



Northern planning area strategy

Area strategies for Tasmania's electricity network

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Authorisations

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Document control

Date	Version	Description	Author	Approved by
October 2015	1.0	Original Issue	Network Planning	Network Planning Team Leader
May 2016	1.1	Westbury area strategy and formatting updates	Network Planning	Network Planning Team Leader
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Responsibilities

This document is the responsibility of the Network Planning team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299. Please contact Network Planning with any queries or suggestions.

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Record of revisions

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Version 1.1	
7.3.4 and 8.0	Issue and strategy for Westbury supply area added
Whole document	Formatting to ensure consistency throughout document
Version 2.0	
Whole document	Update and structure modification for R19 submission
3.3.2	Strategy for Launceston CBD supply amended

Executive summary

The Northern planning area covers the greater Launceston area, George Town and the far north-east. This area is supplied through major supply points at Hadspen, George Town and Palmerston (near Poatina) substations.

Supply in the area is varied, with large transmission-connected customers and both urban and rural distribution networks. There are three transmission-connected customers supplied from George Town Substation, heavily inter-connected urban network in and around Launceston, and rural overhead networks. Issues presented in urban areas are generally those of capacity constraints, and in the rural areas are those where it is difficult to maintain adequate supply and reliability to townships and the end of long distribution feeders.

There is significant generation in the Northern planning area. Trevallyn Power Station supplies to the substations within the Launceston 110 kV network and Musselroe Wind Farm connects to Derby Substation. There are current connection enquires for new generation developments within the Northern planning area with proposed new [REDACTED]

The long term network development plan for the Northern planning area is small in terms of network augmentation requirements to 2050. The largest aspect of this is the establishment of the second 110 kV transmission circuit to Derby Substation. This may be required to facilitate future wind farm developments in north east Tasmania.

Within the 15-year planning period, the network development plan at the transmission and major distribution supply level is small and mostly focussed on asset replacements. The proposed development plan for the planning period is listed in Table 1 and detailed within this strategy. Additional limitations identified in this strategy will be monitored to assess whether corrective action is required.

Table 1: Network development plan for the Northern planning area

Location	Proposed development	Investment need	Estimated cost (\$m)	Forecast completion
Hadspen–Norwood 110 kV transmission line	Replace constraining dead end assemblies	Constrained line capacity	0.4	March 2018
Palmerston Substation	Replace Stanger type DR2 disconnector and earth switch	Asset condition	5.8	June 2019
George Town–Temco 110 kV transmission line	Replace transmission line	Asset condition	5.3	June 2023
George Town–Comalco 110 kV transmission line	Replace transmission line	Asset condition	2.1	June 2019
Westbury Urban reliability community	Rationalise supply to community and reduce exposure	Poor reliability	1.7	June 2023

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1 General

1.1 Introduction

TasNetworks prepares a suite of eight area strategies for Tasmania. These area strategies drive the development strategies for each of the seven planning areas, based on a geographic breakup of the network. The development strategies ensure that the network remains adequate under forecast demand, generation and performance scenarios.

1.2 Purpose

The purpose of this document is to identify the development strategy to maintain an adequate electricity network in the Northern planning area.

1.3 Scope

The area strategy addresses the transmission and distribution electricity networks within the Northern planning area.

1.4 Objectives

The objectives of this area strategy are to:

- provide an overview of the Northern planning area, and the electricity network within it
- present the long term transmission and sub-transmission network vision based on generation and maximum demand scenarios to 2050
- present the long term distribution network vision based on improved operability and development opportunities
- identify existing and forecast limitations based on the maximum demand forecast, security and reliability requirements and other factors
- present proposed developments to address the forecast limitations and other planning considerations such as asset retirements, operational constraints, and other factors
- identify opportunities for new network load connections at a transmission-distribution connection point level

1.5 Strategic context

The TasNetworks vision is to be trusted by our customers to deliver today and create a better tomorrow. The area strategies support this vision by ensuring the network continues to be adequate to cater for the demands on it (generation, load, reliability, performance and so on). The strategies also support the changing operation of the network to integrate more distributed energy resources and identifying opportunities to increase utilisation of the network, ensuring the lowest sustainable prices.

