

# Forecast network capital projects 1 July 2014 – 30 June 2019 (>\$5m)

Appendix 14



Tasmanian Networks Pty Ltd



Transend Networks Pty Ltd



# Waddamana – Palmerston power supply security augmentation

CUSTOMER	COST	CAPACITY	COMPLETION
Southern Tasmania load customers	\$21.1 m		2018

## Existing transmission network

Transend has a responsibility to proactively manage security risks in Tasmania's electricity transmission network. We ensure the network can deliver the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

Tasmania's transmission backbone network is hourglass shaped. There is a strong northern section, strong southern section, and a single corridor in the middle.

### The problem

It has been identified that at times of high electricity transfer from north to south, a fault on a major asset such as a transmission tower, could cause the north-south link to be broken. The entire southern Tasmanian electricity network could suffer an initial black out, including all of Hobart and taking up to 48 hours to restore the north south link

### Proposed solution

Our preferred option to improve the strength and security of this corridor is to convert the existing Waddamana–Palmerston 110 kV transmission line to 220 kV operation to increase the transfer capacity of this corridor.

### Impact on customers

This project will improve the overall security of the transmission network for the benefit of all electricity customers by implementing a solution that is inherently safe, reliable and cost effective to reduce the risks associated with the transfer of electricity from north to south Tasmania.

Implementation of the proposed project may require outages at the Waddamana and Palmerston 220 kV Substations. Some of these outages may constrain Hydro Tasmania generation and the proposed Cattle Hill Wind Farm. All generation customers would be consulted prior to construction to discuss outage requirements in detail.

There may be some periods of constrained north to south power transfer which may directly affect connected load customers.

Consultation with affected customers, landowners and other stakeholders would continue throughout the project's development and implementation stages.

A formal public consultation process will be conducted.



Tasmanian network showing north-south link

## Contacting Transend

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# Newton – Queenstown Power Supply Security Augmentation

CUSTOMER	COST	CAPACITY	COMPLETION
West Coast customers	\$14.1 m	50 MVA	2017

## Existing network

Transend needs to proactively manage security risks in Tasmania's electricity transmission network to ensure we are able to meet the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

Tasmania's transmission system that supplies the south-west of Tasmania consists of a single-circuit 110 kV transmission line that supplies substations at Rosebery, Newton and Queenstown. Electricity from these substations is then reticulated via Aurora's distribution system to customers in the area.

## The problem

It has been identified that a fault on the single-circuit 110 kV transmission line between Farrell and Queenstown could take up to 48 hours to repair.. This fault could result from an asset failure resulting from lightning or bushfires.

## Proposed solution

Our preferred option to improve the security of supply to south-west Tasmania is to install a second independent 110 kV supply to the area. This will be a new 220/110 kV connection to Queenstown Substation.

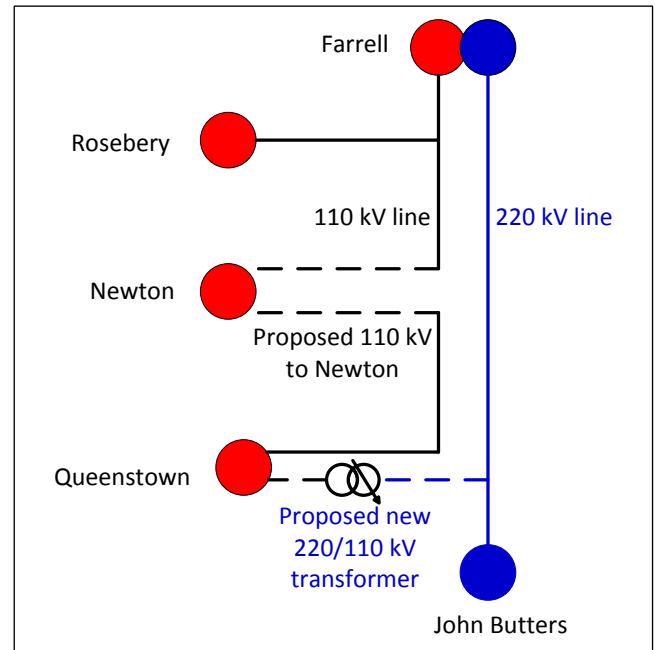
This project will also improve the supply to Newton Substation and allow for the existing old and unreliable transmission line between Queenstown and Newton to be decommissioned.

