Investment Evaluation Summary (IES)

Project Details:

Project Name:	Replace Transformer Earths
Project ID:	00643
Thread:	Overhead
CAPEX/OPEX:	CAPEX
Service Classification:	Standard Control
Scope Type:	D
Work Category Code:	RETXE
Work Category Description:	Replace Transformer Earthing
Preferred Option Description:	Proactive replacement program of transformer earths that perform poorly or are in poor condition and a reactive replacement program for transformer earths that are stolen or vandalised.
Preferred Option Estimate (Nominal Dollars):	$17,287,600

	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Unit ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume	304	304	304	304	304	304	304	304	304	304
Estimate ($)										
Total ($)	$608,000	$608,000	$608,000	$608,000	$608,000	$608,000	$608,000	$608,000	$608,000	$608,000

Governance:

Project Initiator:	Gary Carleton	**Date:**	25/03/2015
Thread Approved:	David Ellis	**Date:**	02/11/2015
Project Approver:	David Eccles	**Date:**	30/10/2015

Document Details:

Version Number:	1

Related Documents:

Description	URL
IES - RETXE - Replace Transformer Earths	http://teamzone.tnad.tasnetworks.com.au/asset-strategy/Shared%20Documents/DD17/Overhead%20Thread/AIOTX%20RETXE%20Overhead%20Transformer%20Earthing/IES%20-%20RETXE%20-Replace%20Transformer%20Earths.docx

NPV - RETXE AIOTX OH Transformer Inspection and Monitoring (Earthing)	http://teamzone.tnad.tasnetworks.com.au/asset-strategy/Shared%20Documents/DD17/Overhead%20Thread/AIOTX%20RETXE%20Overhead%20Transformer%20Earthing/NPV-AIOTX_RETXE-Inspection%20and%20Replacement%20of%20Overhead%20Transformer%20Earthing.xlsm

Section 1 (Gated Investment Step 1)

1. Background

Inadequate transformer earthing places operators, members of the public and the system at risk.

Transformer earths are augmented or repaired for any of the following reasons:

1. The earths are in poor condition – found through the asset inspection and monitoring program (AIOTX);
2. The copper earths have been stolen (are missing) – identified through AITOX or other inspection programs; and
3. The conditions around the pole earth result in unsafe step or touch hazards to the public.

Copper earthing conductors deteriorate over time due to the oxidisation of the copper in contact with the soil and may also have degraded connections following sub-standard installation.

Copper earthing conductor is a target for theft as the salvage prices for copper are significant. There have been instances in the past where the copper conductor associated with the pole earthing system has been stolen from various locations. From the 2009/2010 financial year onwards there has been a significant increase in the amount of copper earth thefts. As a result, standard practice for TasNetworks is to have the earths covered and stapled to the pole when they are replaced at sites targeted by copper thieves. Records of copper theft from previous years are variable as this was not an area of focus for the business.

The earthing installation and inspection programs completed by TasNetworks in the past have operated in a deterministic manner, aiming for a target earthing system resistance. A more appropriate application of the Australian Standard AS2067 would be to take a probabilistic approach to the safety of an earthing system. This probabilistic approach is concerned with the voltages that members of the public or operators may be exposed to under fault conditions. Metallic surfaces that can be touched by members of the public in close proximity to a pole earth will require assessment, and could drive an augmentation of the transformer earthing system in order to ensure public safety.

TasNetworks proposes to undertake the transformer earth inspection program to determine the condition and performance of the assets and identify sites for future repair.

1.1 Investment Need

The drivers for this program are compliance with regulatory requirements and managing business operating risks.

The aim of this program is to proactively replace transformer earths that perform poorly or are in poor condition and reactively replace transformer earths that are stolen or vandalised. This work will be performed at sites identified through the program AIOTX.

The Australian Standard AS2067 outlines a probabilistic approach to the performance of an earthing system. This program will ensure the compliance to AS 2067 Substations and High Voltage Installations Exceeding 1 kV a.c as well as ENA EG 0 Power System Earthing Guide. Compliance with this standard will appropriately mange the performance of the earthing systems and the risk of electric shock to the public.

The inspection program will also identify missing or faulty earthing systems that could result in a bushfire in the event of a fault.

This audit will ensure overhead transformers and associated equipment is safely earthed and determine the current condition of transformer earths to justify and prioritise future replacement programs.

1.2 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 its 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)
- 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, restoration of faults/emergencies and supply reliability
- affordability, green, communicative, innovative, efficient and reliable services

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;

(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 services.

Forecast operating expenditure 6.5.6 (a)

(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;

(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 services.

2. Project Objectives

The objective of this program is to proactively replace transformer earths that perform poorly or are in poor condition and reactively replace transformer earths that are stolen or vandalised.

