Business Case
Fixed Voice Communications

ERGON. ENERGY NETWORK

Executive Summary

Fixed voice and low-speed data services are used to support the operational requirements in substations. The former are used to provide phone service for direct voice communication and/or FAX services, and the latter are used for operational purposes including engineering access and SCADA at remotely located substations where it is not prudent to establish alternative higher speed telecommunications solutions. The importance of these assets is particularly critical for remote locations where mobile reception is poor, and fixed assets are the only reliable method of communication.

Several key services which Ergon Energy rely upon for communications, particularly in remote regional areas where mobile reception is poor, will be disconnected in the coming years due to the rollout of the National Broadband Network (NBN) and the ceasing of sale of older products. The Fixed Voice Communications program responds to external factors which will prevent the continued use of existing services and limit the availability of strategic spares, thereby reducing risks which might impact the use of key communications asset.

A counterfactual, 'Do nothing' option under which the discontinued services are not migrated to modern equivalents was considered but rejected. To do so would pose a significant risk to remote substations, and to the resilience of key telecommunications functions during natural disasters. Two network options have been evaluated in this business case:

Option 1 – A reactive replacement program on disconnection/failure, which proposes to replace services individually upon notice from service providers of imminent disconnection, or where a failure of a service has been detected or reported

Option 2 – A site-based migration program, under which sites are targeted based on their priority and criticality, and all relevant obsolete services are replaced within one site visit.

Ergon Energy aims to minimise expenditure in order to keep pressure off customer prices, however understands that this must be balanced against critical network performance objectives. These include network risk mitigation (e.g. safety, bushfire), regulatory obligations (e.g. safety), customer reliability and security and preparing the network for the ongoing adoption of new technology by customers (e.g. solar PV). In this case safety for staff is a strong driver, based on the need for adequate communications at sites, particularly in the event of natural disasters when mobile reception is likely to be unreliable.

To this end the Option 2 is the preferred option, as it has the least negative NPV result of the two options considered (-$3.6M, compared to -$4.4M for Option 1). The direct cost of the option within the 2020-25 regulatory period is $3.3M, with an additional $0.6M of costs in outer years.

The direct cost of the project for each submission made to the AER is summarised in the table below. Note that all figures are expressed in 2018/19 dollars and apply only to costs incurred within the 2020-25 regulatory period for the preferred option.

Regulatory Proposal	Draft Determination Allowance	Revised Regulatory Proposal
$1.5M	N/A	$3.3M

It should be noted that this proposal has changed in scope from the proposal made as part of Ergon Energy's regulatory proposal in January 2019. The business case has been updated based on latest known information on service closures and the program has been fully reviewed. The overall cost has reduced but the proposed expenditure in the 2020-25 regulatory control period has increased.

Contents

1. Introduction

Legacy fixed voice communications and low-speed data services used across the Ergon Energy network are becoming rapidly obsolete due to upgrades to telecommunications infrastructure throughout Queensland. Several key services which Ergon Energy rely upon for communications, particularly in remote regional areas where mobile reception is poor, will be disconnected in the coming years due to the rollout of the National Broadband Network (nbn™, henceforth NBN) and the sale of older products will cease.

There is a clear need to replace these products and services with modern equivalents so that critical communication functions are not lost across Ergon Energy substations. The Fixed Voice Communications program responds to external factors which will prevent the continued use of existing services and limit the availability of strategic spares, thereby reducing risks which might impact the use of key communications assets.

1.1 Purpose of document

This document recommends the optimal capital investment necessary for the Fixed Voice Communications Program.

This is a preliminary business case document and has been developed for the purposes of seeking funding for the required investment in coordination with the Ergon Energy Revised Regulatory Proposal to the Australian Energy Regulator (AER) for the 2020-25 regulatory control period. Prior to investment, further detail will be assessed in accordance with the established Energy Queensland investment governance processes. The costs presented are in $2018/19 direct dollars.

1.2 Scope of document

The scope of this proposal is for fixed voice communications and low-speed data services used across the Ergon Energy network. These assets include:

- Telstra PSTN (Public Switched Telephone Network) copper phone lines and services;
- ADSL (Asymmetric Digital Subscriber Line) services over Telstra copper lines for data connections to substations;
- ISDN (Integrated Services Digital Network) services in the core Supervisory Control and Data Acquisition (SCADA) network;
- Low-speed frame relay data services;
- The OCC (Operations Control Centre) Core IP (Internet Protocol) telephony voice systems for operational control centres (OCCs);
- Voice services to substations provided on the Powerlink OTN (Operational Telephone Network) network; and,
- Voice services provided over Energy Queensland internal assets.

Excluded from this proposal is the treatment of mobile voice service assets. These assets are covered in the document, “Ergon Energy Field Mobile Voice Communications”.

This proposal is in line with the Energy Queensland (EQL) Telecommunications Asset Management Plan (AMP).

1.3 Identified Need

Ergon Energy aims to minimise expenditure in order to keep pressure off customer prices, however understands that this must be balanced against critical network performance objectives. These

include network risk mitigation (e.g. safety, bushfire), regulatory obligations (e.g. safety), customer reliability and security and preparing the network for the ongoing adoption of new technology by customers (e.g. solar PV). In this case safety for staff is a strong driver, based on the need for adequate communications at sites, particularly in the event of natural disasters when mobile reception is likely to be unreliable.

Fixed voice and low-speed data services provide critical communications support to the field workforce and assist with the monitoring and control of substations throughout Ergon. These assets are provisioned for safety and the efficient completion of operational and supervisory activities at substations. In particular, fixed voice and low-speed data assets support the following services:

- Fixed voice services are used to provide phone service for direct voice communication and/or facsimile (FAX) services; and,
- Low-speed data services are used for operational purposes including engineering access and SCADA at remotely located substations where it is not prudent to establish alternative higher speed telecommunications solutions.

The importance of these assets is particularly critical for remote locations where mobile reception is poor, and fixed assets are the only reliable method of communication. They also provide additional resilience to the Ergon Energy telecommunications capability in the case of natural disasters when mobile reception is typically at its least reliable.

The need for the Fixed Voice Communications Program proposed in this report is driven by two key factors:

- External vendors and third parties ceasing sale and disconnecting legacy telecommunications services; and,
- Risk replacement of aged voice related assets in Ergon Energy's telecommunications network where vendors have ceased sale and support of legacy products.

This proposal has been designed to address these factors in a manner which minimises associated risk to Ergon Energy network staff, assets, and customers, and aligns with the CAPEX objectives and criteria from the National Electricity Rules as detailed in Appendix C.

1.4 Energy Queensland Strategic Alignment

Table 1 below details how the Fixed Voice Communications program contributes to Energy Queensland's corporate and asset management objectives. The linkages between these Asset Management Objectives and EQL's Corporate Objectives are shown in Appendix D.

Table 1: Asset Function and Strategic Alignment

Objectives	Relationship of Initiative to Objectives
Ensure network safety for staff contractors and the community	This proposal supports continued communications functionality for substations and field sites by addressing the coming obsolescence of current fixed voice and low-speed data assets. This will improve safety standards for field staff and contractors and ensure that network outages are not extended unnecessarily by lack of communications, thereby improving safety outcomes for the wider community.

Objectives	Relationship of Initiative to Objectives
Meet customer and stakeholder expectations	Continued asset serviceability supports network reliability and promotes delivery of a standard quality electrical energy service. Improving communications functionality for remote substations will ensure that standard and emergency operations can be carried out efficiently, particularly during natural disaster situations, thereby delivering improved customer outcomes.
Manage risk, performance standards and asset investments to deliver balanced commercial outcomes	Failure of this asset can result in increased risk to Ergon Energy staff, public safety risk, and disruption of the electricity network. This program identifies potential efficiencies and opportunities to minimise cost while addressing the service need.
Develop Asset Management capability & align practices to the global standard (ISO55000)	This approach is consistent with ISO55000 objectives and drives asset management capability by promoting a continuous improvement environment.
Modernise the network and facilitate access to innovative energy technologies	This proposal addresses the coming obsolescence of technology currently used across the Ergon Energy network, modernising the network as necessary to respond to ensure functionality is not lost, while also promoting the replacement of assets at end of economic life as necessary to suit modern standards & requirements.