## Impact on customers

This projects will increase the reliability of the power supply to customers in the south-west Tasmania by providing a second supply point to Queenstown Substation..

We will continue to consult widely with the affected customers with the objective of engineering an optimal technical and commercial solution to the benefit of all customers.

A formal public consultation process still will be undertaken.



South-western Tasmania substations and transmission lines

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# Rosebery Substation transformer capacity augmentation to meet load growth

CUSTOMER	COST	CAPACITY	COMPLETION
Rosebery Substation customers	\$6.1 m	60 MVA	2016

## Existing network

Transend has a responsibility to proactively manage security risks in Tasmania's electricity transmission network. We ensure the network can deliver the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

Rosebery Substation is part of Tasmania's transmission system that supplies the west coast. This substation has two 110/44 kV transformers that can each provide a continuous output of 30 MVA of capacity to provide power to the mining operations at Rosebery and Renison, and residential customers in the Rosebery, Tullah, Zeehan and Trial Harbour areas (via the distribution system).

## The problem

The load supplied by Rosebery Substation is increasing slowly and will soon exceed the capacity of one of the existing transformers. A fault on one of the two transformers at times of high load demand would cut the power supply to some customers. A major transformer fault could take up to eight days for a replacement transformer to be installed.

## Proposed solution

Our preferred is to replace the two 30 MVA transformers with two new 60 MVA transformers. This would enable the full load to be supplied from one transformer for the foreseeable future.

The existing transformers at Rosebery would be refurbished and reused elsewhere on Transend's network.

## Impact on customers

This project will increase the security of the power supply to customers supplied from Rosebery Substation.

We will consult widely with the affected customers, and other affected parties to engineer a technical and commercial solution that best meets the needs of all stakeholders.

A formal public consultation process will be conducted.



Existing transformers at Rosebery Substation

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# Transmission line insulator assembly renewal program

CUSTOMER	COST	CAPACITY	COMPLETION
Tasmania	\$13.2 m	---	2015

## Insulator replacement program

An electrical insulator provides the required separation from high voltage conductor (electrical wires) and the supporting structure (tower).

It is important that insulators are maintained to ensure that there is no risk of live electrical wires falling to the ground, coming into contact with the tower or compromising the required clearance distances from the ground.

We have approximately 44,000 insulators assemblies installed along the transmission network to keep the conductors in the air and out of harm's way. About 10,000 of these are over 60 years old and need replacing.

## The problem

Over time with exposure to the elements these insulator deteriorate and the condition of a large number of these insulators indicate that they should be replaced.

If we did not replace the old, defective insulators, they could cause an operational, environmental and safety incident.

## Proposed solution

We plan to replace approximately 5000 insulators assemblies during the 2014-19 period.

As a preventative measure we proactively assess and replace defective insulators in a planned manner. This allows us to meet the ongoing and longer term needs of our customers in a cost effective and efficient way. It also allows us to ensure our network is both safe and reliable.

## Impact on customers

We will continue to consult widely with the affected customers, landowners and other affected parties regarding planned maintenance activities and outages.

This project is part of our capital expenditure program for 2014-19 and is costed in our revenue proposal for that period.



*A worn insulator*

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# Substation Disconnecter and Earth Switch Renewal

CUSTOMER	COST	CAPACITY	COMPLETION
Tasmanian load and generation customers	\$8.7 m	-	2019

## Existing network

Transend needs to proactively manage security risks in Tasmania's electricity transmission network to ensure we are able to meet the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

Disconnectors are used in the transmission network to isolate sections of the network to allow work and maintenance to be carried out safely.

## The problem

Transend's fleet of Stanger-type DR1 and DR2 disconnectors are approaching the end of their useful lives and have a number of inherent technical and design deficiencies that adversely impact on the transmission network reliability and availability.

## Proposed solution

The replacement strategy is based on asset risk and condition and identifies those asset for replacement that pose an unacceptably high risk.

This project will:

1. Address the design and performance issues associated with the Stanger-type DR1 and DR2 disconnectors thus improving the transmission system performance.
2. Mitigate the business risks presented by the existing disconnectors should they fail.
3. Reduce future maintenance and repair costs.
4. Provide motorised disconnectors removing the need for field operators for routine switching operations.
5. Ensure that customers continue to be provided with a secure and satisfactory electricity supply.