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; and
- 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 developing an appropriate approach to the management and allocation of risk

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

- Customer engagement and service – customer net promoter score
- Price for customers – lowest sustainable prices
- Culture and people engagement – Culture score
- Zero harm – significant and reportable incidents
- Network service performance – meet network planning standards
- Network service performance – outcomes under service target performance incentive schemes
- Sustainable cost reduction – efficient operating and capital expenditure

4. Current Risk Evaluation

Do nothing is not an acceptable option to TasNetworks' risk appetite. The level of risk identified above is such that a treatment plan is required to reduce the risks to a tolerable level, in line with 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 follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Environment and Community	Inadequate earthing causes a protection mal operation. Results in a catastrophic bushfire with widespread loss of property	Possible	Major	High

Financial	Inadequate earthing causes uncleared transformer faults, resulting in catastrophic bushfire or fatality. Insurance providers refuse to cover TasNetworks for future events	Possible	Moderate	Medium
Regulatory Compliance	Breach the earthing requirements of AS2067	Possible	Moderate	Medium
Safety and People	Inadequate earthing causes a fatality or permanently impairs a person	Unlikely	Severe	High

Section 1 Approvals (Gated Investment Step 1)

Project Initiator:	Gary Carleton	**Date:**	25/03/2015
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:

Proactive replacement program of transformer earths that are in poor condition or damaged and a reactive replacement program for transformer earths that are stolen or vandalised.

5.1 Scope

Work to be undertaken shall be earthing repairs or replacements that are of a complex nature that do not readily fall within the AROCO work category. This work will be generated directly as a result of the inspection of transformer earths performed as part of AIOTX. Occasionally work may be generated by field crews or Regional Asset Managers.

It is expected from analysing historical data from the AIOTX transformer earth inspection program that 10% of the sites inspected and tested shall require remedial works to be completed. This is estimated to be 304 sites per annum.

Work under this category will be referred to overhead asset engineering for approval before commencement.

OTHER CONDITIONS:

The work carried out under this scope shall include:

a) Any excavation work directly associated with the earthing attached to the nominated TasNetworks Overhead Assets.

b) The installation of earth rods and mats associated with overhead assets such as transformers, reclosers, switches.

c) The measuring and recording of earth resistance values.

d) The forwarding of the recorded earthing values and as built diagrams to Distribution Records.

e) Any associated materials including earth enhancing products and importation of soils and sands.

f) Remedial works, as required by the land custodian, to any ground that has been disturbed by the repair to the earthing system.

g) If the existing earth rods are found to be in a deteriorated condition a report is to be made to overhead asset engineering stating the pole ID and transformer age.

5.2 Expected outcomes and benefits

The expected outcome of this program is a reduction in risk to TasNetworks from public safety risks, fire starts and the risk of breaching the legislated requirements of AS2067.

5.3 Regulatory Test

6. Options Analysis

Option description	
Option 0 - Do Nothing	Do nothing. No replacement program in place, overhead transformer earthing systems are run to failure. Repairs are only performed when an issue is exposed by a fault and hazardous incident.
Option 1	Proactive replacement program of transformer earths that perform poorly or are in poor condition and a reactive replacement program for transformer earths that are stolen or vandalised.

6.1 Option Summary

Option description	
Option 0	Do nothing. No replacement program in place, overhead transformer earthing systems are run to failure. Repairs are only performed when an issue is exposed by a fault and hazardous incident.
Option 1 (preferred)	Proactive replacement program of transformer earths that perform poorly or are in poor condition and a reactive replacement program for transformer earths that are stolen or vandalised.

6.2 Summary of Drivers

Option			
Option 0	**Regulatory Requirement**	**Environment and Community – Fire Start**	**Public safety**
	Risk a breach of AS2067 in terms of having in place an adequate earthing system	Poses an unacceptable risk of fire start from inadequate earthing. Leaves the Business very exposed to the risk of a fire caused by a faulty earthing system.	Poses an unacceptable risk to public safety from a faulty earthing system. Leaves the Business very exposed to the risk of severe injury or fatality.
Option 1 (preferred)	**Regulatory Requirement**	**Environment and Community – Fire Start**	**Public safety**
	Confirms that each site's earthing system meets the requirements of AS2067	Inspection prioritisation will consider the high Bushfire Loss Consequence Zone.	Inspection shall prioritise denser populated areas where public safety is more unlikely to be at risk.

6.3 Summary of Costs

Option	Total Cost ($)
Option 0	$0
Option 1 (preferred)	$17,287,600

6.4 Summary of Risk

This section outlines an overall residual asset risk level, for each of the options.

Option	Risk Assessment
Option 0	High
Option 1	Medium

6.5 Economic analysis

Option	Description	NPV
Option 0	Do nothing. No replacement program in place, overhead transformer earthing systems are run to failure. Repairs are only performed when an issue is exposed by a fault and hazardous incident.	$0
Option 1 (preferred)	Proactive replacement program of transformer earths that perform poorly or are in poor condition and a reactive replacement program for transformer	-$13,380,397

	earths that are stolen or vandalised.	

6.5.1 Quantitative Risk Analysis

-

6.5.2 Benchmarking

-

6.5.3 Expert findings

-

6.5.4 Assumptions

An average repair cost of $2000 per site. Economic life of earthing system is assumed to be the same as an overhead transformer – 40 years.

Section 2 Approvals (Gated Investment Step 2)

Project Initiator:	Gary Carleton	**Date:**	25/03/2015
Project Manager:		**Date:**	

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