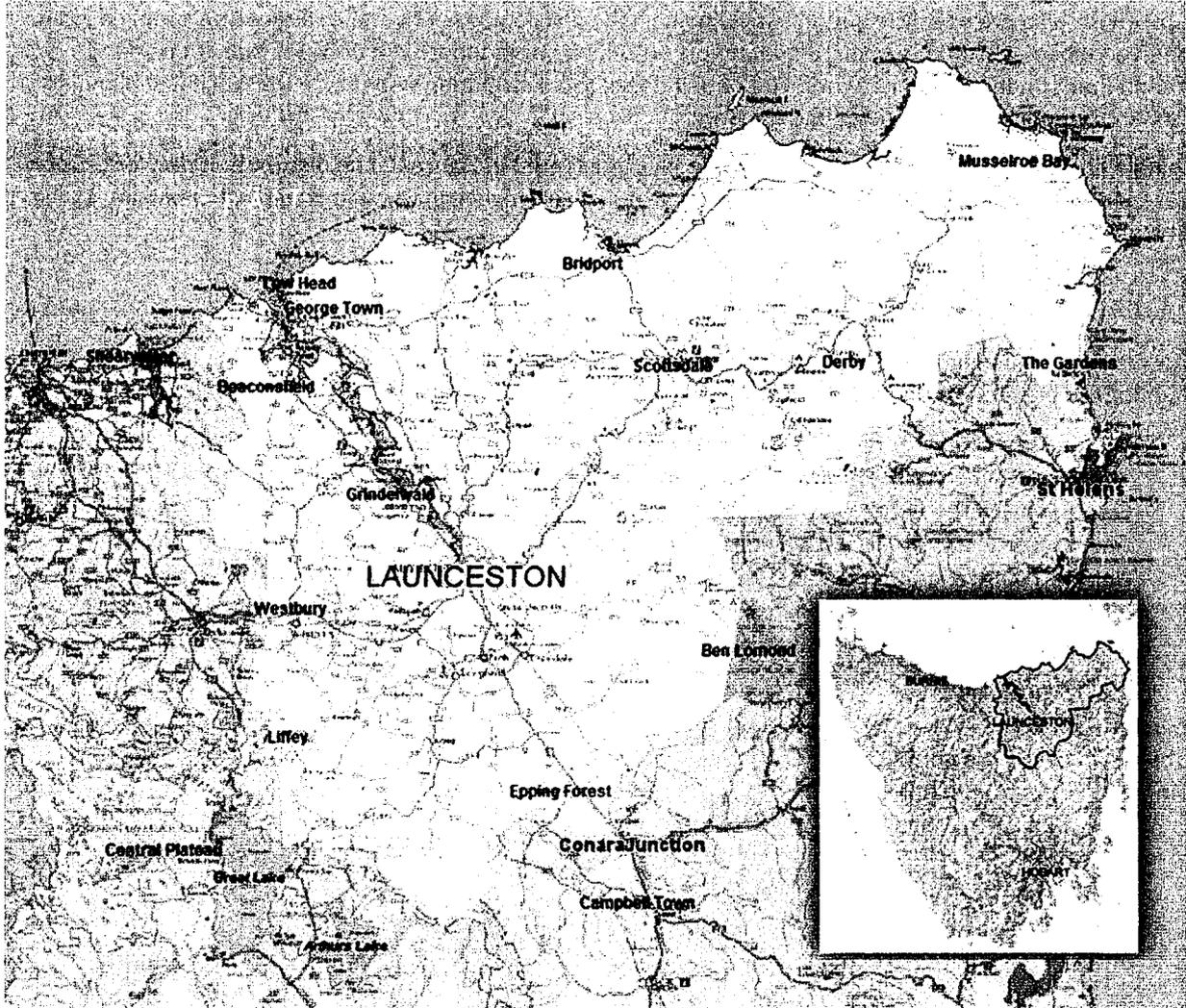
Strategic documents which the area strategies support include:

- TasNetworks Corporate Plan
- TasNetworks Business Plan
- TasNetworks Transformation Roadmap 2025
- Strategic Asset Management Plan
- Network Development Management Plan

2 Area overview

The Northern planning area covers the greater Launceston area, George Town and the far north-east. This area is supplied through major supply points at Hadspen, George Town and Palmerston (near Poatina) substations. The Northern planning area is shown in Figure 1.

