Investment Evaluation Summary (IES)

Project Details:

Project Name:	Replace low voltage CONSAC cable
Project ID:	00671
Business Segment:	Distribution
Thread:	Underground System
CAPEX/OPEX:	CAPEX
Service Classification:	Standard Control
Scope Type:	A
Work Category Code:	REUCS
Work Category Description:	Replace LV cables UG CONSAC
Preferred Option Description:	Option 2: Replace 15 km of CONSAC cable [Preferred Option]
Preferred Option Estimate (Dollars $2016/2017):	$33,750,000

	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Unit ($)	$450	$450	$450	$450	$450	$450	$450	$450	$450	$450
Volume	15000.00	15000.00	15000.00	15000.00	15000.00	15000.00	15000.00	15000.00	15000.00	8000.00
Estimate ($)	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$3,600,000
Total ($)	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$6,750,000	$3,600,000

Governance:

Works Initiator:	Preeti Ravindran	Date:	01/11/2017
Team Leader Endorsed:	Darryl Munro	Date:	01/11/2017
Leader Endorsed:	Nicole Eastoe	Date:	01/11/2017
General Manager Approved:	Wayne Tucker	Date:	01/11/2017

Related Documents:

Description	URL
Replace low voltage CONSAC cable - NPV	http://reclink/R0000863361
TasNetworks Risk Management Framework	http://reclink/R0000238142
TasNetworks Corporate Plan - Planning period: 2017-18	http://reclink/R0000745475
TasNetworks Transformation Roadmap 2025	http://reclink/R0000764285
TasNetworks Business Plan 2017-18	http://reclink/R0000779008
National Electricity Rules (NER)	http://www.aemc.gov.au/Energy-Rules/National-electricity-rules/Current-Rules
Underground System - Distribution Asset Management Plan	http://reclink/R0000301624

Section 1 (Gated Investment Step 1)

1. Overview

1.1 Background

Concentric Neutral Solid Aluminium Conductor (CONSAC) cables are low voltage (LV) cables with the neutral conductor in the form of concentric aluminium sheath acting as a combined neutral and earth connection. These cables are paper insulated and covered with bitumen corrosion proof coating and PVC over sheath.

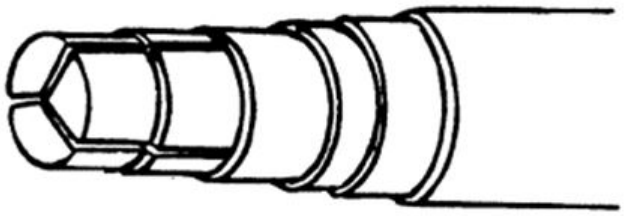

Figure 1 - CONSAC cable

The cables were installed on the distribution network in underground residential subdivisions from 1971 until 1980. Currently records indicate there are approximately 167 km of CONSAC cable in the system.

As CONSAC cables have neutrals connected directly onto the aluminium sheath, if these are not adequately sealed to prevent moisture ingress, they oxidise. This can eventually cause an open circuit, or broken neutral which can pose a serious public safety risk due to the potential for electric shock.

There are on average 31 LV cable failures per year on the distribution network. There were 33 LV cable failures on the network in the 15/16 financial year, of which 13 where CONSAC cable. With CONSAC cable only representing approximately 13 per cent of the network, the number of failures are disproportionately high.

The failure rate of CONSAC cables is increasing as shown in figure 2 below and is presenting an unacceptable level of risk, for which the current program of work is not a satisfactory control.

