Investment Evaluation Summary (IES)

Project Details:

Project Name:	Replace reclosers
Project ID:	00712
Thread:	Overhead
CAPEX/OPEX:	CAPEX
Service Classification:	Standard Control
Scope Type:	A
Work Category Code:	RERER
Work Category Description:	Replace Reclosers
Preferred Option Description:	Replacement of failed reclosers as needed.
Preferred Option Estimate (Nominal Dollars):	$3,248,230

	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Unit ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume	1	1	1	1	1	1	1	1	1	1
Estimate ($)										
Total ($)	$54,137	$54,137	$54,137	$54,137	$54,137	$54,137	$54,137	$54,137	$54,137	$54,137

Governance:

Project Initiator:	Jack Terry	**Date:**	27/03/2015
Thread Approved:	David Eccles	**Date:**	20/10/2015
Project Approver:	David Eccles	**Date:**	20/10/2015

Document Details:

Version Number:	1

Related Documents:

Description	URL
NPV Document	http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Overhead%20Systems%20and%20Structures/REOHS%20and%20RERER%20-%20Other%20overhead%20SWGR%20works/Replace%20Reclosers%20NPV.xlsm
IES Document	http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Overhead%20Systems%20and%20Structures/REOHS%20and%20RERER%20-%20Other%20overhead%20SWGR%20works/Investment%20Evaluation%20Summary%20-%20Replace%20Reclosers%20and%20Sectionalisers%20R1.docx

Section 1 (Gated Investment Step 1)

1. Background

TasNetworks has a range of network switching devices, with different levels of functionality that are installed according to the specific requirements of the network location. These include air break switches, sectionalisers, load break switches, and automatic circuit reclosers. TasNetworks standard installation for all of these devices is now the NOJA OSM Automatic Circuit Recloser ("recloser"). This can be programmed with different settings, to be operated as a network disconnection device (load break switch), a single shot protection device (sectionaliser), or a multiple shot protection device (recloser).

Reclosers are pole mounted devices that operate to clear temporary faults in the medium voltage (MV) distribution network. When a recloser is exposed to a network fault downstream that is of sufficient magnitude, the recloser will immediately open the network to isolate the fault. Modern reclosers have a number of protection functions that include;

- directional over current protection;
- negative phase sequence protection;
- directional earth fault protection;
- frequency protection; and
- harmonic protection.

It will then make a number of pre-programmed attempts to re-energise the line. If the transient fault has been cleared, the auto-recloser will remained closed and normal operation of the line resumes, however, if the fault is a permanent fault, the auto-recloser will exhaust its count of re-energisation attempts and lock-out leaving the faulted line isolated. Reclosers are typically installed on rural overhead feeders, with poor reliability, and have remote control and monitoring facilities.

In recent years, Aurora Energy and TasNetworks have installed reclosers in groups as loop automation ("loop auto") schemes, to reconfigure the network in load conditions to automatically restore supply to network downstream of the fault. Typically implemented in rural areas with particularly poor reliability, loop auto schemes have provided improvements in the reliability in certain areas of the network.

1.1 Investment Need

The installation of reclosers in the MV network is supported by a number of investment drivers that are dependent on the location in the network, and the device (if any) that the recloser is replacing. The various investment drivers for the installation of reclosers are detailed in the points below.

Although the population of reclosers in the network is still relatively young, recloser failures still occur. Under some circumstances (eg. primary equipment failure) these devices will require full replacement with a new unit. It is therefore appropriate to include provision for the replacement of existing recloser devices with a new unit.

TasNetworks has approximately 57 expulsion dropout (EDO) type sectionalisers manufactured by AK power, installed in the distribution network. This population of units have been identified as unreliable, as the unit fail to operate on faults where they are required to. This results in the persistence of the fault, which may result in the operation of upstream protection, and/or the damage of distribution network assets. TasNetworks has a program in place to replace particular AK sectionalisers with a recloser, when a unit has been identified as defective.

Fuses and sectionalisers are cheap and effective methods for providing over current protection for large volumes of distribution feeder spurs. However, the necessity for field crews to be dispatched onsite for the fault restoration process incurs significant cost to the business. Additionally, while fuses, sectionalisers and load break switches are effective at providing single shot protection, their inability to reclose limits their capability to fault clearance, and not fault restoration.

The suitability of these network devices for the purpose of protecting a particular spur, is dependent on

- the magnitude of load that is connected to that spur; and
- the frequency with which the device operates.

Assuming that an appropriate device was selected at the time of installation, increases in either of these two parameters may be sufficient to justify the replacement of that device with a recloser.

1.2 Customer Needs or Impact

The main impacts on the customer that are associated with this option are - cost impacts through implementation of the program; and - impact on reliability through planned/unplanned outages. The selected option finds an optimal balance

between the cost incurred to the customer and the improvement in reliability through additional control capability.

1.3 Regulatory Considerations

This project will be ongoing to meet the ever changing needs of the distribution network with respect to network configuration and protection operation.

2. Project Objectives

The objective of this project is to install automatic circuit reclosers, where there is a demonstrable benefit to the network.

3. Strategic Alignment

3.1 Business Objectives

Maintaining network service performance and achieving zero harm are key parts of enabling TasNetworks to achieve its strategic goal of taking care of its assets, delivering safe and reliable network services while transforming our business. This investment helps achieve this business objective, by reducing unnecessary outage durations, for network reconfigurations and load transfers, and providing effective protection of the network to isolate and clear network faults.