Figure 1: Geographic diagram of the Northern planning area



2.1 The network

The Northern planning area is supplied via different supply arrangements from the transmission network. Three transmission-connected customers and Basslink are supplied from George Town Substation.¹ There are nine transmission-distribution connection points (substations) providing supply to the distribution network at 22 kV. A 110 kV transmission loop around Launceston supplies Hadspen, Trevallyn, Mowbray, St Leonards and Norwood substations and the Norwood–Scottsdale–Derby 110 kV transmission network supplies Scottsdale and Derby substations. Major supply points at George Town and Palmerston substations also provide distribution supply points. The distribution network in Launceston supplied from the five looped substations is an urban network with high interconnectivity between substations and predominant underground network. The remainder of the distribution network in the Northern planning area is predominately rural overhead network.

A single line diagram of the transmission network is presented in Figure 2. The distribution network supply areas for each substation are shown in Figure 3. Detail on the existing assets and transfer capability at the substations is presented in Appendix A.

2.1.1 Transmission

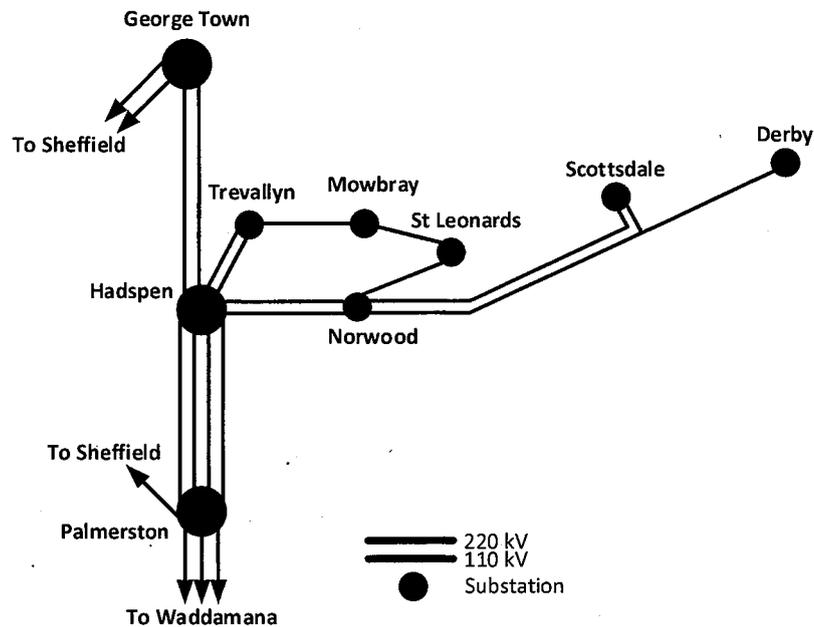
The Northern planning area transmission network is considered in four localities for the purpose of area planning. As presented in Figure 2, they are the:

- **Launceston 110 kV network:** a 110 kV transmission loop around Launceston, from Hadspen Substation and supplies Trevallyn, Mowbray, St Leonards and Norwood substations
- **Scottsdale–Derby network:** supplied via the double-circuit Norwood–Scottsdale and single-circuit Derby Spur 110 kV transmission lines, supplied from one of the Norwood–Scottsdale circuits
- **George Town:** an islanded 110 kV network supplied from the 220 kV network at George Town Substation which provides supply to the distribution network and transmission-connected customers TEMCO and Timberlink Australia supplied at 110 kV, Bell Bay Aluminium at 220 kV
- **Palmerston:** supply to the local distribution from Palmerston Substation

There have been no significant developments in the Northern planning area transmission network since publication of the previous Northern planning area strategy in May 2016. There are also no significant committed developments.

¹ Local supply arrangements or constraints to the transmission-connected customers are considered in this Northern planning area strategy. Issues pertaining to the bulk transmission network and security of the wider power system are outside the scope of this strategy and are considered in the Core Grid strategy.

