Investment Evaluation Summary (IES)

Project Details:

Project Name:	Remedial work identified from earthing injection testing
Project ID:	00506
Thread:	Ground Mounted Substations
CAPEX/OPEX:	CAPEX
Service Classification:	Standard Control
Scope Type:	D
Work Category Code:	REGEA
Work Category Description:	Upgrade Ground Mtd Earthing
Preferred Option Description:	Perform remedial action as a result of non-compliant earthing systems
Preferred Option Estimate (Nominal Dollars):	$1,000,000

	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Unit ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume	2	2	2	2	2	2	2	2	2	1
Estimate ($)										
Total ($)	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000

Governance:

Project Initiator:	James Goodger	**Date:**	20/03/2015
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
IES REGEA Work identified from earthing injection testing	http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Ground%20Mounted%20Substations/DRAFT%20IES%20REGEA%20Remedial%20Work%20Identified%20From%20Earthing%20Injection%20Testing.docx

Section 1 (Gated Investment Step 1)

1. Background

TasNetworks routinely undertakes auditing of distribution substations earthing systems to ensure the installation does not present any safety hazards and ait compliant with relevant industry standards.

For each installation a condition assessment of the earthing system is dveloped which allows an assessment to be made for compliance with AS 2067 (Reference 11) and ENA DOC 025 EG-0 *Power system earthing guide – Part 1: management principles* (Reference 23).

Identification of substations that pose the threat of non-negligible shock or fatality, the following is considered[DE1] :

1. Substations with earthing systems interconnection via cable screens or MEN networks.
2. Areas with high fault levels or high soil resistivity.
3. Sites with above average contact scenarios (schools, swimming pools, shopping centres, etc).

Five high risk sites are audited annually with zone substations being tested every ten years to verify the integrity of the earthing system.

In some instances the outcome of the assessment is that remedial work needs to beto be undertaken at the site.

1.1 Investment Need

This program is required to address substandard installatrions to mitigate the potential for a non-negligible shock or fatality and to comply with relevant earthing standards as well as best practices.

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

Customers will continue to be consulted through routine TasNetworks processes, including the Voice of the customer program, the Annual Planning Review and ongoing regular customer liaison meetings.

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) and 6.5.6(a).

6.5.7 (a) Forecast capital expenditure

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

(2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;

(4) maintain the safety of the distribution system through the supply of standard control services.

2. Project Objectives

To address safety risks identified during routine earthing audits due to step, touch and transferred potentials.

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 understand our customers by making them central to all we do.

• We enable our people to deliver value.

• 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:

- Safety of our people and the community, while reliably providing network services, is fundamental to the TasNetworks business and remains our immediate priority
- We care for our assets to ensure they deliver safe and reliable network services
- We will transform our business with a focus on:

  - an appropriate approach to the management and allocation of risk

  - a well run, efficient business, that delivers sustainable returns to the Tasmanian community and is resilient to future challenges.

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

- Price for customers – lowest sustainable prices
- Zero harm – significant and reportable incidents
- Sustainable cost reduction – efficient operating and capital expenditure

4. Current Risk Evaluation

If TasNetworks does not continue to audit distribution earthing systems and rectify defficiencies found to ensure they comply with Australian standards and best practices then there is potential for non-compliant earthing systems. If auditing is neglected the public risk of a shock causing harm or a fatality will increase.

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

The level of risk identified was such that a treatment plan is required to reduce the risk down to a manageable level.

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	Loss of supply	Possible	Negligible	Low
Network Performance	Partial disconnection of network	Possible	Negligible	Low
Reputation	Damage to reputation from harm/fatality to member of the public	Possible	Moderate	Medium
Safety and People	Risk of fatality is deemed unacceptable in accordance with relevant standards	Unlikely	Severe	High

	(EG0 Risk management framework) and best industry practice.			

Section 1 Approvals (Gated Investment Step 1)

Project Initiator:	James Goodger	**Date:**	20/03/2015
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 to address the safety risks identified during routine earthing audits, through earthing redesign, or other appropriate remedial actions.

5.1 Scope

The scope of work will vary greatly depending on the nature of the issues identified. Sites to be audited have been chosen predominately either because they are high societal risk areas (schools, shopping centers, pools, etc), or because the expected earth potential rise and step and touch potentials at the site may be quite large due to the size of the earthing system and factors such as fault level (determined through a high level analysis). The cause of the earthing risk may be most effectively addressed via earthing system interconnection (via overhead earthwires or LV cable installation), fault level mitigation (through NERs), clearing time reduction (protection arrangements), grading conductors or installation of non-conductive infrastructure, and a range of other considerations that may include a combination of the above. The redesign or remedial work performed at each site must determine the most cost effective method of risk reduction for the benefit acheived.

5.2 Expected outcomes and benefits

TasNetworks performs routine earthing audits on high risk ground mounted substation sites, to determine whether step and touch voltages exceed the risks deemed acceptable by the business, relevant standards and best industry practice.

The preferred solution is to reduce safety risk risk to the public and operational personnel by rectifying substandard installations that have resulted in an elevated safety risk.

5.3 Regulatory Test

Not applicable

6. Options Analysis

6.1 Option Summary

Option description	
Option 0 (preferred)	Perform remedial action as a result of non-compliant earthing systems
Option 1	Do nothing

6.2 Summary of Drivers

Option	
Option 0 (preferred)	Safety of public and personnel
Option 1	Results in unacceptable level of safety risk (probability of fatality) to the public and personnel. Note NPV is dependent on the amount of untreated risk identified during routine audits

6.3 Summary of Costs

Option	Total Cost ($)
Option 0 (preferred)	$1,000,000
Option 1	$0

6.4 Summary of Risk

Option 0: Do Nothing

A 'do nothing' approach would result in significant system security and capacity issues, resulting in large outages and in extreme cases preventing customer access to the distribution network. The running of all ground mounted transformers until failure would also increase the probability of a significant failure occurring (transformer fire or explosion).

The risk of fatality or serious injury to personnel or a member of the public is maintained at 'medium' for the short term, as the assets continue to deteriorate that level will reach 'high'.

Option 1: Replace transformer at 60 years of age if condition is confirmed poor [Preferred Option]

This option will maintain network performance, reduce the possibility of oil leaking into unbunded areas, the possibility of transformer insulation failure and safety issues regarding contacting transformer bushings will reduce with proactive replacement.

6.5 Economic analysis

Option	Description	NPV
Option 0 (preferred)	Perform remedial action as a result of non-compliant earthing systems	$0
Option 1	Do nothing	$0

6.5.1 Quantitative Risk Analysis

Every site that has an routine audit undertaken is assessed against the ENA EG0 framework, a quantitative risk assessment tool which identifies the probability of fatality at the site based on a number of inputs. Remedial actions will be identified such that they reduce this probability of fatality to a generally accepted industry and community standard (pfat = 10-6), provided the cost of this remedial action is not grossly disproportionate to the benefit achieved.

6.5.2 Benchmarking

Undertaking remedial work at electrical installations to reduce the risk of harm to operational personnel and the public is a strategy that other utilities across Australia also undertake.

6.5.3 Expert findings

Not applicable

6.5.4 Assumptions

This program assumes that remedial action will be required as a result of performing routine earthing tests. A recent risk review of ground mounted substations has revealed a series of untested high risk sites which, when tested, have been revealing to require remedial actions. This is the basis for the estimated cost of works.

Section 2 Approvals (Gated Investment Step 2)

Project Initiator:	James Goodger	**Date:**	20/03/2015
Project Manager:		**Date:**	

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