This project proposes to replace the Stanger type DR1 and DR2 disconnectors and associated earth switches rated for 220 kV at Burnie, Chapel Street, Liapootah, Wayatinah and Palmerston Substations.

## Impact on customers

It is anticipated that there will be minimal interruption to the power supply for customers during implementation of this project.

Consultation with affected parties will continue throughout the project's development and implementation stages.



Typical disconnector installation

## Contacting Transend

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# Telecommunications multiplexer system renewal program

CUSTOMER	COST	CAPACITY	COMPLETION
State-wide	\$6.6 m		2019

## Existing network

Transend has a responsibility to proactively manage safety and security risks in Tasmania's electricity transmission network. We ensure the network can deliver the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

Transend owns and operates two networks: the transmission network to transport and transform electricity; and a telecommunications network which is used to control and operate the transmission network.

Transend's telecommunications multiplexer system provides services that are critical to maintaining the security and safety of Tasmania's transmission system. It ensures that systems used to protect transmission network assets are fast and efficient and that power system control is coordinated.

## The problem

Assessments of the telecommunications multiplexer equipment have identified that risk associated with the equipment is becoming high and needs to be addressed. Current performance issues with the equipment are affecting the ability of the transmission system to maintain the required safety and security. This can result in the isolation of transmission system areas and the loss of supply to customers.

Service restoration relies being able to access spare parts. With the equipment vendors superseding their products, repairing failed components is no longer offered and spare part stocks are becoming depleted. This results in the increase of telecommunication restoration times and unplanned costs.

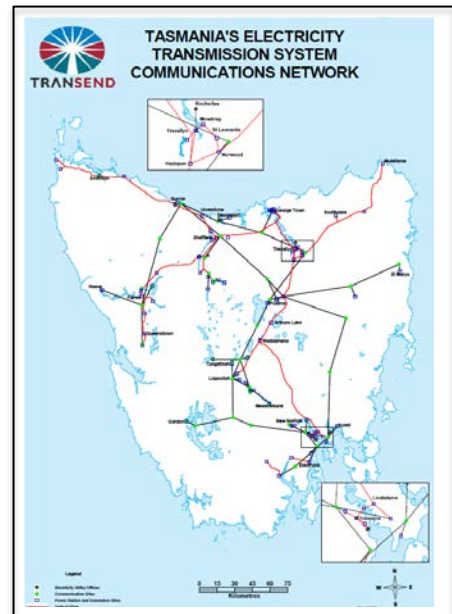
## Proposed solution

The proposed solution is a targeted replacement of the out of condition multiplexers. The replacement strategy is based on risk of failure, condition and ability to repair. The program identifies the asset that pose an unacceptably high risk be replaced.

## Impact on customers

This project will to increase reliability of the transmission system by improving the essential telecommunications services necessary for controlling and safe operation of the system. This will enhance the safety of power transmission and maintain the total system control.

We will consult widely with the affected customers, landowners in the proposed areas and other affected parties with the aim of engineering a technical and commercial solution that best meets the needs of all stakeholders.



Telecommunications Network Map

## Contacting Transend

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# Transformer protection renewal program

CUSTOMER	COST	AFFECTED LOAD	COMPLETION
State-wide	\$6.5 m	210 MVA	2019

## Existing network

Transformers are major assets installed in substations to transform electricity from one voltage level to another.

Transformer protection is needed to detect and isolate transformer faults to prevent power system instability and minimize explosive damage to these expensive transmission network assets. The protection also facilitates local, remote and automatic control of the transformers.

## The problem

A condition assessment has identified specific models of protection that present a high risk to the security of the transmission network. The performance issues identified mean that the transformer protection could fail to operate as designed and impact on security of supply. Also keeping these devices in service will increase maintenance costs.

Once a model of protection is obsolete, spare parts begin to become difficult to obtain and can result in increased circuit restoration times

Modern protection provides self-supervision, disturbance recording and remote interrogation which vastly improves the reliability and fault diagnostic capability of the transmission network.

## Proposed solution

The proposed solution is a targeted replacement of the transformer protection. The replacement strategy is based on asset risk and condition. It identifies those assets for replacement that pose an unacceptably high risk.

## Impact on customers

This project will increase the reliability of the power supply to customer in the areas supplied by Boyer, Chapel Street, Farrell, Gordon, North Hobart and Rosebery Substations.

We will consult widely with the affected customers in the proposed areas and other affected parties with the aim to coordinate circuit outages and minimise disruption to power supply.