Figure 2: Northern planning area distribution network diagram



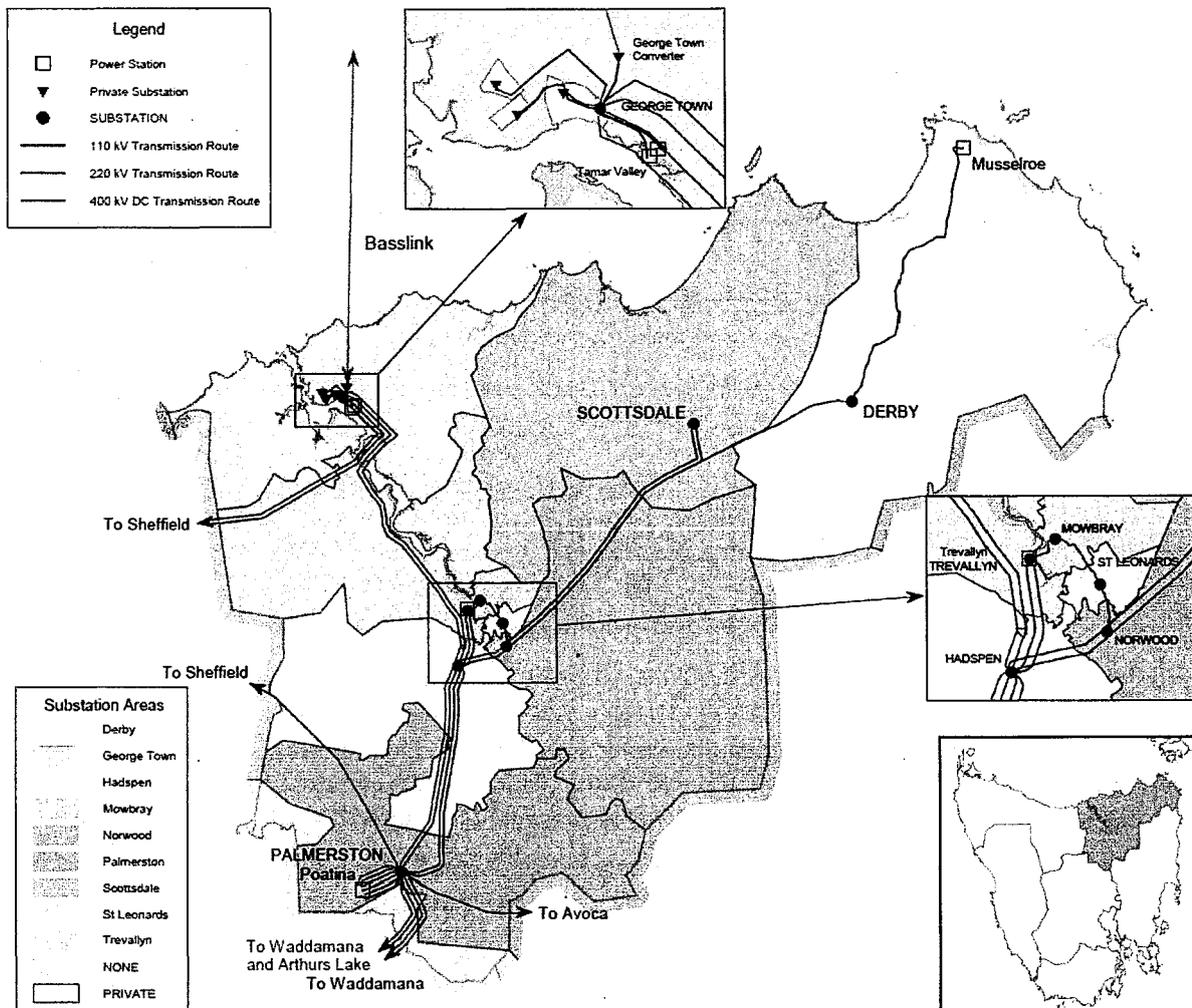
2.1.2 Distribution

The distribution network in the Northern planning area is supplied from nine transmission-distribution connection points. The distribution network in the Northern planning area operates at 22 kV. The distribution network supply areas for each substation are presented in Figure 3.