3.2 Business Initiatives

TasNetworks continues to undertake consumer engagement as part of business as usual through the Voice of the Customer program. Customers have identified that into the future they believe that affordability, green, communicative, innovative, efficient and reliable services must be provided by TasNetworks. This project specifically provides improvements to consumers with respect to 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.

4. Current Risk Evaluation

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
Financial				
Customer	Interruption of supply as a result of inadequate protection.	Likely	Negligible	Low
Regulatory Compliance				
Network Performance	Increases in load connected or fault frequency, will result in reduction of reliability (SAIDI and SAIFI).	Likely	Minor	Medium
Reputation	Negative impacts on image through unplanned outages	Unlikely	Negligible	Low
Environment and Community	Failure of AK power EDO sectionalisers to operate may result in bushfire.	Unlikely	Major	Medium
Safety and People				

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	Interruption of supply as a result of inadequate protection.	Likely	Negligible	Low
Environment and Community	Inadequate protection may fail to clear faults as required, resulting in bushfire.	Unlikely	Major	Medium
Network Performance	Non replacement of recloser with a similar unit, will result in reduction of reliability (SAIDI and SAIFI).	Likely	Minor	Medium
Reputation	Negative impacts on image through unplanned outages.	Unlikely	Negligible	Low

Section 1 Approvals (Gated Investment Step 1)

Project Initiator:	Jack Terry	**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:

Reclosers will be installed in targeted locations in the MV network to replace failed recloser units (one unit, per year).

5.1 Scope

The scope of this work is to replace failed reclosers with a similar device, to provide appropriate protection for that network section. Based on historical rates, it is expected that one failed recloser shall be required to be replaced each year.

5.2 Expected outcomes and benefits

The expected outcome of this work is 1. Improvement in network reliability (SAIDI and SAIFI) through clearance of temporary MV faults; 2. Reduction in operational expenditure required for sending crews on site to restore supply after temporary faults; and

5.3 Regulatory Test

6. Options Analysis

Option No.	Option description
0.	Do nothing - Do not replace reclosers on failure. - Do not remove AK power EDO sectionalisers from the network. - Do not upgrade fuses and sectionalisers to reclosers.
1.	Installation of six reclosers per year in the MV network to - address risk of bushfire presented by AK power EDO type sectionalisers; - replace reclosers that have failed; - maintain network reliability, where load or fault rate is increased, and current network protection device is no longer suitable.

Option description	
Option 0 - Do Nothing	No pro-active action to maintain reliability of the distribution network, and address risks presented by AK power EDO devices.
Option 1	Targeted installation of reclosers in the network to provide protection functionality that is appropriate for the network that it is covering.
Option 2	
Option 3	

This option matrix provides a comparison of the options against the investment drivers detailed in section 2.

Summary of Drivers	Customer	Environment and Community	Network Reliability	Minimise cost to customer
Option 0 - Do Nothing	No mitigation	No mitigation	No mitigation	Low Cost
Option 1	Partial mitigation	Partial mitigation	Partial mitigation	Moderate Cost

6.3 Summary of Costs

[Discuss the overall costs of the option but don't delve into detailed costings which belong in the economic analysis.]

Option	Total Costs ($)
Option 0	$0
Option 1	$3,248,220

Total costs are calculated in nominal dollars and are only base costs (not including oncosts).

6.4 Summary of Risk

The main risks associated with selecting option 0 are:

- Non-material interruption of supply to customers through inadequate fault clearance, and fault restoration;
- reduction in network performance (SAIDI and SAIFI) through failure to clear temporary MV faults;
- maintained operational expenditure required for sending crews on site to restore supply after temporary faults; and

6.1 Option Summary

Option description	
Option 0	Do nothing - bypass failed recloser.
Option 1 (preferred)	Replacement of failed reclosers as needed.

6.2 Summary of Drivers

Option	
Option 0	Customer - Increased number and duration of interruptions to customers through faults. Network Performance - Reduction in network performance. Environment and Community - Increased risk of bushfire starting, through inadequate feeder protection. Reputation - Increased negative impacts on image through unplanned outages.
Option 1 (preferred)	Customer - Maintained or reduced number and duration of interruptions to customers through faults. Network Performance - Network performance maintained. Environment and Community - Risk of bushfire starting is maintained at low level. Reputation - Negative impacts on image through unplanned outages is minimised.

6.3 Summary of Costs

Option	Total Cost ($)
Option 0	$0

Option 1 (preferred)	$3,248,230

6.4 Summary of Risk

6.5 Economic analysis

Option	Description	NPV
Option 0	Do nothing - bypass failed recloser.	$0
Option 1 (preferred)	Replacement of failed reclosers as needed.	-$3,669,482

6.5.1 Quantitative Risk Analysis

None

6.5.2 Benchmarking

None

6.5.3 Expert findings

None

6.5.4 Assumptions

Installed cost of recloser including overheads is $54,137. This is based on a WASP estimate which would have been a bit low for Nulec reclosers. However, NOJA reclosers are a unit price of approx $15k with communications, and this cost is representative of installing a recloser with a new pole and all associate equipment.

Section 2 Approvals (Gated Investment Step 2)

Project Initiator:	Jack Terry	**Date:**	27/03/2015
Project Manager:		**Date:**	

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