1.5 Applicable service levels

Corporate performance outcomes for this asset are rolled up into Asset Safety & Performance group objectives, principally the following Key Result Areas (KRA):

- Customer Index, relating to Customer satisfaction with respect to delivery of expected services
- Optimise investments to deliver affordable & sustainable asset solutions for our customers and communities

Corporate Policies relating to establishing the desired level of service are detailed in Appendix D.

Under the Distribution Authorities, Ergon Energy is expected to operate with an ‘economic’ customer value-based approach to reliability, with “Safety Net measures” for extreme circumstances. Safety Net measures are intended to mitigate against the risk of low probability vs high consequence network outages. Safety Net targets are described in terms of the number of times a benchmark volume of energy is undelivered for more than a specific time period. Ergon Energy is expected to employ all reasonable measures to ensure it does not exceed minimum service standards (MSS) for reliability, assessed by feeder types as

- System Average Interruption Duration Index (SAIDI), and;
- System Average Interruption Frequency Index (SAIFI).

Both Safety Net and MSS performance information are publicly reported annually in the Distribution Annual Planning Reports (DAPR). MSS performance is monitored and reported within Ergon Energy daily.

1.6 Compliance obligations

Table 2 shows the relevant compliance obligations for this proposal.

Table 2: Compliance obligations related to this proposal

Legislation, Regulation, Code or Licence Condition	Obligations	Relevance to this investment
QLD Electrical Safety Act 2002 **QLD Electrical safety Regulation 2013**	We have a duty of care, ensuring so far as is reasonably practicable, the health and safety of our staff and other parties as follows: • Pursuant to the Electrical Safety Act 2002, as a person in control of a business or undertaking (PCBU), EQL has an obligation to ensure that its works are electrically safe and are operated in a way that is electrically safe.1 This duty also extends to ensuring the electrical safety of all persons and property likely to be affected by the electrical work.[2]	This proposal supports improved and more reliable communications functionality for substation and field staff across the Ergon Energy network, particularly for remote areas or in times of natural disasters where mobile reception cannot be relied upon. This will improve safety standards for field staff and contractors and ensure that network outages are not extended unnecessarily by lack of communications, thereby improving safety outcomes for the wider community. Additionally, as some remote substations currently rely on fixed voice and low-speed data assets for control services, this proposal supports the correct and safe operation of the Ergon Energy network.
Distribution Authority for Ergon Energy issued under section 195 of *Electricity Act 1994* (Queensland)	Under its Distribution Authority: • The distribution entity must 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. • The distribution entity will ensure, to the extent reasonably practicable, that it achieves its safety net targets as specified. • The distribution entity must use all reasonable endeavours to ensure that it does not exceed in a financial year the Minimum Service Standards (MSS)	This program will improve communications reliability for field staff and contractors, ensuring that network outages are not extended unnecessarily by lack of communications, thereby improving supply and service outcomes for customers.
National Electricity Rules, Chapter 5	Schedule S5.1 of the National Electricity Rules, Chapter 5 provides a range of obligations on Network Services Providers relating to Network Performance Requirements. These include: • Section S5.1.9 Protection systems and fault clearance times • Section S5.1a.8 Fault Clearance Times • Section S5.1.2 Credible Contingency Events	This program supports increased reliability of communications services which control remote substations and will therefore help to ensure the network remains compliant.

[1] Section 29, *Electrical Safety Act 2002*
[2] Section 30 *Electrical Safety Act 2002*

1.7 Limitation of existing assets

Fixed voice and low-speed communications assets used across Ergon Energy substations typically rely on legacy communication technologies which are becoming rapidly outdated. In remote substations where fixed voice and low-speed data assets play a more critical role in the telecommunications functions of the Ergon Energy network, the correct functioning of these assets is necessary to ensure compliance and efficient operations. Ergon Energy must therefore address its use of these legacy communication assets before existing services are disconnected, and before products cease to be sold or supported by vendors.

Table 3 outlines the legacy assets at risk of disconnection or ceasing support by vendors in the Ergon Energy network, and the driver for replacement, extent of use, and applicable replacement strategy based on existing modern technologies for each asset type.

Table 3: Legacy assets used by Ergon Energy and their drivers for replacement

Asset	Extent of Use of Assets by Ergon Energy	Driver for Replacement	Replacement strategy
PSTN Services	There are around 511 PSTN voice services across the Ergon Energy network. 224 services have been confirmed for disconnection during the next regulatory period, with disconnection of the further 287 services considered possible within the same period.	The Federal Government (NBN Co) has directed Telstra to disconnect existing landline PSTN and ADSL services after 18 months of the NBN network being available within a specific area. NBN rollout is expected to be complete by June 2021, however, this is subject to variation.[3]	One of the following paths will be selected based on least-cost option for each service: • Cancel service if no longer required. • Transition service to existing modern IP infrastructure. • Transition service to NBN utilising a retail service provider.
ADSL Services	Around 12 ADSL services used to transmit substation data are used across substations.		
ISDN Services	Ergon Energy utilises six ISDN services in its core voice systems: two in core SCADA systems in Rockhampton and Townsville areas, and four for the OCC IP telephony platform.	Telstra has advised they are ceasing sale and will be disconnecting ISDN and Frame Relay data services between June 2019 and June 2021.[4]	ISDN and Frame Relay services will be replaced using the least cost solutions. Migration to an alternative commercially offered Telstra IP solution is expected.
Frame Relay Services	The only Frame Relay service is used for the provision of services at Kidston substation.		
PSTN Phone Services	Around 104 PSTN phone exist across Ergon Energy, with around 60 currently at inappropriate service levels.	These assets have reached end of life and are no longer supported by vendors. These services also rely on corporate systems which do not have the SLA (Service Level Agreement) requirements for Operational Telephony	These services need to be migrated to the modern equivalent operational systems, likely Voice over Internet Protocol (VoIP) Phones on the CoreNet network.
OTN Phone Services	Ergon Energy has 16 OTN services currently provided by Powerlink, used for substation voice and FAX services.		
OCC Core IP Telephony System	Ergon Energy has two Operational Call Control services at Rockhampton and Townsville, which are the primary assets to deliver phone calls between North and South region substations and the OCCs.	This system is now end of life and is not supported by the vendor. No further security patches, software bug fixes, or technical assistance are available, placing this core system at an unacceptable operational risk. The end-of-life date for this system is July 2022.	A new OCC core IP telephony system will be installed within the Ergon Operational Technology Environment (OTE) to improve security and availability.

[3] NBN (2019) *Services that will be switched* off <https://www.nbnco.com.au/learn/device-compatibility/services-that-will-be-switched-off>
[4] Telstra (2016) *ISDN Product Cease Sale and Longer-Term Exit* <https://enterprise-support.telstra.com.au/t5/Knowledge-Articles/ISDN-Product-Cease-Sale-and-longer-term-exit/ta-p/3628>

2 Counterfactual Analysis

2.1 Purpose of asset

Fixed voice and low-speed data services are used to support the operational requirements in substations:

- Fixed voice services are used to provide phone service for direct voice communication and/or FAX services; and,
- Low-speed data services are used for operational purposes including engineering access and SCADA at remotely located substations where it is not prudent to establish alternative higher speed telecommunications solutions.

The importance of these assets is particularly critical for remote locations where mobile reception is poor, and fixed assets are the only reliable method of communication. They also provide additional resilience to the Ergon Energy telecommunications capability in the event of natural disasters when mobile reception is typically at its least reliable.

2.2 Business-as-usual service costs

Fixed voice and low-speed data services are provisioned from a variety of external commercial carrier offered products and through several different internal voice asset classes, with over 600 existing voice services and 60 low-speed data services across Ergon's telecommunication network. As outlined in Table 3, all of these assets will be at risk of disconnection, ceasing sale and support, or age-based obsolescence within the next regulatory period.

