

# Investment Evaluation Summary (IES)



## Project Details:

<b>Project Name:</b>	Remote Area Power Supply - Murchison Dam
<b>Project ID:</b>	00926
<b>Thread:</b>	Non Network Solutions
<b>CAPEX/OPEX:</b>	CAPEX
<b>Service Classification:</b>	Standard Control
<b>Scope Type:</b>	A
<b>Work Category Code:</b>	NNNOC
<b>Work Category Description:</b>	Non Network Solutions Network Optimisation Capex
<b>Preferred Option Description:</b>	Option 1 - Deploy a RAPS unit. Option 1 requires a RAPS unit to be installed at Murchison Dam. The unit features an optimal and efficient combination of diesel generator/s, battery bank/s and renewable energy. Whilst this option offers similar advantages to Option 1 it comes at a much lower cost.
<b>Preferred Option Estimate (Nominal Dollars):</b>	\$510,000

	<b>19/20</b>
<b>Unit (\$)</b>	N/A
<b>Volume</b>	1
<b>Estimate (\$)</b>	
<b>Total (\$)</b>	\$510,000

## Governance:

<b>Project Initiator:</b>	Andrew Fraser	<b>Date:</b>	02/04/2015
<b>Thread Approved:</b>	Andrew Fraser	<b>Date:</b>	19/10/2015
<b>Project Approver:</b>	Stephen Jarvis	<b>Date:</b>	19/10/2015

## Document Details:

<b>Version Number:</b>	1
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## Related Documents:

Description	URL
Investment Evaluation Summary - DOC version	<a href="http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Forms/AllItems.aspx?RootFolder=%2Fbusiness-projects%2Fnis-program%2FDD17SAM%2FDeliverables%2FNon-Networks%20Solutions%2FRAPS%20-%20Murchison%20Dam&amp;FolderCTID=0x0120003B7C9B94ADB7CF4A83A329243E759205&amp;View=%7B1CF0E10E-A1B2-4835-A398-F3447C251E8C%7D&amp;InitialTabId=Ribbon%2EDocument&amp;VisibilityContext=WSSTabPersistence">http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Forms/AllItems.aspx?RootFolder=%2Fbusiness-projects%2Fnis-program%2FDD17SAM%2FDeliverables%2FNon-Networks%20Solutions%2FRAPS%20-%20Murchison%20Dam&amp;FolderCTID=0x0120003B7C9B94ADB7CF4A83A329243E759205&amp;View=%7B1CF0E10E-A1B2-4835-A398-F3447C251E8C%7D&amp;InitialTabId=Ribbon%2EDocument&amp;VisibilityContext=WSSTabPersistence</a>
Templated NPV Evaluation	<a href="http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Forms/AllItems.aspx?RootFolder=%2Fbusiness-projects%2Fnis-program%2FDD17SAM%2FDeliverables%2FNon-Networks%20Solutions%2FRAPS%20-%20Murchison%20Dam&amp;FolderCTID=0x0120003B7C9B94ADB7CF4A83A329243E759205&amp;View=%7B1CF0E10E-A1B2-4835-A398-F3447C251E8C%7D&amp;InitialTabId=Ribbon%2EDocument&amp;VisibilityContext=WSSTabPersistence">http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Forms/AllItems.aspx?RootFolder=%2Fbusiness-projects%2Fnis-program%2FDD17SAM%2FDeliverables%2FNon-Networks%20Solutions%2FRAPS%20-%20Murchison%20Dam&amp;FolderCTID=0x0120003B7C9B94ADB7CF4A83A329243E759205&amp;View=%7B1CF0E10E-A1B2-4835-A398-F3447C251E8C%7D&amp;InitialTabId=Ribbon%2EDocument&amp;VisibilityContext=WSSTabPersistence</a>

# Section 1 (Gated Investment Step 1)

## 1. Background

The distribution network in Tasmania grew dramatically from 1950 to 1990, as the Hydro Electric Commission rolled out electrification across East Coast, West Coast, Central and North parts of the State. During this electrification period, the network was extended to any rural sites to facilitate new load connections as required. These practices have resulted in sites where small isolated loads are connected at the end of long distribution spur lines. These spur lines are often travel through heavily vegetated areas in mountainous terrain. Issues associated with supplying these small isolated loads include:

1. Ongoing pole inspection and replacement costs relative to the supplied load
2. Ongoing bushfire mitigation and vegetation clearing costs
3. Fault operation cost
4. Supply reliability and quality
5. Revenue collected from the customer

Murchison Dam is one of the several rural sites identified with all abovementioned issues. The site is situated in the west coast of Tasmania. The site houses a power generation station owned and operated by Hydro Tasmania. The station is supplied by distribution transformers T940058 (25kVA) and T940030 (25kVA). These are extended from the main grid via a 6 km distribution spur line that travels through heavily vegetated areas.

