childers - Degilbo - Gayndah T/line	28/10/2015	1062*	1204	1
15WB10762	Childers - Degilbo - Gayndah T/line	28/10/2015	947 *	25616	23
15WB11284	Childers - Degilbo - Gayndah T/line	6/11/2015	1121	88914	79
15WB11462	Childers - Degilbo - Gayndah T/line	8/11/2015	1119	67867	60
16WB0072	Childers - Degilbo - Gayndah T/line	5/01/2016	1126	93608	83
16WB1049	Childers - Degilbo - Gayndah T/line	29/01/2016	985*	29550	26
16WB2700	Childers - Degilbo - Gayndah T/line	18/02/2016	1129	377067	335
16WB3712	Childers - Degilbo - Gayndah T/line	19/03/2016	1130	37271	33
16WB3720	Childers - Degilbo - Gayndah T/line	19/03/2016	1130	54636	49
16WB15046	Childers - Degilbo - Gayndah T/line	1/12/2016	1116	67816	60
16WB15962	Childers - Degilbo - Gayndah T/line	14/12/2016	1117	53393	47
16WB16633	Childers - Degilbo - Gayndah T/line	25/12/2016	1121	31089	28
17WB3569	Childers - Degilbo - Gayndah T/line	26/02/2017	1123	27401	24
17WB3671	Childers - Degilbo - Gayndah T/line	27/02/2017	1123	62158	55
17WB21021	Childers - Degilbo - Gayndah T/line	31/12/2017	1017	89123	79
18WB0123	Childers - Degilbo - Gayndah T/line	1/01/2018	880	15811	14
18WB3472	Childers - Degilbo - Gayndah T/line	16/02/2018	1130	14069	12
18WB9816	Childers - Degilbo - Gayndah T/line	26/07/2018	1136	62329	55
18WB13018	Childers - Degilbo - Gayndah T/line	10/10/2018	1133	28665	25
18WB13023	Childers - Degilbo - Gayndah T/line	10/10/2018	1133	16995	15
		Total Customer Minutes		**1829604**	

Table 7 - Unplanned outages on Isis – Gayndah 66kV line M049, Dec 2014 - Dec 2018

Event No.	Feeder	Date	Customers	Customer Minutes	Outage Duration (min)
14WB9491	ISIS - GAYNDAH 66KV FDR	8/12/2014 13:52	2414	51056	21.1
15WB0560	ISIS - GAYNDAH 66KV FDR	19/01/2015 14:10	3957	27369	6.9
15WB1026	ISIS - GAYNDAH 66KV FDR	26/01/2015 17:21	3956	67977	17.2
15WB10648	ISIS - GAYNDAH 66KV FDR	28/10/2015 0:11	3994	54518	13.6
15WB10756	ISIS - GAYNDAH 66KV FDR	28/10/2015 19:19	3830	12511	3.3
15WB11278	ISIS - GAYNDAH 66KV FDR	6/11/2015 22:03	3991	295134	73.9
15WB13491	ISIS - GAYNDAH 66KV FDR	11/12/2015 21:26	1846	28213	15.3
16WB1068	ISIS - GAYNDAH 66KV FDR	29/01/2016 18:37	3883	1249161	321.7
16WB1330	ISIS - GAYNDAH 66KV FDR	30/01/2016 16:04	3866	56186	14.5
16WB16632	ISIS - GAYNDAH 66KV FDR	25/12/2016 13:30	3962	216853	54.7
17WB0615	ISIS - GAYNDAH 66KV FDR	15/01/2017 17:00	3903	4944	1.3
17WB3570	ISIS - GAYNDAH 66KV FDR	26/02/2017 17:02	3958	72827	18.4
17WB3676	ISIS - GAYNDAH 66KV FDR	27/02/2017 15:06	3956	111559	28.2
18WB4058	ISIS - GAYNDAH 66KV FDR	26/02/2018 16:45	1	18	18.0
18WB13019	ISIS - GAYNDAH 66KV FDR	10/10/2018 17:12	3506	63108	18.0
18WB16451	ISIS - GAYNDAH 66KV FDR	4/12/2018 13:51	1	76	76.0
		Total Customer Minutes		**2311510**	