Investment Evaluation Summary (IES)

Project Details:

Project Name:	Install/Augment Ground Mounted Voltage Regulator for Capacity
Project ID:	01041
Thread:	System Development
CAPEX/OPEX:	CAPEX
Service Classification:	Standard Control
Scope Type:	A
Work Category Code:	CAHVF
Work Category Description:	HV Feeder Upgrade - Capacity
Preferred Option Description:	Install Ground Mounted voltage regulator with SCADA communications (as required)
Preferred Option Estimate (Nominal Dollars):	$335,930

	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Unit ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume	1	2	1	1	0	0	0	0	0	0
Estimate ($)										
Total ($)	$335,930	$671,861	$335,930	$335,930	$0	$0	$0	$0	$0	$0

Governance:

Project Initiator:	Ewan Sherman	**Date:**	15/06/2015
Thread Approved:	Stephen Jarvis	**Date:**	19/10/2015
Project Approver:	Stephen Jarvis	**Date:**	19/10/2015

Document Details:

Version Number:	1

Related Documents:

Description	URL
Network Development Management Plan 2017-19	-
Summary Report - Voltage Regulator Assessment	-

Section 1 (Gated Investment Step 1)

1. Background

This program proposes reinforcement expenditure associated with the High Voltage (HV) distribution feeder network.

This network includes feeder elements operating at 6.6 kV, 11 kV, 22 kV, 33 kV or 44 kV (including SWER). The main components of this network includes:

- Overhead conductors
- Underground cables
- Voltage control equipment (regulators, capacitor banks, Statcoms);
- Overhead switchgear and (Reclosers, sectionalisers Gas Switches, ABS, Fuse Savers. Fuses, Links)
- Ground mounted switchgear (generally components of Distribution Substations)

This programs includes the installation of new, or the relocation and/or upgrade of existing regulators to manage asset thermal loading (existing reglators), and/or voltage control along feeder networks under normal or contingent configurations.

In particular, this program includes Ground Mounted (Closed Delta) voltage regulators.

1.1 Investment Need

Reinforcement of voltage regulator sites are required to manage:

- thermal overloading of voltage regulators;
- operational limitations of regulators and HV feeders; and
- network voltage levels (steady state voltage levels outside the requriements of Tasmanian Electricity Code).

The management of the above risks supports TasNetworks to deliver the following outcomes:

- Compliance with regulatory obligations; and
- Safety, reliability and security of supply outcomes that meet customers' needs, by maintaining asset utilisation rates at appropriate levels at the lowest whole of life cost.

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. Consumers have identified safety, restoration of faults/emergencies and supply reliability as the highest performing services offered by TasNetworks. This project specifically addresses the requirements of consumers in the area 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 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;
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:
    - the quality, reliability or security of supply of standard control services; or
    - the reliability or security of the distribution system through the supply of standard control services, to the relevant extent:
    - maintain the quality, reliability and security of supply of standard control services; and
    - 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

To manage risks associated with:

- excessive thermal loading of HV feeder elements,
- voltage levels outside acceptible limits; and
- operational limitations in the HV feeder network resulting from the above.

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 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 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
    - Network service performance – meet network planning standards

4. Current Risk Evaluation

The current risk evaluation regarding asset loading and voltage control issues associated with votlage regulators is between Medium to High; depending on the site, feeder configuration, customer numbers, and requriements.

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	Material Supply Interuption, and contribution towards: • substandard performance (SAIFI and SAIDI) • unavailability of network services • negative impact on community values and expectations • Increased customer complaints • Reputation damage	Likely	Minor	Medium
Environment and Community	Significant localised enviromental impact with short-term effects where there is an Increased risk of explosion and expulsion of oil, conductor clashing or failure leading to interruptions and fire ignition particular in regards to: • High bushfire risk areas; • public roads, traffic hazards; • Area's of environmental significance;	Possible	Minor	Low
Financial	Higher cost associated with repairing equipment under fault, compensation payments, under regulatory regime - STPIS outcomes;	Likely	Minor	Medium
Network Performance	Running the system in an insecure state or above its capability that may lead to consequential failures: • Protection operation initiated interruptions to	Likely	Minor	Medium