2.3 Key assumptions

Considering the counterfactual 'Do Nothing' case, there would likely be significant potential risk to Ergon Energy assets, staff safety, and compliance.

It is known that many current fixed voice and low-speed data services and assets used by Ergon Energy will be discontinued or disconnected within the next regulatory period. Under a 'Do Nothing' scenario, existing services would be used until they become obsolete due to network disconnection, or until spares can no longer be purchased from commercial suppliers. This would constitute a significant departure from Ergon Energy and Energy Queensland's asset management principles which require adequate planning for asset end-of-life and redundancy and would put the network and substation operators at risk of telecommunications outages.

Failing to plan for the coming obsolescence of these assets and services would have the following impacts:

- **Failure of SCADA communications:** Forced decommissioning of fixed voice lines provisioned for SCADA communications at remote substations could result in the loss of control of multiple zone substations, with significant associated risks to compliance, network staff and equipment safety, and customer supply.
- **Failure of fixed voice communications:** Inability to communicate with field crews via substation phones (fixed voice) would impact on emergency and planned works, by extending the duration of time required to carry out works, increasing safety risks for field staff, and potentially extending outage duration leading to increased customer impacts.

Besides the heightened risk to remote substations under normal operating conditions, a 'Do Nothing' approach would put the entire network at risk in the event of natural disasters. Following natural disaster events such as cyclones or bushfires, the likelihood of serious mobile reception disruption is significant as carriers' mobile networks are not designed for extended power outages, network congestion, and damage to mobile infrastructure. During tropical cyclone Yasi in 2011, 159 mobile

base stations were impacted[5] representing approximately 10% of all mobile cellular sites in Queensland at the time. Around 116 sites were impacted during cyclone Debbie in 2017.

While fixed-voice services are also at risk of damage during natural disasters, they introduce additional resilience for communications services rather than allowing the network to rely entirely on mobile coverage which is more susceptible to outage and congestion. Failing to plan for the coming obsolescence of these assets and services would therefore have the following impacts during natural disaster scenarios:

- **Heightened risk to field crews:** Lack of access to fixed voice communications increases the risk to network staff as they cannot be contacted easily, reducing the efficiency of works and extending their time spent in high risk conditions, given that the underlying environmental conditions where restoration activities take place are during natural disasters are typically worse than during normal day to day operations. Additionally, if control or protection services are also lost due to natural disasters, field staff may potentially be exposed to unsafe network conditions while attempting to respond to outages.
- **Extending network outages:** With limited voice communications and the potential failure of remote control of network assets due to loss of SCADA functioning, it is likely that outages would be extended. This carries higher impacts under natural disaster conditions, as vast areas of the grid are often without power resulting in limited access to crucial services for customers.

As well as the potential safety, reliability, and security impacts which may occur as a result of in-service degradation or failure of linear communication assets, a 'Do Nothing' approach does not represent prudent application of asset management or efficient investment principles. The counterfactual ignores the coming obsolescence of legacy communication services, and the fact that replacing or repairing assets after in-service failure carries significant emergency cost increases.

2.4 Risk assessment

Table 4 outlines the risk associated with continued business-as-usual operation of fixed voice communication assets. This risk assessment is in accordance with the EQL Network Risk Framework and the Risk Tolerability table from the framework is shown in Appendix E.

Table 4: Risk Assessment

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
SCADA – Forced 3rd party decommission of fixed voice lines leads to failure of the SCADA communications link that results in **loss of control of multiple zone substations**.	Business Impact	4 *(Inability to remotely control multiple substations)*	5 *(Very Likely)*	**20** ***(High Risk)***	2022
Field Voice – Forced 3rd party decommission of fixed voice lines leads to inability to communicate with field crews via substation phones (fixed voice) **impacting on restoration and planned works**.	Business Impact	2 *(Significant impact on any restoration or planned works)*	4 *(Likely)*	**8** ***(Low Risk)***	2022

[5] Telstra (2011), *Submission of Telstra Corporation Limited in Relation to the Capacity of Communication Networks and Emergency Networks and Emergency Warning Systems to Deal with Emergencies and Natural Disasters*.

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Normal day to day operations: Forced 3rd party decommission of fixed voice lines leads to reduced communication services and results in reduced communication coverage. This will increase risks associated field operations **impacting on restoration and planned works**.	Customer Impact	2 *(Increase restoration time by > 3 hours)*	6 *(Almost certain to occur)*	**12** ***(Moderate Risk)***	2022
Normal day to day operations: Forced 3rd party decommissioning of fixed voice lines leads to reduced communication services in higher risk areas with poor mobile phone coverage resulting in a potential **delay in response from emergency services to accidents**.	Safety	2 *(Resulting in Single Serious Injury)*	4 *(Likely)*	**8** ***(Low Risk)***	2022
Natural Disaster operations: Forced 3rd party decommission of fixed voice lines leads to reduced communication services in higher risk areas with poor mobile phone coverage resulting in a potential **delay in response from emergency services to accidents**.	Safety	4 *(Multiple serious injuries)*	3 *(Unlikely)*	**12** ***(Moderate Risk)***	2022
Natural Disaster operations: Forced 3rd party decommission of fixed voice lines leads to significantly reduced communication capability. In natural disasters poor mobile network coverage for essential communication for tasks such as switching results in **increased restoration times for customers**.	Customer Impact	5 *(Increase restoration time by >3 days)*	3 *(Unlikely)*	**15** ***(Moderate Risk)***	2022

Further Details of the risk ratings and descriptions can be found in Energy Queensland's Network Risk Framework.

2.5 Retirement or de-rating decision

Retirement or de-rating of fixed voice and low-speed data communication assets is not feasible as they provide an essential service to substation staff and assist with meeting key compliance objectives such as SCADA functions, particularly in regional areas with poor mobile reception. They also play a key role across the Ergon Energy network during natural disasters, when mobile network coverage is not guaranteed.

3 Options Analysis

In this proposal, options have been developed to address the rapidly approaching obsolescence of fixed voice and low-speed data assets in the Ergon Energy network.

3.1 Options considered but rejected

One option was considered and rejected in this analysis:

- **'Do Nothing':** The counterfactual option which considers no migration of fixed voice or low-speed data services prior to their disconnection or discontinuation cannot be accepted as an option, as it poses significant risk to remote substations, and to the resilience of key telecommunications functions during natural disasters.

3.2 Identified options

Two options have been identified to address the obsolescence of fixed voice and low-speed data communications assets across the Ergon Energy network. These are:

- Option 1 – Reactive Replacement upon Disconnection or Failure; and,
- Option 2 – Site-Based Replacement.

Both options involve the replacement of identified legacy communications assets with their least-cost modern equivalents, in order to maintain key services to Ergon Energy substations without introducing unnecessary cost to customers through significant upgrades to telecommunications assets. The difference between Options 1 and 2 is their approach to updating infrastructure with regards to timing and program planning.

Figure 2 and Figure 3 in Appendix G were developed by Ergon Energy to visualise the current and future operational voice architecture systems achieved under either option.

Option 1 – Reactive Replacement on Disconnection or Failure

This option proposes to replace services individually upon notice from service providers of imminent disconnection, or where a failure of a service has been detected or reported. Service migration where feasible will be bundled with other work at the specific site locations.

While this option does not bring forward expenditure until absolutely necessary, the reactive nature of replacement works for individual services involves higher duplicated design and construction efforts, increases to travel time, and will likely result in a less holistic solution for each site.

Additionally, recent experience indicates that works of this nature typically take around two months from notification to completion for each site. Delays to the project program could therefore feasibly result in substation sites being left without specific telecommunications services, particularly if service provider schedules are brought forward unexpectedly.

Option 2 – Site-Based Migration of Infrastructure (Recommended)

It is common for a single site to be utilising multiple obsolete voice solutions such as PSTN and ADSL services. Option 2 therefore adopts a site-wide migration approach, targeting sites based on their priority and criticality, and replacing all relevant obsolete services with one site visit.