Areas within the Northern planning area distribution network of particular focus are the supply to Westbury township and industrial estate and the supply within the Launceston urban area. These localities are:

- **Westbury:** the township and industrial estate are supplied at the end of two long feeders from Hadspen Substation. Limited backup supply is available, and the township has a high reliability standard.
- **Launceston:** urban distribution network supplied from five transmission-distribution connection point substations with generally strong interconnections between substations.
- **North East:** rural distribution network supplied from feeders from Scottsdale and Derby substations.
- **Palmerston:** rural distribution network supplied from feeders from Palmerston Substation.
- **Tamar:** semi-rural and urban distribution network of east and west Tamar and George Town supplied from feeders from Trevallyn and George Town substations.

Figure 3: Distribution network substation supply areas



There has been one significant developments within the Northern planning area distribution network identified in the previous Northern planning area strategy, completed since its publication in May 2016, being:

- replacement of GI conductor on Trevallyn feeder 61043 supplying Windermere, Dilston and Swan Bay area. This has improved voltage regulation in the area, however further action is proposed as detailed in section 4.2.4.

There are no material projects committed or underway in the distribution network in the Northern planning area.

2.2 Customers

This section details the material existing and proposed generation and load customers in the Northern planning area.

2.2.1 Generation

There are four transmission-connected generation sites in the Northern planning area. Poatina (300 MW) and Tamar Valley (386 MW) power stations supply directly to the core grid and not discussed here. The two other sites within the Northern planning area are presented in Table 2. There are four embedded generators over 0.5 MW capacity, presented in Table 3. There are currently connection enquiries for two new generation sites, presented in Table 4.

Table 2: Transmission-connected generation

Generation site	Description	Capacity (MW)
Trevallyn Power Station	Hydro power station connected to Trevallyn Substation. Majority of power generated is consumed by substations within the Launceston 110 kV transmission loop.	95.8
Musselroe Wind Farm	Wind farm connected to Derby Substation. Large size compared to load at Derby and Scottsdale substations means majority of power is exported to Norwood Substation and Launceston 110 kV transmission loop and into the core grid from Hadspen Substation.	168

Table 3: Embedded generation over 0.5 MW

Location	Source	Capacity (MW)	Export (MW)	Connecting feeder
Mowbray	Biomass	1.1	1.1	Mowbray feeder 62006
Launceston	Natural gas	2.0	2.0	Trevallyn feeder 61026
Derby	Hydro	1.12	1.12	Derby feeder 55001
Herrick	Hydro	1.25	1.25	Derby feeder 55002

Table 4: Proposed transmission-connected generation developments

Location	Source	Capacity (MW)	Status	Timing	Reference
[REDACTED]	[REDACTED]	[REDACTED]	Enquiry	[REDACTED]	2.2.1.1
[REDACTED]	[REDACTED]	[REDACTED]	Enquiry	[REDACTED]	2.2.1.2

2.2.1.1 [REDACTED]

[REDACTED]

[Redacted]

[Redacted]

[Redacted]

2.2.1.2

[REDACTED]

[REDACTED]

[REDACTED]

2.2.2 Load

There are three transmission-connected customers in the Northern planning area, all supplied from George Town Substation. These are identified in Table 5. The local supply arrangement of these customers is considered in this strategy, however their performance in regards to the power system as a whole is considered in the Core grid strategy.

There are a number of large customers within the distribution network in the Northern planning area.

Table 5: Transmission-connected customers in Northern planning area

Customer	Operations	Contract capability (MW)	Supply arrangement
Bell Bay Aluminium	Aluminium smelter	[REDACTED]	Double-circuit 220 kV transmission line from George Town Substation
TEMCO	Manganese smelter	[REDACTED]	Double-circuit 110 kV transmission line from George Town Substation

[REDACTED]

Customer	Operations	Contract capability (MW)	Supply arrangement
Timberlink	Timber mill	■	Single-circuit 110 kV transmission line from George Town Substation

2.3 Reliability

Like most of Tasmania, the Northern planning area consists mainly of Low Density Rural supply reliability communities, with pockets of High Density Rural and Urban communities around local townships. There are large Urban communities of Launceston and Tamar South covering greater Launceston area. There are two High Density Commercial communities Launceston CBD and Kings Meadows. There are 24 reliability communities in the area.

The area has five loop automation schemes to minimise outage durations to some communities. A loop automation scheme is a control scheme to automatically reconfigure the HV network to resupply unaffected areas during fault events.