TasNetworks has deployed a two RAPS units to supply customer loads at Crotty Dam. The technical performance of the RAPS system is as expected. Implementing this solution has helped avoid the cost of maintain the existing distribution spur line to Crotty Dam.

### 1.1 Investment Need

The line was built from 1976 and is made of three phase conductors. The ongoing maintenance involves bushfire mitigation, vegetation clearing, fault operations, pole inspections and replacement.

It is estimated that the ongoing maintenance of the existing spur line incurs a net present cost of nearly \$1.9M over the 25 year period. This is equivalent to \$118,000 per annum. At the same time the total load customer consumption is relatively small.

### 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
- 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.

This site serves a Hydro Tasmania generator as its station services supply. The customer will be specifically consulted prior to the project implementation.

### **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.

## **2. Project Objectives**

The aim of this project is to deploy a RAPS system at Murchison Dam as a cost effective alternative to the existing distribution spur line. The RAPS will be an efficient combination of diesel generators, battery banks and renewable energy sources such as wind or solar. The equipment sizing will mainly be dictated by optimising the implementation cost, but such factors as environment impact will be taken into account.

The project is to achieve the following outcomes:

1. Reduce the cost of providing distribution network services, by avoiding the following distribution line maintenance costs:
  - Fault operations
  - Vegetation clearing
  - Pole inspections and replacements
  - Other (ancillary) costs
2. Provide demonstrable innovative solutions, raising our business profile
3. Provide a reliable supply for the customers at Murchison Dam
4. Reduce the need for fault response in difficult terrains, contributing to a safe environment for employees, customers and the general public
5. Decommission the existing distribution spur line (that is incurring poor reliability.)

## **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:
  - the customer, and a strong commitment to delivering services they value
  - an engaged workplace with strong cultural qualities and people who will be great ambassadors for TasNetworks
  - a high performing culture with clear accountabilities for deliverables
  - 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:

- Customer engagement and service – customer net promoter score
- Price for customers – lowest sustainable prices
- 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

Bushfire and/or asset failure results in

1. A fatality or permanently impairs a person's life
2. Significant media coverage

### 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	Disruption to customers with declining network reliability	Likely	Minor	Medium
Environment and Community	Vegetation contact and/or asset failure results in a catastrophic bushfire with widespread loss of property	Unlikely	Severe	High
Financial	The business continues to incur the financial burden associated with maintaining the existing feeder	Almost Certain	Minor	Medium
Network Performance	Interruption of supply to customers (and detrimental power quality)	Likely	Minor	Medium
Regulatory Compliance	Increased number of unplanned outage leads to local NCEF breaches	Possible	Minor	Low
Reputation	Bushfire and/or asset failure results in significant media coverage	Unlikely	Moderate	Medium
Safety and People	Bushfire and/or asset failure results in a fatality or permanently impairs a person's life	Unlikely	Severe	High

## Section 1 Approvals (Gated Investment Step 1)

<b>Project Initiator:</b>	Andrew Fraser	<b>Date:</b>	02/04/2015
<b>Line Manager:</b>		<b>Date:</b>	
<b>Manager (Network Projects) or Group/Business Manager (Non-network projects):</b>		<b>Date:</b>	
[Send this signed and endorsed summary to the Capital Works Program Coordinator.]			

<b>Actions</b>			
<b>CWP Project Manager commenced initiation:</b>		<b>Assigned CW Project Manager:</b>	
<b>PI notified project initiation commenced:</b>		<b>Actioned by:</b>	

## Section 2 (Gated Investment Step 2)

### 5. Preferred Option:

The preferred option is to deploy a RAPS system at Murchison Dam as a cost effective alternative to the existing distribution spur line. The proposed project involves the following principle components:

1. deploy a RAPS unit to supply the customers at Murchison Dam
2. remove the thereafter redundant distribution spur line

The preferred option has been demonstrated as the least cost solution to providing distribution network services for Murchison Dam. The other options considered are doing nothing (e.g. continuing with the maintenance of the existing distribution lines), and replacing the line with a new underground cable. These options have pros and cons; importantly they incur higher costs than that of the proposed solution. TasNetworks has experience in the area of remote area power supply.