This would be completed in logical geographical site groupings to decrease total travel time and increase resource efficiencies. Core voice systems including Call Manager, Voice Mail, ISDN links etc. can also be grouped together to provide the most cost-effective solution and avoid redesign.

Ergon Energy proposes to create a dedicated team to drive replacement of key network services (all planned site replacement programs apart from OCC data centre works), in order to deliver maximum

efficiency. This team would be responsible for project management, IP expertise and design, communications design, and field communications internal resources necessary to complete this project. This team would work across concept development, design, equipment configuration, and the project management and construction phases of the proposed option to deliver an efficient program.

This option presents significant efficiencies compared to Option 1 with regards to design and construction works by taking a holistic approach, allowing site works to be bundled effectively to reduce labour costs, and also reducing duplicated efforts in audits, design, configuration, construction, travel etc.

3.2.1 Non-Network Options

The only non-network option available in this case is a 'Do Nothing' scenario, under which fixed voice communications assets are allowed to continue operating without a planned replacement program. As it is known that key telecommunication services will be disconnected within the next few years, this option cannot be considered viable, as this would leave sites without critical support infrastructure.

As well as the potential safety, reliability, and security impacts which may occur as a result of in-service degradation or failure of linear communication assets, a Do-Nothing approach does not represent prudent application of asset management or efficient investment principles. The counterfactual ignores the coming obsolescence of legacy communication services, and the fact that replacing or repairing assets after in-service failure carries significant emergency cost increases.

Additionally, the use of mobile services only to replace legacy telecommunications assets cannot be considered in this case, as many remote substations do not have reliable access to mobile reception.

3.3 Economic analysis of identified options

3.3.1 Cost versus benefit assessment of each option

The Net Present Value (NPV) of each option has been determined by considering costs and benefits over the program lifetime from FY2019/20 to FY2039/40, using the EQL standard NPV analysis tool. The following costs and benefits have been considered for each option.

Assets Replaced in Each Option

Table 5 outlines the various services and assets which will be impacted by the key drivers identified in each option identified. The total quantity of assets impacted in different areas of the network is dependent on factors such as NBN rollout timeline, with key dates yet to be announced.

The following assumptions were used to determine the disconnection dates for each asset:

- **NBN:** The NBN delivery timeframe requires services to be migrated by June 2021, however, this is dependent on the NBN rollout schedule which is subject to variation. Actual service migration activities will occur based on the geographical site bundling where feasible to improve cost efficiency.
- **Telstra:** Telstra's ISDN and Frame Relay service disconnection timeframe is between June 2019 and June 2021. Telstra is yet to communicate the actual disconnection date for Ergon Energy's telecommunications network-specific services.
- **Core voice systems:** Based on risk the vast majority are required for replacement in the 2019/20 and 2020/21 financial years.

Table 5: Fixed Voice and Low-Speed Data Communications Assets in Ergon Energy Networks

Service Type	Existing Provider	Use	Total Quantity	Impacted Quantity	Replacement	Disconnection Date
PSTN copper lines	Telstra	Substation phones and FAX	511	224[6]	NBN	2019-2022
ADSL	Telstra	Substation data	12	12	NBN	2019-2022
ISDN services	Telstra	SCADA core data	6	6	Service discontinued	2022
Frame relay service	Telstra	Substation data	1	1	Service discontinued	2022
PSTN Phone Services	Internal Asset	Substation phones and FAX	104	60	Age based risk	Risk based
OTN Phone services	Powerlink	Substation phones and FAX	16	16	Service discontinued	2019-2020
OCC Core IP Tel. system	CISCO/ Internal	OCC and Sub Phone calls	2	2	Age based risk	2022

Options 1 and 2 both consider replacement of all the assets outlined in Table 5. In the case of PSTN copper lines, this analysis considers replacement of all 511 services, due to the likelihood that the remaining 287 PSTN services will still be scheduled for disconnection within the next regulatory period.

The following assumptions were also used to design the program timelines for each option:

- The migration program provided by NBN and Telstra is accurate.
- Telstra forecasted service/product cancellation dates are accurate.
- Telco legacy assets identified for replacement do not experience accelerated failures.
- Existing external and internal engagement arrangements to implement forecast replacements remain in place.

Capital Costs – Option 1

Capital costs (CAPEX) for Option 1 were developed based on the cost of replacement for each particular service or asset defined. Table 6 outlines the unit cost associated with each asset replacement solution identified. These unit costs were developed using the following assumptions:

- **NBN:** Costs and resources required to complete each alternative solution have been established based on previous NBN migration work that has been completed over the last three years.
- **Telstra:** Costs and resources required to complete each alternative solution are based on similar commercial products currently available from Telstra.

[6] 224 services have been confirmed for disconnection while the remainder have a potential for disconnection within the 2020-2025 timeframe.

- **Legacy PSTN phones:** Costs and resources required to migrate services to VOIP Phones on the Corenet network are well established. These activities have been frequently required over the last eight years.
- **Operational Call Manager and Voice Mail Systems:** Costs and resources are based on previous similar activities that have been undertaken and indicative quotes from vendors.

Table 6: Unit costs used to develop CAPEX forecasts for Option 1

Asset / Service	Service Replacement Solution	No. replaced	Unit Cost	Date (FY)
NBN Migration of PSTN and ADSL services	Cancel existing service, do not replace. Alternative services are already available.	17	$3,511	2019-2022
	Transition service to like-for-like internal infrastructure service.	388	$6,596	2019-2022
	Transition service to like-for-like commercially offered NBN service.	105	$19,980	2019-2022
Telstra disconnection of ISDN and Frame Relays	Transition service to like-for-like alternative commercially offered Telstra IP service.	7	$3,022	2019-2022
Legacy PSTN and OTN phones	Replace existing aged and obsolete underpinning infrastructure to VOIP phones on Ergon Energy telecommunications network, CoreNet.	60	$9,147	2019-2022
OCC IP Telephony	Replace existing unsupported systems with alternative commercially obtained systems with like-for-like functionality at least cost.	2	$183,132	2022

The program of replacement works for Option 1 was developed using the approximate disconnection dates for each service, shown in Table 6. Given the uncertainty surrounding the exact date of disconnection for many of these services, the CAPEX associated with each asset was spread over the likely disconnection period.

Table 7 outlines the CAPEX profile of Option 1, using the assumptions and rates defined.

Table 7: CAPEX profile of Option 1 based on asset or service-based replacement

Asset / Service Replaced	2019/20	2020/21	2021/22	2022/23	Total
NBN Migration (PSTN & ADSL) (Cancel)	$14,921	$14,921	$14,921	$14,921	**$59,684**
NBN Migration (PSTN & ADSL) (Transition Internal)	$639,817	$639,817	$639,817	$639,817	**$2,559,270**
NBN Migration (PSTN & ADSL) (Transition NBN)	$524,463	$524,463	$524,463	$524,463	**$2,097,852**
Telstra Migration of ISDN and Frame Relay	$4,534	$4,534	$4,534	$4,534	**$18,135**
Legacy PSTN and OTN phones	$249,265	$249,265	$249,265	$249,265	**$997,060**
OCC IP Telephony	$0	$0	$0	$366,264	**$366,264**
TOTAL	**$1,433,000**	**$1,433,000**	**$1,433,000**	**$1,799,264**	**$6,098,264**

Capital Costs – Option 2

The CAPEX forecast for Option 2 was developed based on a program of site-based replacement defined by Ergon Energy. The site-based replacement program was designed as follows:

- 218 sites have been identified for disconnection as part of the NBN schedule and also require the upgrade of many legacy voice assets. Replacement works for all assets at these sites is planned during the period 2019/20 to 2021/22.
- 207 sites have been identified as being of a lower priority for replacement, as PSTN disconnection by Telstra has been postponed in these areas. Replacement of services has been planned for these sites over the period 2022/23 to 2024/25.
- The two sites with Core OCC data centres have been targeted for replacement in 2020/21 due to age-based risk.