3 Long term network development

The long term network development presents the load and generation scenarios to 2050 and the likely state of the network required to support them. This long term network development has not been justified economically or deeply considered against alternative options, but provides a reasonable assessment of the solutions forecast in the long term if met by network development.

The long term network development plan informs the path that developments in the transmission and sub-transmission network 15-year planning horizon should follow to ensure that network development remains efficient in the long term.

A distribution network supply vision is also presented. This vision is largely driven by existing network and operational limitations and development opportunities. There are no specified triggers for this vision and it has not been justified.

3.1 Scenarios

We consider planning scenarios for load and generation as a basis for the long term network vision.

3.1.1 Load

The scenario considered in the load change to 2050 is the extrapolated AEMO connection point forecast. Specifically, this forecast is the 2017 AEMO Transmission Connection Point Forecasts for Tasmania (connection point forecast). This connection point forecast is provided to 2026 and has been extrapolated to 2050.

The forecast for each connection point in general is flat or declining to 2021 before recovering or the rate of decline reducing. In extrapolating the forecast, 2021 was used as the base year with the growth factor between 2021 and 2026 used to extrapolate the forecast to 2050. The assumption being that this recovering demand growth or reduced rate of decline will continue. This assumption aligns with AEMO's 2016 National Electricity Forecasting Report (NEFR), which provides a regional (state) forecast for Tasmania, which forecasts a decline in early 2020s before recovering and continuing to grow to 2037, the end of the forecast.

AEMO’s 2016 National Electricity Forecasting Report, including a regional (state) forecast for Tasmania, contains Neutral, Strong, and Weak economic scenarios. The connection point forecast is only provided under the Neutral scenario. Hence, the load scenario presented here is only provided under this single Neutral scenario.

Table 6: 2050 maximum demand forecast

System	2016 maximum demand (MW)		Maximum demand forecast for 2050 (MW)
	Actual	Weather corrected	
George Town Substation	17.0	17.9	11.2
Palmerston Substation ⁴	10.3	10.0	18.9
Launceston 110 kV transmission locality	181.5	187.7	226.7
Hadspen Substation	50.4	52.1	68.7
Trevallyn Substation	69.0	71.2	68.3
Norwood Substation	27.2	26.7	19.1
Mowbray Substation	33.4	35.2	64.1
St Leonards Substation	26.8	28.8	41.8
Scottsdale–Derby locality⁴	15.5	14.9	21.2
Scottsdale Substation ⁴	11.0	10.3	13.8
Derby Substation ⁴	6.5	6.5	10.3

3.1.2 Generation

The long term network development plan is also driven by generation scenarios within the area.

There are currently two identified grid-scale potential generation developments in the Northern area: [REDACTED], identified in Section 2.2.1. [REDACTED], and as such is considered as part of the Core grid strategy and not addressed in this Northern planning area strategy.

[REDACTED]

There remains possibility of other grid-scale generation within the Northern planning area. Continuation to a low emissions future in the NEM means future renewable energy development in Tasmania is highly likely. In the Northern planning area, this would most likely be wind farms. As there are currently no specific identified opportunities or any level of certainty, this scenario is not included in the long term network development plan identified here. However the far north-east appears the most likely wind resource to be developed in the Northern planning area.

⁴ Summer peaking substation/locality

There will be a continued increase in embedded generation within the distribution network, including small-scale photovoltaic and batteries, with the effects of this reflected in the demand forecast. We expect that increasing photovoltaic and batteries will increase bi-directional power flows within the distribution network, but this will not be sufficient to materially affect flows with the transmission and sub-transmission networks part of this long term network development plan.

3.2 Long term network development plan

There is limited network augmentations are expected to be required to meet the load and generation scenario requirements to 2050, presented in Section 3.1. This section presents the long term network development plan forecast requirement under these scenarios.

As discussed the long term network development plan has not been justified economically or deeply considered against alternative options, but provides a reasonable assessment of the solutions forecast in the long term if met by network development.

The long term network development plan of the transmission and sub-transmission network is displayed in Figure 6 and summarised below.