*Gordon Substation 220 kV / 22 kV transformer protection*

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# Lindisfarne Substation transformer replacement

CUSTOMER	COST	CAPACITY	COMPLETION
Hobart eastern shore load customers	\$6.6 m	2 x 30/60 MVA	2016

## Existing network

Transend needs to proactively replace aged assets in the Tasmanian electricity transmission network to ensure the ongoing and future electrical energy requirements of Tasmanian customers is being met in a cost effective, sustainable and efficient manner.

Transformers are major assets installed in substations to transform electricity from one voltage level to another

## The problem

The existing supply transformers at Lindisfarne Substation are in poor physical and electrical condition, and are susceptible to failure and have been identified as needing replacement. They have technical design deficiencies that could allow an incipient fault inside the transformer to go undetected resulting in a catastrophic failure of the transformer.

The replacement of the existing transformers will increase reliability and security of supply to the 33 kV system at Lindisfarne Substation. In addition, replacing the transformers with new modern units will reduce safety and environmental risks.

## Proposed solution

The preferred option is to install two new 110/33 kV transformers at Lindisfarne Substation to replace the existing units that are in poor condition.

This project will ensure the power supply needs for the Eastern Shore area of Hobart will be satisfactorily maintained into the foreseeable future.

## Impact on customers

Consultation regarding constructability issues and outage requirements will be agreed in advance with customers. It is expected that during construction of the project there will be minimal, if any, impact customers.



Existing Lindisfarne transformers

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# Transmission line K-pole renewal program

CUSTOMER	COST	CAPACITY	COMPLETION
East coast load customers	\$5.8 m	-	2019

## Existing network

Transmission line support structures literally hold up the electricity network. Support structures ensure that Transend can keep the live wires that carry the electricity up high enough to ensure the public is safe.

Transend has approximately 8,000 support structures installed around Tasmania that we monitor and maintain to ensure a safe and reliable transmission network.

## The problem

The transmission line support structures that help carry electricity to Triabunna and the surrounding regions includes some older K-pole structures. These structures were first installed in 1927 in another part of Tasmania, and were relocated to this line in 1970. This makes them some of the oldest transmission structures in Australia. Considering their age they have provided Transend with good service, but they are now showing signs of severe rust and other factors that compromise their strength and they need to be replaced.

A failure of one of these structures would result in a significant power outage to Triabunna and the surrounding area for an extended period. There is also a risk that if one of these towers fell, it could start bushfire from the live wire touching the ground.

## Proposed solution

Our preferred option is to replace the remaining 42 K-poles. This would ensure that the supply to the Triabunna area would not be subject to failure of a K-pole structure, and significantly reduce the risk of a bushfire from fallen lines.

## Impact on customers

This will increase the reliability of the power supply to customers in the areas around Triabunna.

We will consult widely with the affected consumers, and landowners with the aim of engineering a technical and commercial solution that best meets the needs of all stakeholders.



*Example of a K-pole structure currently in service*

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# Strategic spare mobile 110/33/22/11 kV substation

CUSTOMER	COST	CAPACITY	COMPLETION
Load customers	\$7.1 m	10/15/25 MVA	2017

## Existing network

Transend needs to proactively manage the Tasmania's electricity transmission network and ensure we are able to meet the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

Transend has identified a need to ensure suitable system spares to minimise the time to restore load in the event of the total loss of an existing substation by providing a modular portable substation.

## The problem

In the event of a catastrophic failure of a system transformer at some substations, there could be a sustained loss of supply of up to 8 days to customers supplied from that substation.

This portable modular substation arrangement could be used to supply a new customer until their transformer can be manufactured and installed.

The mobile substation could also be used to maintain a power supply to customers when major maintenance is being carried out on system transformers.

## Proposed solution

Transend proposes to purchase a portable modular substation which can be used around the state as required.

The modular portable substation can be used for:

- risk mitigation and restoring supply to an area where local substation is unable to due to un-resolvable issues, eg. fire, major asset failure, etc; or
- quick supply provision for a short lead time customer connection; or
- maintaining supply to customer when major maintenance is being carried out on a transformer.

An additional advantage is that if substation assets replacement are deferred, the risk associated with failures can be somewhat mitigated by holding a strategic mobile substation.

## Impact on customers

Consultation regarding constructability and usage requirements will be agreed in advance with all affected customers.