The unit rates for typical asset replacement shown in Table 6 were used as a basis for analysis, with a site-by-site approach used to consider savings which might be achieved by taking a site-based approach. Table 8 presents the profile of site-based replacement targeted by Option 2, as well as the option CAPEX based on the above unit rates.

Table 8: CAPEX profile of Option 2 based on bundled site-based activities

Program Description	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Total
Key Network Service Replacements							
No. of Sites	*38*	*90*	*90*	*69*	*69*	*69*	***425***
CAPEX	$645,979	$934,555	$934,555	$323,459	$323,459	$323,459	**$3,485,466**
Core OCC Data Centre Replacements							
No. of Sites	*0*	*2*	*0*	*0*	*0*	*0*	***2***
CAPEX	$0	$478,789	$0	$0	$0	$0	**$478,789**
TOTAL	**$645,979**	**$1,413,344**	**$934,555**	**$323,459**	**$323,459**	**$323,459**	**$3,964,255**

Operating Costs

Operating costs (OPEX) could not be quantified for the different options at the time of this study, as OPEX rates for the legacy assets could not be confirmed. As it is unlikely that the incremental increase in OPEX costs associated with the replacement assets will be substantially higher than current services, and as the program of replacement only brings forward replacement for some services by a few years, it is considered unlikely that inclusion of OPEX would have a material impact in this analysis.

Results

Using the assumptions outlined previously, the Present Value (PV) and NPV results of each option, discounted at the Regulated Real Pre-Tax Weighted Average Cost of Capital (WACC) rate of 2.62% (as specified in the EQL Standard NPV Tool) and considering a study period of 20 years, are outlined in Table 9. Option 2 presents the least cost option.

Table 9: Net present value of options

Option	CAPEX PV ($M)	NPV ($M)
Option 1	(4.397)	(4.397)
Option 2	(3.572)	(3.572)

3.4 Scenario Analysis

3.4.1 Sensitivities

Sensitivity analysis was considered on several key assumptions used to perform this analysis:

- **CAPEX:** A sensitivity of +/- 10% was considered the CAPEX forecasts for Options 1 and 2, to account for uncertainty in these rates.
- **Disconnection Date:** The impact of deferring the planned disconnection date of all assets by 1-2 years was considered, given the uncertainty around NBN and Telstra disconnection dates.

Table 10 outlines the results of sensitivity analysis based on the above parameters.

Table 10: Results of sensitivity analysis

NPV ($M)	Base Scenario	Unit Rate Sensitivity		Disconnection Deferred by	
Sensitivity		**+10%**	**-10%**	**1 year**	**2 years**
Option 1	(4.397)	(4.836)	(3.957)	(4.135)	(3.876)
Option 2	(3.572)	(3.930)	(3.215)	(3.572)	(3.572)

Considering a -10% change in the unit rates used for both options also had a significant impact, improving the NPV of Option 1 by around $440,000, and Option 2 by around $360,000.

When considering deferment of key disconnection dates, Option 1 saw an improvement to NPV by nearly $260,000 in the 1-year case, and around $520,000 in the 2-year case. Option 2 was not affected by deferred disconnection of legacy voice services, as the program is based more on-site criticality than disconnection of network services and seeks to minimise the use of legacy assets across the network ahead of disconnection.

In all sensitivity scenarios, Option 2 is more cost-effective than Option 1, indicating that achieving efficiencies by grouping replacement activities by site is the most effective way to reduce the costs of this program.

3.4.2 Value of regret analysis

Option 2 is the least-regret option in this program. While Option 2 brings forward expenditure more than Option 1, the site-based program of replacement introduces significant cost savings meaning that the program is more cost-effective despite accelerating works. Additionally, the planned program reduces risk more than Option 1 by bringing forward replacement of some services that may not necessarily be discontinued or disconnected for a few years. Given that the exact timeline of NBN rollout and Telstra service disconnection for different Ergon Energy sites is unknown, postponing replacement of these legacy assets may force Ergon Energy to perform replacement works in a rushed manner, increasing costs, and potentially introduce the risk that sites lose communications functionality without an adequate modern equivalent asset in place.

This program is in line with customer engagement programs which demonstrate customer interest in modernising the Ergon Energy grid, and other intelligent grid technology proposals which support Ergon Energy's transition to modern grid solutions. The continued use of ageing legacy assets, which perform poorly compared to modern equivalents and put key services at risk through increasing obsolescence, is not a viable solution for the future operation of the network. The replacement of these assets with least-cost modern equivalents is a least-regret solution to address the current risks.

3.5 Qualitative comparison of identified options

3.5.1 Advantages and disadvantages of each option

Table 11 details the advantages and disadvantages of each option considered.

Table 11: Qualitative assessment of options

Option	Advantages	Disadvantages
Option 1 – Reactive Replacement on Disconnection or Failure	• Postpones capital investment until required by disconnection or failure.	• Not addressing all services in one site visit increases design time and travel time, and associated project costs.
Option 2 – Site-Based Replacement	• Significant cost benefits through efficiencies gained through reducing duplicated efforts in audits, design, configuration, construction, and travel. • Reduces the risk that key services are disconnected or discontinued while still in use at substations.	• Brings forward expenditure for replacement for some services which would not be discontinued for several years.

3.5.2 Alignment with network development plan

The preferred option aligns with the Asset Management Objectives in the Distribution Annual Planning Report. In particular it manages risks, performance standards and asset investment to deliver balanced commercial outcomes while modernising the network to facilitate access to innovative technologies.

3.5.3 Alignment with future technology strategy

This program of work supports Energy Queensland's transition to a modern communications network, addressing the obsolescence and risks associated with communications technology in a manner which balances risk and cost. This is in alignment with the Future Grid Roadmap and Intelligent Grid Technology Plan, which promote the use of modern technology in maintaining affordability of the distribution network while also maintaining safety, security and reliability of the energy system, and supporting optimal customer outcomes and value across short, medium and long-term horizons.

Additionally, customers have indicated they want prudent investments in technology to modernise the network, to enable them to interact with the network, manage their electricity costs and take advantage of new products and technology developments. A modern communication network is a critical part of the intelligent grid of the future that will enable this for customers.

3.5.4 Risk Assessment Following Implementation of Proposed Option

Table 12 outlines the risk assessment for Ergon Energy, following the implementation of Option 2.

Table 12: Risk assessment showing risks mitigated following implementation

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
SCADA – Forced 3rd party decommission of fixed voice lines leads to failure of the SCADA communications link that results in **loss of control of multiple zone substations**.	Business	(Original) 4 *(Inability to remotely control multiple substations)* (Mitigated) 4 *(Inability to remotely control multiple substations)*	5 *(Very Likely)* 2 *(Very unlikely)*	**20** ***(High Risk)*** **8** ***(Low Risk)***	2022
Field Voice – Forced 3rd party decommission of fixed voice lines leads to inability to communicate with field crews via substation phones (fixed voice) **impacting on restoration and planned works**.	Business	(Original) 2 *(Significant impact on any restoration or planned works)* (Mitigated) 2 *(Significant impact on any restoration or planned works)*	4 *(Likely)* 2 *(Very Unlikely)*	**8** ***(Low Risk)*** **4** ***(Low Risk)***	2022
Normal day to day operations: Forced 3rd party decommission of fixed voice lines leads to reduced communication services and results in reduced communication coverage. This will increase risks associated field operations **impacting on restoration and planned works**.	Customer	(Original) 2 *(Increase restoration time by > 3 hours)* (Mitigated) 2 *(Increase restoration time by > 3 hours)*	6 *(Almost certain to occur)* 2 *(Very Unlikely)*	12 *(Moderate Risk)* 4 *(Low Risk)*	2022
Normal day to day operations: Forced 3rd party decommissioning of fixed voice lines leads to reduced communication services in higher risk areas with poor mobile phone coverage resulting in a potential **delay in response from emergency services to accidents**.	Safety	(Original) 2 *(Resulting in Single Serious Injury)* (Mitigated) 2 *(Resulting in Single Serious Injury)*	4 *(Likely)* 2 *(Very Unlikely)*	8 *(Low Risk)* **4** ***(Low Risk)***	2022
Natural Disaster operations: Forced 3rd party decommission of fixed voice lines leads to reduced communication services in higher risk areas with poor mobile phone coverage resulting in a potential **delay in response from**	Safety	(Original) 4 *(Multiple serious injuries)* (Mitigated) 4	3 *(Unlikely)* 2	12 *(Moderate Risk)* 8	2022