	supply • Rotational interruptions to supply to manage equipment loading and downed networks			
Regulatory Compliance	Non-compliance with obligations, resulting in: • Minor fine, or • breach of code and standard or licence for TEC, NER, connection agreements, legislation and regulation; • Failure of assets	Possible	Negligible	Low
Reputation	Non-sustained state press coverage including wider social media covereage, particularly in regards to: • High bushfire risk areas; • Area's of environmental significance	Unlikely	Negligible	Low
Safety and People	Explosion, or decreased operating clearances resulting in: • Increasing risk of third party contact • Electric shock or electrocution • Physical damage or harm.	Likely	Minor	Medium

Section 1 Approvals (Gated Investment Step 1)

Project Initiator:	Ewan Sherman	**Date:**	15/06/2015
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:

Where alternative solutions cannot adequately manage feeder capacity, reinforcement by installing voltage regulators is generally the preferred option.

Voltage regulators provide automated management of voltages on long rural networks. These untis are a proven technology and a standard component of the distrubution networks.

5.1 Scope

This programs includes the installation of new, or the relocation and/or upgrade of existing regulators to manage asset loading, and/or feeder steady sate voltage control under normal or contingent network configurations.

Where alternative solutions cannot adequately manage feeder capacity, reinforcement by installing voltage regulators is generally the preferred option.

Voltage regulators provide automated management of voltages on long rural networks. These untis are a proven technology and a standard component of the distrubution networks.

Within the two year determination (2017-19), a total of 7 ground mounted sites are proposed under this program.

5.2 Expected outcomes and benefits

It is expected that network risk in terms of:

- thermal overloading of existing regulators;
- operational limitations of existing feeder networks; and
- unacceptable steady state voltage levels on the network;

can be adequateley managed throughout the planning period.

5.3 Regulatory Test

Not applicable.

6. Options Analysis

In order to manage thermal loading or low voltage levels of HV feeder elements along the distribution feeder network, reinforcement or establishment of voltage regulators, cap banks, Statcoms, or mobile generator connection sites can be deployed.

Undertaking reinforcement augmentation can be expensive depending on the feeder configuration and constraints being managed. Often management through seasonal transfers or mobile generation is preferred to defer this expenditure. However, this may not always be possible. Where demand management cannot be facilitated adequately to manage feeder capacity, reinforcement augmentation is preferred.

Depending upon the capacity requried and nature of the feeder constraints, voltage regualtors are generally the preferred reinforcement option. These assets can be pole mounted in an Open-Delta configuration (two single phase tanks to regulate a three phase system), or ground mounted in a Closed –Delta configuration (three single phase tanks to regulator a three phase system).

Closed Delta configurations have the benefit of an additional 5% of voltage regulation, can be paralleled though, and minimised neutral voltage shift. Consequently with the additional tank, this configuration must be ground mounted with appropriate oil containment, which has a substantial cost increase compared to pole mounted arrangements. For these reasons, a closed-delta configuration is only installed where a pole mounted unit is not suitable. This is generally required in normal or contingent network configurations where more than two voltage regulators will be configured in series.

6.1 Option Summary

Option description	
Option 0	Do nothing
Option 1 (preferred)	Install Ground Mounted voltage regulator with SCADA communications (as required)

6.2 Summary of Drivers

Option	
Option 0	Continued overloading of asset, and unacceptable voltage levels and limiting network operation during normal and contingency siturations resulting in business risks described in Section 1.1.
Option 1 (preferred)	Manage overloading of asset, and/or unacceptable voltage levels and/or operational limitation during normal and contingency siturations.

6.3 Summary of Costs

Option	Total Cost ($)
Option 0	$0
Option 1 (preferred)	$335,930

6.4 Summary of Risk

The target risk assessment as a result of this program is Low.

6.5 Economic analysis

Option	Description	NPV
Option 0	Do nothing	$0
Option 1 (preferred)	Install Ground Mounted voltage regulator with SCADA communications (as required)	$0

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

Not applicable.

Section 2 Approvals (Gated Investment Step 2)

Project Initiator:	Ewan Sherman	**Date:**	15/06/2015
Project Manager:		**Date:**	

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