A typical mobile substation installation

## Contacting Transend

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# Enterprise asset management system renewal project

CUSTOMER	COST	CAPACITY	COMPLETION
State-wide	\$6.2 m	-	2019

## Existing systems

Transend has a responsibility to proactively manage safety and security risks in Tasmania's electricity transmission network. We ensure the network can deliver the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

In order to deliver these requirements, we need to understand a great deal about our network assets. We need to know precisely what assets we own, where they are located, the condition that they are in, how they are performing and the maintenance that they require.

Transend uses an asset management information system (AMIS) to keep track of hundreds of thousands of assets. The AMIS ensures that all relevant information is captured throughout the life of every network asset. Information about asset commissioning, operation and maintenance, asset performance and eventual asset decommissioning is maintained. The AMIS holds millions of pieces of data that Transend uses to manage asset risk and to optimise infrastructure investments.

## The problem

At its core, the AMIS uses a piece of software known as an enterprise asset management system (EAM). The main software that Transend's uses as its EAM was first released in 1997. Seventeen years on the technology has become outdated. This software has become difficult to maintain and will progressively become more and more so.

Continued reliance upon an application that is based on unsupported technology presents significant risk to Transend if the application fails and cannot be rectified. Supporting an outdated system that can no longer be developed means that Transend has limited opportunity to further improve its asset information management capabilities.

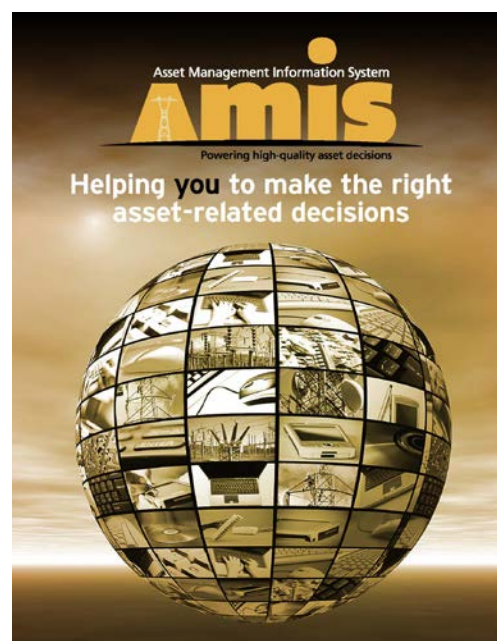
## Proposed solution

The preferred option is to replace the EAM software at the core of Transend's AMIS.

## Impact on customers and consumers

This project will maintain the reliability of the transmission system by improving the enterprise asset management system. Replacement of the aged EAM with a modern system will assist with the ongoing effectiveness of asset management practices.

No interruptions of power supply to customers will be required during implementation of this project.



*Asset Management Information System*

## Contacting Transend

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# Information Technology applications program

CUSTOMER	COST	CAPACITY	COMPLETION
State-wide	\$5 m	-	2019

## Existing systems

Transend has a responsibility to proactively manage safety and security risks in Tasmania's electricity transmission network. We ensure the network can deliver the ongoing and future electrical energy requirements of Tasmania in a cost effective, sustainable and efficient manner.

In order to deliver these requirements, we operate and maintain a large number of software applications to support virtually every business function. We support a diverse selection of systems, ranging from engineering applications such as network outage planning and network modelling applications through to corporate systems such as email and document management.

Transend undertakes full lifecycle management (procurement / build, implementation, maintenance and retirement) of over one hundred software systems that provide services to all staff and a range of external parties.

## The problem

Our Information Technology (IT) applications are assets that in many ways are similar to our transmission and telecommunication network assets—they require ongoing maintenance and replacement to ensure that they remain reliable, maintain performance and continue to manage corporate risks. In addition, evolving business environments and objectives often require new software or changes to existing software.

In order to support Transend's corporate objectives and regulatory requirements, ongoing identification, procurement, development, maintenance and disposal critical IT applications is required.

## Our approach

Many of our critical systems are scheduled for a major refresh or update within the next five years. Our approach involves assessing new versions of software and undertaking upgrades to systems when there are clear benefits in doing so.

## Impact on customers and consumers

This project will sustain the reliability of the transmission systems by maintaining critical IT applications.

No interruptions of power supply to customers will be required during implementation of this project.



IT Application Lifecycle Management

## Contacting Transend

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