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
emergency services to accidents.		*(Multiple serious injuries)*	*(Very Unlikely)*	*(Low Risk)*	
<u>Natural Disaster operations:</u> Forced 3rd party decommission of fixed voice lines leads to significantly reduced communication capability. In natural disasters poor mobile network coverage for essential communication for tasks such as switching results in **increased restoration times for customers**.	Customer	(Original) 5 *(Increase restoration time by >3 days)* (Mitigated) 5 *(Increase restoration time by >3 days)*	3 *(Unlikely)* 2 *(Very Unlikely)*	15 *(Moderate Risk)* 10 *(Low Risk)*	2022

4 Recommendation

4.1 Preferred option

The preferred option is Option 2, site-based migration of legacy fixed voice and low-speed data assets and services. This option was found to be the least cost approach to addressing the coming obsolescence of legacy assets despite bringing forward replacement of some services ahead of their scheduled disconnection or discontinuation dates. Taking a holistic approach to replacement of key services will result in significant savings in design and construction works, allowing site works to be bundled effectively to reduce labour costs, and also reducing duplicated efforts in audits, design, configuration, construction, and travel.

4.2 Scope of preferred option

The planned program of works for Option 2 involves replacement of legacy communications assets across 427 sites within the Ergon Energy network with least-cost modern equivalent assets and services. Replacement works will be planned and carried out on a site-by-site basis, considering asset condition, site criticality, and timing factors such as NBN rollout dates to define the exact program timing.

Table 13 outlines the planned program for annual site replacement works, and the annual CAPEX forecast. The total CAPEX for the six-year program is as $3,964,255 (real 2018/19 dollars), and the CAPEX associated with the next regulatory period is $3,318,276.

Table 13: Scope of Option 2 activities and Capital Cost Profile

Program Description	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Total
Key Network Service Replacements							
No. of Sites	*38*	*90*	*90*	*69*	*69*	*69*	***425***
CAPEX	$645,979	$934,555	$934,555	$323,459	$323,459	$323,459	**$3,485,466**
Core OCC Data Centre Replacements							
No. of Sites	*0*	*2*	*0*	*0*	*0*	*0*	***2***
CAPEX	$0	$478,789	$0	$0	$0	$0	**$478,789**
TOTAL	**$645,979**	**$1,413,344**	**$934,555**	**$323,459**	**$323,459**	**$323,459**	**$3,964,255**

This proposal represents a relatively significant change from the original proposal submitted to the AER. The overall program has reduced by $368,839, but the cost incurred during the 2020-25 period has increased by $1,823,233. There are several key factors justifying this change:

- Ergon Energy has continued to refine the scope and approach of the program since the original submission, in line with the intent to carry out the majority of works in 2019/20 as per the original program.
- However, the business has not been able to provide distribution resources to complete the project as originally planned. Resources have been the major constraint for the project as there are requirements from multiple teams which have resource constraints.
- The original decommissioning schedule provided by third party (Telstra) has continued to change and a number of services have been decommissioned which were not outlined in the original schedule, this has resulted in a reactive implementation. This has applied further constraints on the small number of resources the project has, additionally services which were outlined to be decommissioned are still in service.

- On multiple occasions NBN has not attended the assigned appointments on site, attracting additional time and cost to the project.
- As a result of these continued works, a further 95 sites requiring asset replacement have been identified, but changes to the scope and design of the project and a significant change in the projects' implementation have resulted in overall cost savings of $368,839. This proposal includes the formation of a dedicated team to drive replacement of key network services (all planned site replacement apart from OCC data centre works).

Appendix A. References

Note: Documents which were included in Energy Queensland's original regulatory submission to the AER in January 2019 have their submission reference number shown in square brackets, e.g. Energy Queensland, *Corporate Strategy [1.001], (31 January 2019).*

AEMC, *Integrating Distributed Energy Resources for the Grid of the Future, Economic Regulatory Framework Review,* (26 September 2019).

Energy Queensland, *Asset Management Overview, Risk and Optimisation Strategy [7.025]*, (31 January 2019).

Energy Queensland, *Asset Management Plan, Telecommunications [7.043]*, (31 January 2019).

Energy Queensland, *Customer Quality of Supply Strategy [7.047],* (31 January 2019).

Energy Queensland, *Corporate Strategy [1.001],* (31 January 2019).

Energy Queensland, *Future Grid Roadmap [7.054],* (31 January 2019).

Energy Queensland, *Intelligent Grid Technology Plan [7.056],* (31 January 2019).

Energy Queensland, *Low Voltage Network Monitoring Strategy [7.080],* (31 January 2019).

Energy Queensland, *Network Risk Framework*, (October 2018).

Ergon Energy, *Distribution Annual Planning Report (2018-19 to 2022-23) [7.049]*, (21 December 2018).

Ergon Energy, *Strategic Proposal – Field Mobile Voice Communications – Coastal [7.099]*, (31 January 2019)

Appendix B. Acronyms and Abbreviations

The following abbreviations and acronyms appear in this business case.

Abbreviation or acronym	Definition
$M	Millions of dollars
$ nominal	These are nominal dollars of the day
$ real 2019-20	These are dollar terms as at 30 June 2020
2020-25 regulatory control period	The regulatory control period commencing 1 July 2020 and ending 30 Jun 2025
ADSL	Asymmetric Digital Subscriber Line
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AMP	Asset Management Plan
BESS	Battery Energy Storage System
CAPEX	Capital Expenditure
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAPR	Distribution Annual Planning Reports
DER	Distributed Energy Resource
DSO	Distribution System Operator
ENA	Energy Networks Association
ENTR	Electricity Network Transformation Roadmap
EQL	Energy Queensland
ESR	(Queensland) Electrical Safety Regulation (2013)
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FAX	Facsimile
IP	Internet Protocol
ISDN	Integrated Service Digital Network
KRA	Key Result Areas
MEGU	Micro Embedded Generating Units
MSS	Minimum Service Standards
NBN	National Broadband Network (nbn^{tm})
NER	National Electricity Rules
Next regulatory control period or forecast period	The regulatory control period commencing 1 July 2020 and ending 30 Jun 2025
NPV	Net Present Value

Abbreviation or acronym	Definition
OPEX	Operating Expenditure
OCC	Operations Control Centre
OTE	Operational Technology Environment
OTN	Operational Telephone Network
PCBU	Person in Control of a Business or Undertaking
PQ	Power Quality (of the network)
Previous regulatory control period or previous period	Regulatory control period 1 July 2010 to 30 June 2015
PSTN	Public Switched Telephone Network
PV	Present Value
QoS	Quality of Supply (to a customer)
Regulatory Proposal	Ergon Energy's proposal for the next regulatory control period submitted under clause 6.8 of the NER
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SLA	Service Level Agreement
VoIP	Voice over Internet Protocol
WACC	Weighted Average Cost of Capital

Appendix C. Alignment with the National Electricity Rules (NER)

The table below details the alignment of this proposal with the NER capital expenditure requirements as set out in Clause 6.5.7 of the NER.