3.2.1 Launceston 110 kV transmission loop locality

Mowbray and Hadspen substations are forecast to experience significant and moderate growth in maximum demand to 2050 such that both substations will exceed their firm rating (both 50 MVA). Maximum demand at other substations in the Launceston 110 kV transmission loop, Trevallyn, St Leonards, and Norwood, is forecast to remain flat, grow, and decline, respectively, to 2050. The capacity at all substations within the locality is sufficient that load between the five substations can be managed within the group firm rating of the substations. This means that, for example, load between Mowbray, St Leonards and Norwood substations can be rationalised such that all remain within their firm ratings. As a result, there is no forecast significant transmission network investment in the locality to 2050.

3.2.2 Derby Substation second supply transformer

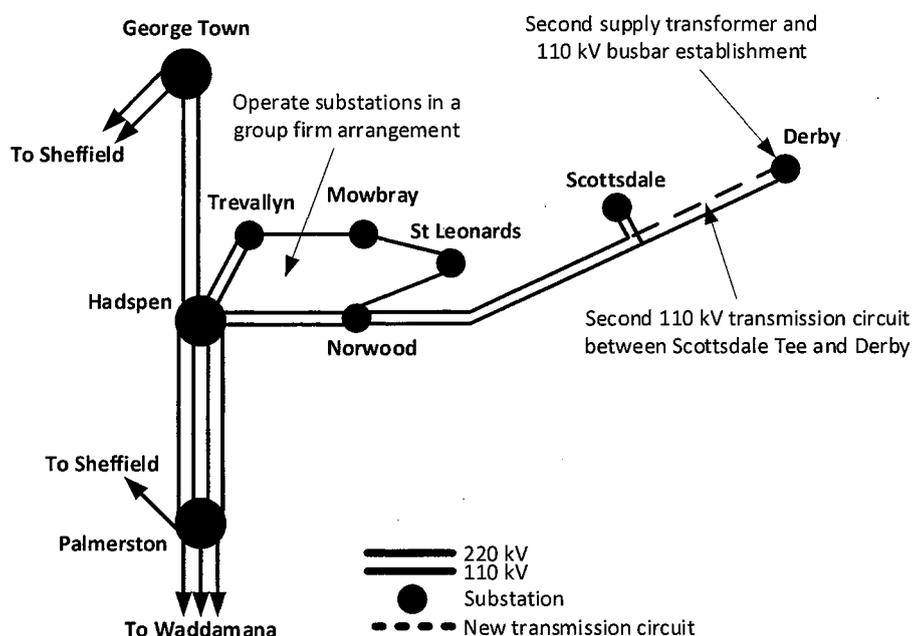
Derby Substation currently has a single supply transformer, with a capacity of 17 MVA. The maximum demand forecast for Derby Substation for 2050 is 10.3 MVA. This remains within the capacity of the existing transformer, however it is expected that for a transformer contingency there will be insufficient backup capability in the distribution network to maintain unserved energy below 300 MWh, as required by the network planning requirements⁵. The anticipated network solution is to install a new, second supply transformer at Derby Substation to provide firm capacity to the connected load. A second supply transformer will require the establishment of a 110 kV busbar.

3.2.3 Second Scottsdale Tee–Derby 110 kV transmission circuit

Derby Substation is supplied via a single 110 kV transmission circuit strung on a double circuit-capable transmission line. Though supplying the substation, the main purpose of this circuit is to transmit the energy from Musselroe Wind Farm to the wider network. As identified in Section 3.1.2, we anticipate new wind farm development in this area. Stringing the second side of the transmission line will provide for non-firm transmission capability of approximately 240 MVA to Norwood Substation – not accounting for the load at Derby and Scottsdale substations.

⁵ *Electricity Supply Industry (Network Planning Requirements) Regulations 2007*
<https://www.legislation.tas.gov.au/view/whole/html/inforce/2013-11-13/sr-2007-114>

Figure 6: Long term network development plan



3.3 Distribution network supply vision

A distribution network supply vision is presented for those supply areas within the distribution network where relevant. The vision is largely driven by existing network and operational limitations and development opportunities, and provided where these will likely drive material changes to the distribution network. There are no specified triggers for the vision and the vision may not have been justified. In the Northern planning area, two material distribution network supply visions have been identified.