#### 5.1 Scope

The deployed RAPS unit will feature an optimal and efficient combination of diesel generator/s and battery unit/s. Renewable energy could be considered in order to reduce the amount of diesel consumption and the need for regular refuelling. The renewable energy sources could include solar PV and/or wind. There are several factors influencing the renewable selection:

1. Upfront and ongoing costs
2. Environment impact
3. Land availability

The proposed project will involve planning and design, specification, construction and finally performance evaluation of the RAPS unit. Whilst the ongoing running and maintenance tasks are considered in the NPV (economic) analysis they will not be covered by the project itself.

The planning and design phases will address the following:

1. Detailed assessment to determine the optimal sizing of RAPS equipment (diesel generators, battery banks and renewable energy) in order to minimise the total deployment cost;
2. Engagement with Hydro Tasmania that have physical load connections at Murchison Dam. The discussions will specifically be to understand customer expectations on the supply reliability.

The specification phase will define the essential performance characteristics that TasNetworks require in order to maintain the supply reliability and quality for Hydro Tasmania. Such specification will facilitate the tendering process for choosing the right vendor to supply RAPS equipment (generators, batteries, wind turbines, solar panels.)

The construction will involve site preparation, equipment delivery and installation.

The performance evaluation phase will be undertaken for 12 month in order to ensure that the deployed RAPS system technically performs as expected. Upon a positive evaluation result the distribution spur line will be decommissioned and removed.



## 5.2 Expected outcomes and benefits

Project deliverables are as follows:

1. A complete RAPS unit, featuring an optimal combination of diesel generator/s, battery bank/s and renewable energy (solar and/or wind)
2. Removal of the distribution spur line

Completion of the project will result in the following outcomes:

1. Reduced asset management cost associated with the supplied load, which includes
  - 1a. Fault Operation
  - 1b. Vegetation (and bushfire mitigation)
  - 1c. Pole inspection and replacement
  - 1d. Other (ancillary) costs such as pre-fire inspection and meter reading
2. Improved safety for both staff and the public
3. Reduced risk of bushfire start
4. Improved power supply reliability and quality for the customer

These outcomes are consistent with the investment needs of TasNetworks

## 5.3 Regulatory Test

## 6. Options Analysis

Options considered are:

1. Option 0: Do nothing (and keep maintaining the existing distribution line)
2. Option 1: Deploy a RAPS unit
3. Option 2: Rebuild the existing line with a new underground cable

All options meet relevant standards including network performance, reliability and safety. Option 1 offers the highest NPV.

### 6.1 Option Summary

Option description	
Option 0	Option 0 - Do nothing Option 0 continues to supply customer loads at Murchison Dam through the existing lines. As such TasNetworks would continue a range of ongoing maintenance activities through vegetation clearing, outage management, pole inspection and replacement amongst other activities. As constructed in 1980s the spur lines are in an aged condition; the maintenance will likely increase over time with the ongoing replacement of power poles and conductors. In addition, this option suffers both public safety risks and the poor reliability.

Option 1 (preferred)	Option 1 - Deploy a RAPS unit. Option 1 requires a RAPS unit to be installed at Murchison Dam. The unit features an optimal and efficient combination of diesel generator/s, battery bank/s and renewable energy. Whilst this option offers similar advantages to Option 1 it comes at a much lower cost.
Option 2	Option 2 - Rebuild the feeder with a new underground cable Option 2 installs a new underground cable to replace the 6-km spur line. Main advantages include avoided vegetation clearing and improvement in supply reliability (as the underground cable is not exposed to the severe environment conditions). Whilst this option is a significant investment it cannot be justified by the financial returns from the load customer at Murchison Dam.

