Investment Evaluation Summary (IES)

Project Details:

Project Name:	Replace High Voltage Submarine Cable
Project ID:	00700
Thread:	Underground System
CAPEX/OPEX:	CAPEX
Service Classification:	Standard Control
Scope Type:	A
Work Category Code:	REUGC
Work Category Description:	Replace cables UG - HV
Preferred Option Description:	Option 2: Replace poor condition/failed submarine cable [Preferred Solution] Poor condition submarine cables will be replaced either proactively or when a fault occurs. Advantages • Current level of performance maintained • Partially proactive solution • No OPEX components Disadvantages • CAPEX required
Preferred Option Estimate (Nominal Dollars):	$1,654,852

	20/21	**24/25**
Unit ($)	N/A	N/A
Volume	1	1
Estimate ($)		
Total ($)	$827,426	$827,426

Governance:

Project Initiator:	Jarad Hughes	**Date:**	27/03/2015
Thread Approved:	David Ellis	**Date:**	02/11/2015

Project Approver:	David Ellis	**Date:**	02/11/2015

Document Details:

Version Number:	1

Related Documents:

Description	URL
NPV	http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Underground%20Systems/REUGC%20Submarime%20CablesTasNetworks%20NPV.xlsm
Replace High Voltage Submarine Cable - IES	http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Underground%20Systems/DRAFT%20IES%20REUGC%20Replace%20High%20Voltage%20Submarine%20Cable.docx

Section 1 (Gated Investment Step 1)

1. Background

As of March 2015 TasNetworks own and maintain twenty four high voltage submarine cables, with the older of these assets being installed in the 1950s. TasNetworks' has experienced failures of HV submarine cables in the past, largely due to the joints on these assets.

Damage to these cables may occur from the use of shipping anchors. The most recent failure was in September 2013 when a joint failed on a cable under the Derwent River.

1.1 Investment Need

The high voltage submarine cables are critical components of the high voltage network and they used as either a main source of supply, or an alternative supply to provide supply following asset failures.

Based on historical experience it is anticipated that there will be two cable failures over the next five to ten years. In each instance these failures would result in a need to undertake extensive repairs or cable replacement. Where a failure occurs due to poor condition of the cable, its complete replacement is often the most cost effective solution or the long term.

If a failure occurred and remedial works were not undertaken then it would result in loss of supply to a significant number of customers, or at best a reduction in network security for the surrounding area. In some instances it may be possible to provide supply using an alternate path or a portable generator, but the high operational cost means this is not a viable option as a short term supply.

The criticality of these assets and the often limited alternative means to provide network support following a failure results in the need undertake cable repairs or replacement following asset failures.

1.2 Customer Needs or Impact

TasNetworks continues to undertake a 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)
- Increase 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, restoration of faults/emergencies and supply reliability

1.3 Regulatory Considerations

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

6.5.7 (a) Forecast capital expenditure

(1) meet or manage the expected demand for standard control services over that period;

(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.

2. Project Objectives

The objective of this work is to replace poor condition or failed high voltage submarine cables. Completion of this work should aid in maintaining the existing reliability of the network.

3. Strategic Alignment

3.1 Business Objectives

Strategic and operational performance objectives relevant to this project are derived from TasNetworks 2014 Corporate Plan, approved by the board in 2014. This project is relevant to the following areas of the corporate plan:

- We care for our assets, delivering safe and reliable networks services while transforming our business.

3.2 Business Initiatives

The business initiatives that relate to this project are as follows:

- We care for our assets to ensure they deliver safe and reliable network services

The strategic key performance indicators that will be impacted through undertaking this project are as follows:

- Network service performance – meet network planning standards
- Network service performance – outcomes under service target performance incentive

schemes

4. Current Risk Evaluation

If TasNetworks did nothing when the submarine cables are in poor condition or have failed reactive repairs would occur. This reactive approach would decrease supply security and network performance and create power quality issues.

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 follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Customer	Submarine cable fault leading to loss of supply to multiple areas or a significant number of customers	Unlikely	Moderate	Medium
Network Performance	Submarine cable fault leading to interruption to supply across multiple areas or substantial power quality issues	Unlikely	Moderate	Medium

Section 1 Approvals (Gated Investment Step 1)

Project Initiator:	Jarad Hughes	**Date:**	27/03/2015
Line Manager:		**Date:**	
Manager (Network Projects) or Group/Business Manager (Non-network projects):		**Date:**	
[Send this signed and endorsed summary to the Capital Works Program Coordinator.]			

Actions			
CWP Project Manager commenced initiation:		**Assigned CW Project Manager:**	
PI notified project initiation commenced:		**Actioned by:**	

Section 2 (Gated Investment Step 2)

5. Preferred Option:

The preferred solution is the replacement of poor condition 11 and 22 kV submarine cables, this work is likely to be reactive following a fault.