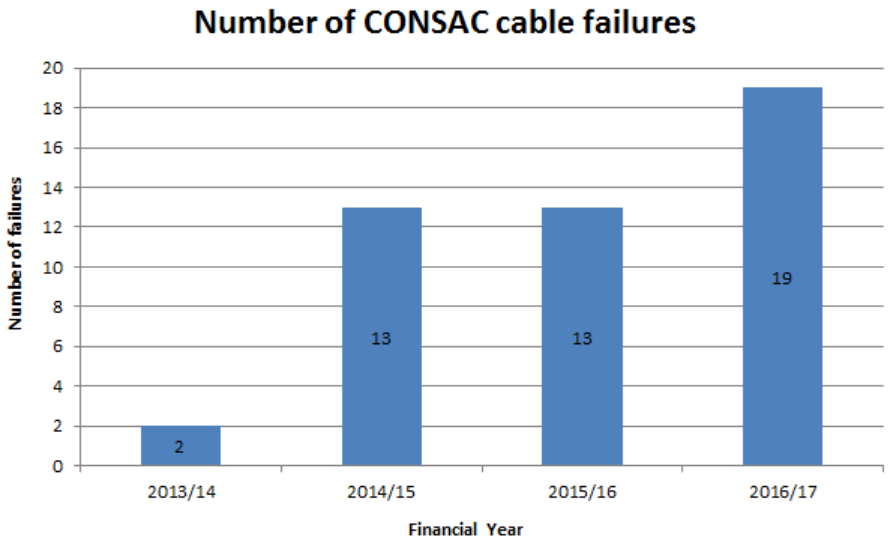

Figure 2 - CONSAC cable failures per financial year

The age profile of the CONSAC cable fleet also increases the likelihood of failure. The fleet is continuing to age and as a result it is anticipated that the failure rate will also continue to increase.

The primary driver of this program is to reduce the public risk from a broken neutral that has the potential to result in an electric shock or electrocution. The secondary driver is to reduce the failure rate for these cables so that it is comparable to other cables. A reduction in the failure rate will reduce the operational expenditure associated with the repair of these cables under fault.

As the primary failure mode of CONSAC cables leads to a broken neutral, the introduction of CablePI somewhat reduces the risk associated with CONSAC cable failures.

CablePI is a device used by residential customers and businesses to detect broken neutrals. In the hierarchy of control, it provides the lowest level of control. Whilst CablePI is an effective control, TasNetworks considers that additional higher order controls need to be put in place to manage the risk appropriately.

Historically the business has replaced CONSAC cables in areas where multiple failures had been experienced. It is thought that local jointing practices, soil type and other environmental conditions were contributing to the failures as the failures were clustered in geographical areas.

1.2 Investment Need

Replacement of low voltage CONSAC cable to reduce the likelihood of electrical shocks/electrocution occurring as a result of defective cables.

1.3 Customer Needs or Impact

TasNetworks continues to undertake consumer engagement as part of business as usual and through the voice of the customer program. This engagement seeks in depth feedback on specific issues relating to:

- How it prices impact on its services;
- Current and future consumer energy use;
- Outage experiences (frequency and duration) and expectations;
- Communication expectations;
- STPIS expectations (reliability standards and incentive payments); and
- Increasing understanding of the electricity industry and TasNetworks.

Consumers have identified safety, restoration of faults/emergencies and supply reliability as the highest performing services offered by TasNetworks.

Consumers also identified that into the future they believe that affordability, green, communicative, innovative, efficient and reliable services must be provided by TasNetworks.

This project specifically addresses the requirements of consumers in the areas of safety and affordability.

1.4 Regulatory Considerations

This project is required to achieve the following capital expenditure objectives as described by the National Electricity Rules section 6.5.7(a):

(3) to the extent that there is no applicable *regulatory obligation or requirement* in relation to:

(i) the quality, reliability or security of supply of *standard control services*; or

(ii) the reliability or security of the *distribution system* through the supply of *standard control services*,

to the relevant extent:

(iii) maintain the quality, reliability and security of supply of *standard control services*; and

(iv) maintain the reliability and security of the *distribution system* through the supply of *standard control services*; and

(4) maintain the safety of the *distribution system* through the supply of *standard control serv*ices.

2. Project Objectives

The objective of this project is to continue the replacement of the low voltage CONSAC cable on the distribution network to reduce the likelihood of electrical shocks/electrocution occurring as a result of defect cables.