## 6.2 Summary of Drivers

Option	
Option 0	<p><b>Expenditure</b></p> <ul style="list-style-type: none"> <li>+ No initial capital expenditure</li> <li>+ High ongoing expenditure</li> </ul> <p><b>Environment Community - Fire Start</b></p> <ul style="list-style-type: none"> <li>+ High risk of fire ignition due to potential vegetation contact</li> </ul> <p><b>Safety</b></p> <ul style="list-style-type: none"> <li>+ High risk of public safety due to pole and conductor failures, and bushfire start</li> </ul> <p><b>Reliability</b></p> <ul style="list-style-type: none"> <li>+ Reliability level is relatively poor</li> </ul>
Option 1 (preferred)	<p><b>Expenditure</b></p> <ul style="list-style-type: none"> <li>+ Medium upfront capital expenditure</li> <li>+ Relatively low operating expenditure</li> </ul> <p><b>Environment and Community – Fire Start</b></p> <ul style="list-style-type: none"> <li>+ Rare chance of fire ignition due to the removal of the existing SWER line</li> </ul> <p><b>Safety</b></p> <ul style="list-style-type: none"> <li>+ Low risk of fire ignition due to the removal of the existing SWER line</li> </ul> <p><b>Reliability</b></p> <ul style="list-style-type: none"> <li>+ Reliability level will be improved</li> </ul>
Option 2	<p><b>Expenditure</b></p>

	<ul style="list-style-type: none"> <li>+ High upfront capital expenditure</li> <li>+ Low operating expenditure</li> </ul> <p><b>Environment and Community – Fire Start</b></p> <ul style="list-style-type: none"> <li>+ Rare chance of fire ignition due to the new cable being underground</li> </ul> <p><b>Safety</b></p> <ul style="list-style-type: none"> <li>+ Low risk of public safety due to the new cable being underground</li> </ul> <p><b>Reliability</b></p> <ul style="list-style-type: none"> <li>+ Reliability level will be substantially improved (due to the very low failure rate of the underground cable being)</li> </ul>
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### 6.3 Summary of Costs

Option	Total Cost (\$)
Option 0	\$0
Option 1 (preferred)	\$510,000
Option 2	\$1,200,000

### 6.4 Summary of Risk

Remove the existing distribution spur line in order to minimise the risk of bushfire

### 6.5 Economic analysis

Option	Description	NPV
Option 0	Option 0 - Do nothing Option 0 continues to supply customer loads at Murchison Dam through the existing lines. As such TasNetworks would continue a range of ongoing maintenance activities through vegetation clearing, outage management, pole inspection and replacement amongst other activities. As constructed in 1980s the spur lines are in an aged condition; the maintenance will likely increase over time with the ongoing replacement of power poles and conductors. In addition, this option suffers both public safety risks and the poor reliability.	\$0
Option 1 (preferred)	Option 1 - Deploy a RAPS unit. Option 1 requires a RAPS unit to be installed at Murchison Dam. The unit features an optimal and efficient combination of diesel generator/s, battery bank/s and renewable energy. Whilst this option offers similar advantages to Option 1 it comes at a much lower cost.	\$811,096
Option 2	Option 2 - Rebuild the feeder with a new underground cable Option 2 installs a new underground cable to replace the 6-km spur line. Main advantages include avoided vegetation clearing	\$653,124

	and improvement in supply reliability (as the underground cable is not exposed to the severe environment conditions). Whilst this option is a significant investment it cannot be justified by the financial returns from the load customer at Murchison Dam.	
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#### **6.5.1 Quantitative Risk Analysis**

N/A

#### **6.5.2 Benchmarking**

N/A

#### **6.5.3 Expert findings**

N/A

#### **6.5.4 Assumptions**

- [Option 0] Volumes of vegetation, fault operation, pole and conductor replacements would be consistent for each of the twenty five years
- [Option 1] The cost of deploying a RAPS unit (including planning and design, specification, construction and performance evaluation) is \$450,000 in 2015 dollar
- [Option 1] The cost incurred to decommission and remove a distribution spur line is \$10,000 per km
- [Option 1] The annual cost of running and maintaining the RAPS system is \$20,000 in 2015 dollar
- [Option 2] The cost of installing a new underground cable (including design and construction) is \$200,000 per km in 2015 dollar value

## Section 2 Approvals (Gated Investment Step 2)

<b>Project Initiator:</b>	Andrew Fraser	<b>Date:</b>	02/04/2015
<b>Project Manager:</b>		<b>Date:</b>	

<b>Actions</b>			
<b>Submitted for CIRT review:</b>		<b>Actioned by:</b>	
<b>CIRT outcome:</b>			