As of March 2015 TasNetworks' own and maintain 24 high voltage submarine cables, with the older of these assets being installed in the 1950s. TasNetworks' has experienced failures of HV submarine cables in the past, largely due to the joints on these assets. Damage to these cables may occur from the use of shipping anchors. The most recent failure was in September 2013 when a joint failed on a cable under the Derwent River.

5.1 Scope

This work will include installation of new submarine cables to replace poor condition/failed cables. Substantial repair work where large sections of submarine cable are replaced will also be covered under this work. The scope would entail replacement of the high voltage cable annually with new XLPE insulated cable. The installation would need to comply with legislative requirement and TasNetworks' design standard.

5.2 Expected outcomes and benefits

It is expected that with the implementation of this project current level of reliability and system security will be maintained.

5.3 Regulatory Test

Not applicable.

6. Options Analysis

6.1 Option Summary

Option description	
Option 0	Option 0: Do Nothing Submarine cables to remain in service until failure occurs and repair when necessary. Poor condition cables or cables that have failed would not be replaced. Advantages • No CAPEX spend • Lowest cost solution Disadvantages

	• Frequency of faults will increase with deteriorating cables • Decrease in supply security • Increase in power quality issues • Loss of customer supply
Option 1	Option 1: Install generator connection points Install generator connection point and generators of capacity equivalent to the poor condition submarine cable so that under fault supply can be returned quickly. Advantages • Fast resupply to affected area Disadvantages • Temporary solution due to reliability issues • High operational cost to run the diesel generators • Significant CAPEX spend for a temporary solution • Not all locations are suitable for generators use – residential areas • Limited capacity of generators to supply load
Option 2 (preferred)	Option 2: Replace poor condition/failed submarine cable [Preferred Solution] Poor condition submarine cables will be replaced either proactively or when a fault occurs. Advantages • Current level of performance maintained • Partially proactive solution • No OPEX components Disadvantages • CAPEX required

6.2 Summary of Drivers

Option	
Option 0	Not replacing the poor condition or failed cable could lead to interruption to supply across multiple areas and potentially large power quality issues.
Option 1	This option does not adequately address the reliability issues associated with a poor condition/failed submarine cable. The installation of generators may not be possible in all areas, will result in large up front costs along with significant running costs and due to poor reliability of these units is not seen as an adequate long term solution.
Option 2 (preferred)	Replacement of submarine cables will adequately address reliability and quality of supply issues.

6.3 Summary of Costs

Option	**Total Cost ($)**

Option 0	$0
Option 1	$5,745,000
Option 2 (preferred)	$1,654,852

6.4 Summary of Risk

Option 0: Do Nothing

The performance risk will increase to 'High' as the condition of the cable deteriorates.

Option 1: Install Generators

The performance risk will remain at 'Medium' but the likelihood will increase to 'Possible' as the generators are likely to fail to supply constantly within "months to years"

Option 2: Replace Cables

The performance risk will reduce to 'Low'.

6.5 Economic analysis

Option	Description	NPV
Option 0	Option 0: Do Nothing Submarine cables to remain in service until failure occurs and repair when necessary. Poor condition cables or cables that have failed would not be replaced. Advantages • No CAPEX spend • Lowest cost solution Disadvantages • Frequency of faults will increase with deteriorating cables • Decrease in supply security • Increase in power quality issues • Loss of customer supply	$0
Option 1	Option 1: Install generator connection points Install generator connection point and generators of capacity equivalent to the poor condition submarine cable so that under fault supply can be returned quickly. Advantages • Fast resupply to affected area Disadvantages • Temporary solution due to reliability issues • High operational cost to run the diesel generators • Significant CAPEX spend for a temporary solution • Not all locations are suitable for generators use – residential areas	$4,026,996

	• Limited capacity of generators to supply load	
Option 2 (preferred)	Option 2: Replace poor condition/failed submarine cable [Preferred Solution] Poor condition submarine cables will be replaced either proactively or when a fault occurs. Advantages • Current level of performance maintained • Partially proactive solution • No OPEX components Disadvantages • CAPEX required	$118,188

6.5.1 Quantitative Risk Analysis

Not applicable.

6.5.2 Benchmarking

Not applicable.

6.5.3 Expert findings

Not applicable.

6.5.4 Assumptions

It is assumed that during the upcoming regulatory period at least one high voltage (11 or 22 kV) submarine cable will be identified as poor condition, needing significant repair work or replacement.

Section 2 Approvals (Gated Investment Step 2)

Project Initiator:	Jarad Hughes	**Date:**	27/03/2015
Project Manager:		**Date:**	

Actions			
Submitted for CIRT review:		**Actioned by:**	
CIRT outcome:			