The replacement of the cables is required to be proactive and not only reactive after a fault due to:

- increasing age profile of the fleet; and
- increasing failure rate, as the age profile of the CONSAC cable fleet also increases the likelihood of failure.

These factors can increase the likelihood of shocks occurring. Replacing cables at a higher rate will reduce likelihood of a failure causing harm to a member of the public.

3. Strategic Alignment

3.1 Business Objectives

Strategic and operational performance objectives relevant to this project are derived from TasNetworks 2017-18 Corporate Plan, approved by the board in 2017.
This project is relevant to the following areas of the corporate plan:

- We understand our customers by making them central to all we do;
- We enable our people to deliver value; and
- We care for our assets, delivering safe and reliable networks services while transforming our business.

3.2 Business Initiatives

The business initiatives reflected in TasNetworks Transformation Roadmap 2025 publication (June 2017) for transition to the future that have synergy with this project are as follows:

- Voice of the customer: We anticipate and respond to your changing needs and market conditions;
- Network and operations productivity: We'll improve how we deliver the field works program, continue to seek cost savings and use productivity targets to drive our business;
- Electricity and telecoms network capability: To meet your energy needs and ensure power system security, we'll invest in the network to make sure it stays in good condition, even while the system grows more complex; and
- Predictable and sustainable pricing: To deliver the lowest sustainable prices, we'll transition our pricing to better reflect the way you produce and use electricity.

4. Current Risk Evaluation

If TasNetworks does not replace CONSAC on the distribution network there is a risk that a cable fault could result in death or serious injury to a member of the public or customer.

The business risk associated with these assets has been evaluated as High by using the TasNetworks Risk Management Framework.

4.1 5x5 Risk Matrix

TasNetworks' business risks are analysed utilising the 5x5 corporate risk matrix, as outlined in TasNetworks Risk Management Framework.

Relevant strategic business risk factors that apply are as follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Customer	Loss of supply	Possible	Minor	Low
Network Performance	Partial disconnection of network	Possible	Minor	Low
Reputation	Damage to reputation from harm to member of the public	Possible	Minor	Low
Safety and People	Personal injury or death to member of the public	Unlikely	Severe	High

5. Preferred Option:

The preferred option is to replace 15 km of CONSAC cable on the distribution network where:

- A section of CONSAC cable has previously failed;
- Locations where defective installations have been identified; and
- CONSAC cable is connected to assets that are scheduled in for replacement e.g. replacement of ground mounted substations.

5.1 Scope

Cable sections would be replaced when they meet the criteria defined in section 5.

The scope would entail replacement of 15 km of CONSAC cable annually with new low voltage PVC insulated cable. In addition to the cable, replacement of other supporting infrastructure would be required to connect it to the distribution network e.g. turrets, cabinets and reconnection of customer mains.

5.2 Expected outcomes and benefits

Following the completion of this program the likelihood of electric shocks/electrocution occurring from defective CONSAC cable installations would reduce to zero as all CONSAC cable will be removed from the network.

A secondary benefit is the improved reliability of the network, due to replacement of substandard CONSAC cables from the network, which will reduce the failure rate of the LV cable fleet.

5.3 Regulatory Test

A Regulatory Investment Test may be required for this program.

6. Options Analysis

6.1 Option Summary

Option description	
Option 0	Option 0: Do Nothing
Option 1	Option 1: Replace 6 km of CONSAC cable
Option 2 (preferred)	Option 2: Replace 15 km of CONSAC cable [Preferred Option]
Option 3	Option 3: Replace 24 km of CONSAC cable

6.2 Summary of Drivers

Option	
Option 0	All CONSAC cable installations remain in service with only repairs undertaken when defects identified. Advantages: • Lowest cost solution. Disadvantages: • Does not reduce the likelihood of electric shocks/electrocution from defective CONSAC cables. • Increase in operational expenditure as failure rates increase. • Resourcing required to accommodate reactive events. • Customer impact from asset failures will increase over time. • Network impact from asset failures will increase over time. • Risk to reputation from failures occurring that causes personal harm. • Does not address safety risk.