Table 14: Alignment with NER

Capital Expenditure Requirements	Rationale
6.5.7 (a) (2) The forecast capital expenditure is required in order to **comply with all applicable regulatory obligations or requirements** associated with the provision of standard control services	As indicated in *Table 2: Compliance obligations related to this proposal*, this proposal ensures that safety obligations, reliability obligations and protection requirements are met by providing an appropriate, economically efficient program of works to ensure that the coming obsolescence of legacy telecommunications assets can be managed effectively. Without this program, these obligations would be at risk of being breached.
6.5.7 (a) (3) The forecast capital expenditure is required in order to: (iii) maintain the **quality, reliability and security of supply** of supply of standard control services (iv) maintain the **reliability and security of the distribution system** through the supply of standard control services	This program of work addresses the coming obsolescence of legacy telecommunications assets which provide key communications functionality to remote substation sites, ensuring that standard substation activities and restoration works can be carried out in a safe and efficient manner by network staff, and in some cases, enabling SCADA and protection services for the correct operation and control of network assets. This program is necessary to ensure that key communications functionality and by extension the reliability and security of the distribution system is not lost due to asset obsolescence.
6.5.7 (a) (4) The forecast capital expenditure is required in order to maintain the **safety of the distribution system** through the supply of standard control services.	This program ensures that SCADA and protection services supported by legacy low-speed data assets function correctly, and that field staff have access to reliable voice communication services to carry out restoration and emergency works in an efficient and safe manner, ensuring that restoration works are not unnecessarily extended impacting on customer safety. These assets are also critical during natural disaster events when mobile reception is particularly poor and enable field staff to restore services more quickly and safely, with positive network, customer, and staff impacts.
6.5.7 (c) (1) (i) The forecast capital expenditure reasonably reflects the **efficient costs** of achieving the capital expenditure objectives	The options considered in this proposal take into account the need for efficiency in delivery and use historical programs of work as a basis for cost estimates. The preferred option has utilised a site-based delivery approach that provides for bundling of work in terms of both timing and geography to enable a lower cost delivery. Specialised contractors are utilised as appropriate to ensure that costs are efficiently managed through market testing. Cost performance of the program will be monitored to ensure that cost efficiency is maintained. The unit costs that underpin our forecast have also been independently reviewed to ensure that they are efficient (Attachments 7.004 and 7.005 of our initial Regulatory Proposal).
6.5.7 (c) (1) (ii) The forecast capital expenditure reasonably reflects a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objective	The prudency of this proposal is demonstrated through the options analysis conducted. The prudency of our CAPEX forecast is demonstrated through the application of our common frameworks put in place to effectively manage investment, risk, optimisation and governance of the Network Program of Work. An overview of these frameworks is set out in our Asset Management Overview, Risk and Optimisation Strategy (Attachment 7.026 of our initial Regulatory Proposal).

Appendix D. Mapping of Asset Management Objectives to Corporate Plan

This proposal has been developed in accordance with our Strategic Asset Management Plan. Our Strategic Asset Management Plan (SAMP) sets out how we apply the principles of Asset Management stated in our Asset Management Policy to achieve our Strategic Objectives.

Table 1: "Asset Function and Strategic Alignment" in Section 1.4 details how this proposal contributes to the Asset Management Objectives.

The Table below provides the linkage of the Asset Management Objectives to the Strategic Objectives as set out in our Corporate Plan (Supporting document 1.001 to our Regulatory Proposal as submitted in January 2019).

Table 15: Alignment of Corporate and Asset Management objectives

Asset Management Objectives	Mapping to Corporate Plan Strategic Objectives
Ensure network safety for staff contractors and the community	**EFFICIENCY** ***Operate safely as an efficient and effective organisation*** Continue to build a strong safety culture across the business and empower and develop our people while delivering safe, reliable and efficient operations.
Meet customer and stakeholder expectations	**COMMUNITY AND CUSTOMERS** ***Be Community and customer focused*** Maintain and deepen our communities' trust by delivering on our promises, keeping the lights on and delivering an exceptional customer experience every time
Manage risk, performance standards and asset investments to deliver balanced commercial outcomes	**GROWTH** ***Strengthen and grow from our core*** Leverage our portfolio business, strive for continuous improvement and work together to shape energy use and improve the utilisation of our assets.
Develop Asset Management capability & align practices to the global standard (ISO55000)	**EFFICIENCY** ***Operate safely as an efficient and effective organisation*** Continue to build a strong safety culture across the business and empower and develop our people while delivering safe, reliable and efficient operations.
Modernise the network and facilitate access to innovative energy technologies	**INNOVATION** ***Create value through innovation*** Be bold and creative, willing to try new ways of working and deliver new energy services that fulfil the unique needs of our communities and customers.

Appendix E. Risk Tolerability Table

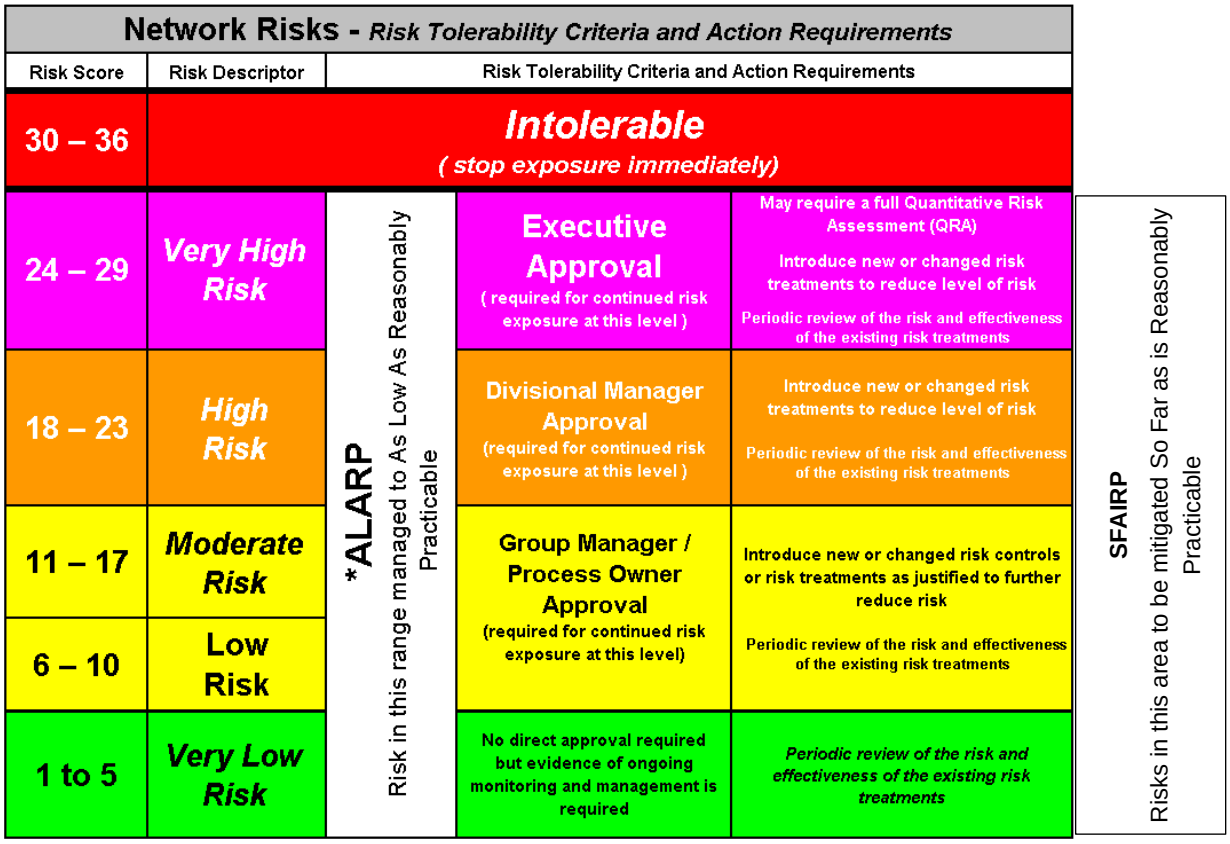

Figure 1: A Risk Tolerability Scale for evaluating Semi-Quantitative risk score

Appendix F. Reconciliation Table

Reconciliation Table Conversion from $18/19 to $2020	
Business Case Value	
(M$18/19)	$3.30
Business Case Value	
(M$2020)	$3.42

Appendix G. Current and Future Operational Voice Architecture

Figure 2 and Figure 3 on the following pages have been developed to give an outline of the Current and Future Operational Voice Architecture planned for the Ergon Energy network.

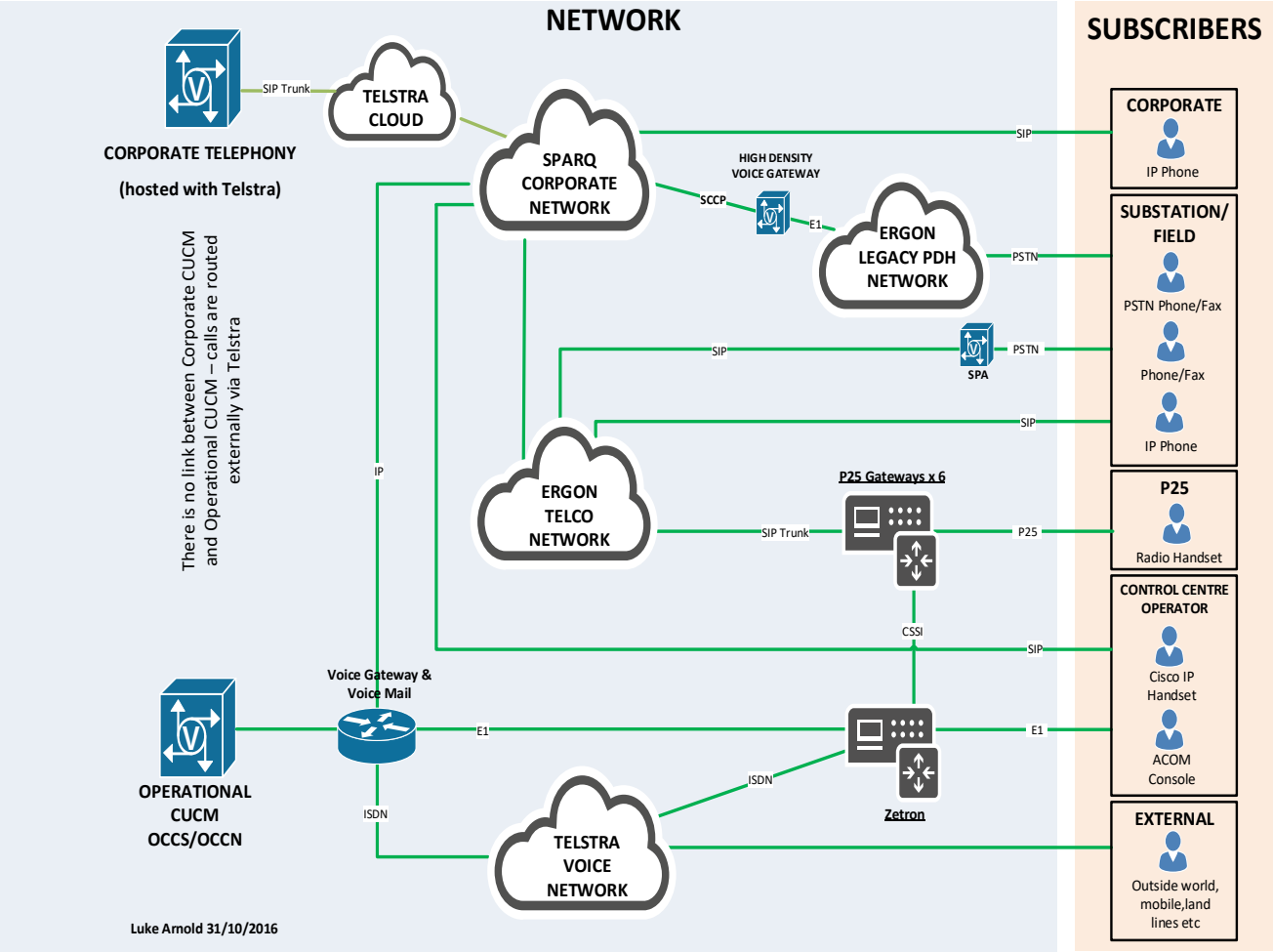

Figure 2: Current Operational Voice Architecture

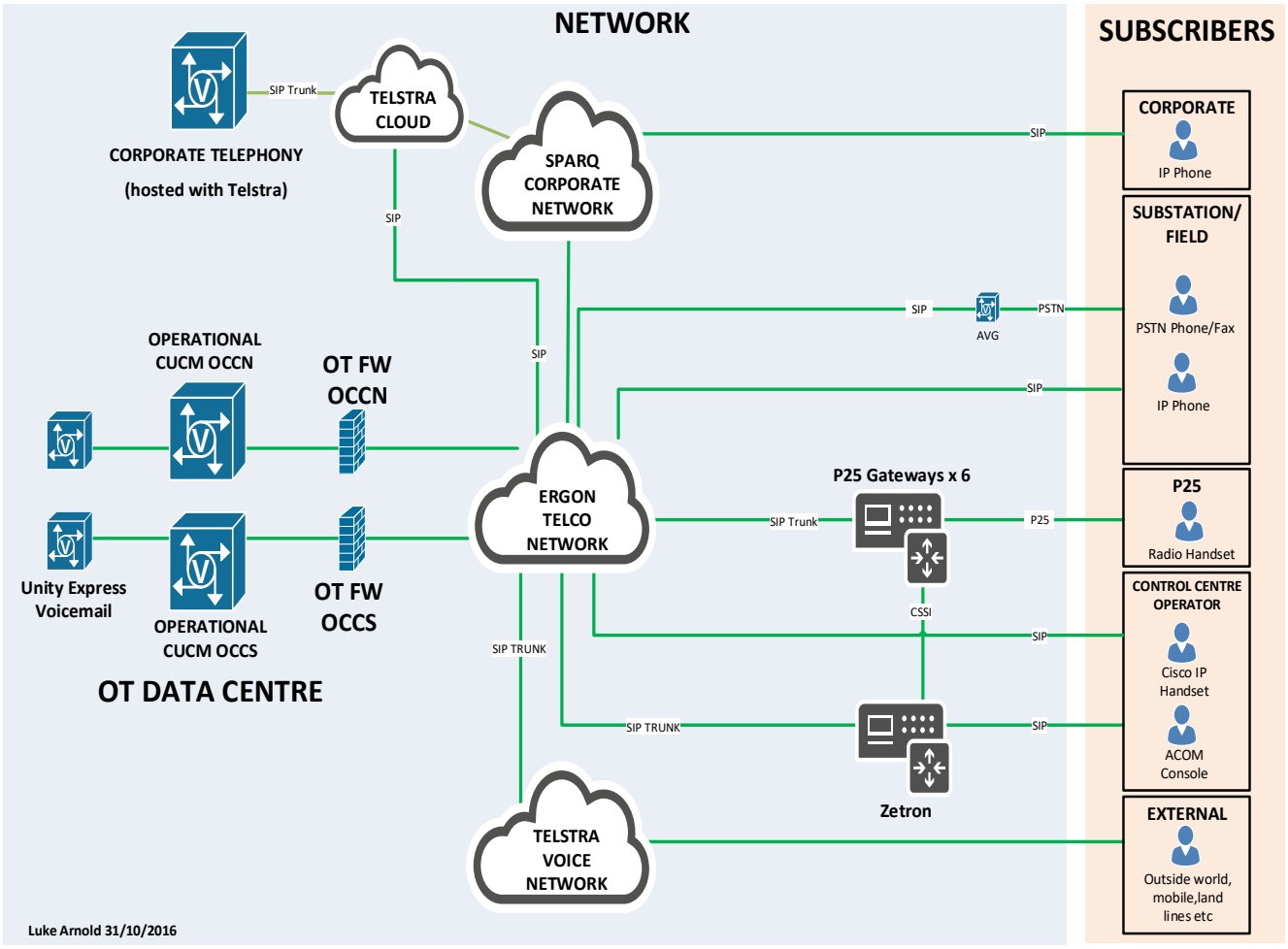

Figure 3: Future Operational Voice Architecture