Option 1	Replacement of 6 km of CONSAC cable with new PVC cable. Advantages: • Reduces the likelihood and risk of electric shocks/electrocution from defective cable. • Reduces the risk of customer impact from asset failures. • Reduces the risk of network impact from asset failures. • Reduces the risk to reputation from failures occurring that causes personal harm. • The likelihood of a failure causing harm to a member of the public reduces over time, with it being completely eliminated in 26 years. • Ability to deliver replacement at 6 km per annum. Disadvantages: • Capital expenditure required. • Increase in operational expenditure as failure rates increase.
Option 2 (preferred)	Replacement of 15 km of CONSAC cable with new PVC cable. Advantages: • Reduces the likelihood and risk of electric shocks/electrocution from defective cable. • Reduces the risk of customer impact from asset failures. • Reduces the risk of network impact from asset failures. • Reduces the risk to reputation from failures occurring that causes personal harm. • The likelihood of a failure causing harm to a member of the public reduces over time, with it being completely eliminated in 10 years. • Ability to deliver replacement at 15 km per annum. • This is the most cost effective option to reduce the business risks to a manageable level. Disadvantages: • Capital expenditure required. • Increase in operational expenditure as failure rates increase.
Option 3	Replacement of 24 km of CONSAC cable with new PVC cable. Advantages: • Reduces the likelihood and risk of electric shocks/electrocution from defective cable. • Reduces the risk of customer impact from asset failures. • Reduces the risk of network impact from asset failures. • Reduces the risk to reputation from failures occurring that causes personal harm. • The likelihood of a failure causing harm to a member of the public reduces over time, with it being completely eliminated in 6 years. Disadvantages: • Capital expenditure required. • Increase in operational expenditure as failure rates increase. • Inability to deliver replacement at 24 km per annum.

6.3 Summary of Costs

Option	Total Cost ($)
Option 0	$0
Option 1	$13,500,000
Option 2 (preferred)	$33,750,000
Option 3	$54,000,000

6.4 Summary of Risk

Option 0: Do nothing

Public safety risk remains at ‘High’ with the potential to increase further over time as the failure rate increases.

Option 1: Replace 6 km of CONSAC cable

The likelihood of a failure causing harm to a member of the public reduces over time, with it being completely eliminated in 26 years.

Option 2: Replace 15 km of CONSAC cable [Preferred Option]

The likelihood of a failure causing harm to a member of the public reduces over time, with it being completely eliminated in 10 years.

Option 3: Replace 24 km of CONSAC cable

The likelihood of a failure causing harm to a member of the public reduces over time, with it being completely eliminated in 6 years.

6.5 Economic analysis

Option	Description	NPV
Option 0	Option 0: Do Nothing	$0
Option 1	Option 1: Replace 6 km of CONSAC cable	$3,489,933
Option 2 (preferred)	Option 2: Replace 15 km of CONSAC cable [Preferred Option]	$3,517,624
Option 3	Option 3: Replace 24 km of CONSAC cable	$2,165,679

6.5.1 Quantitative Risk Analysis

Not applicable.

6.5.2 Benchmarking

Minimising the safety risk that CONSAC cable presents to the public is considered a high priority to other Distribution Network Service Providers (DNSPs) around Australia with replacement programs in place at multiple DNSPs.

The replacement programs are generally proactive replacement.

6.5.3 Expert findings

Not applicable.

6.5.4 Assumptions

Cable replacements have been distributed uniformly across the years, whereas in practice they will be prioritised by geographical areas experiencing more failures.

12 km of CONSAC cable will be replaced annually in 2017/18 and 2018/19 financial years.

All costs are in 2016/17 dollars.

Other assumptions are included in the NPV spreadsheet.