3.3.1 Westbury supply area

The distribution network supplying the Westbury supply area, covering Westbury and Deloraine townships and surrounds, is approaching its limits of supply. Moderate load growth is forecast for the area, although there has been recent interest in supply to the Westbury industrial estate, with a number of prospective customer developments identified. The Westbury supply area is supplied via two feeders each from Hadspen and Railton (North West planning area) substations and one from Palmerston Substation, as shown in Figure 7.

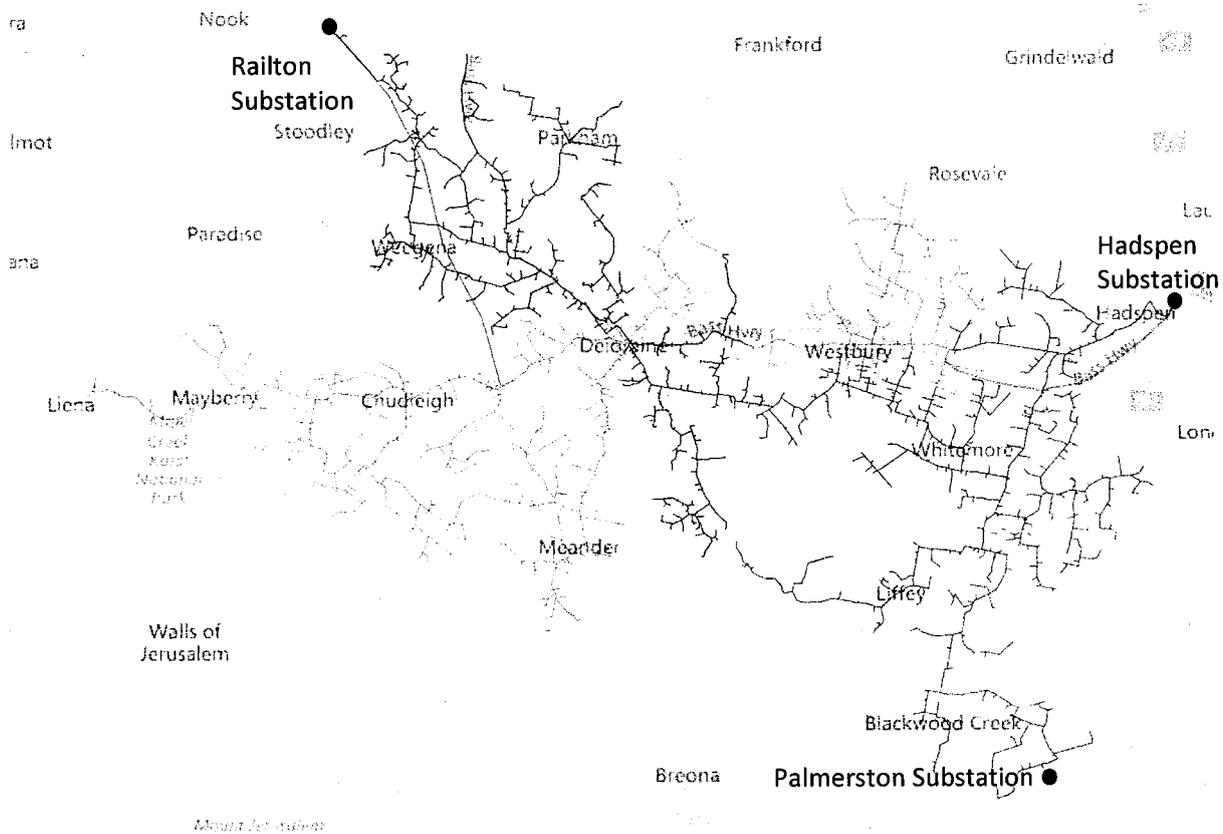
BOC, a business in Westbury, has the ability to participate in demand side management. The Tasmanian gas supply network is available in Westbury, meaning there is potential for gas or co-generation embedded generation. This may be a viable option for deferring significant network investment in the area.

The strategy is to continue to develop the distribution network in the area. This comprises establishing additional feeders from Hadspen, Palmerston and Railton substations. Additional feeders will be developed as required based on size and location of load increases in the area. A new substation injection point at Westbury is not considered technically or economically justified unless there is a material increase to the maximum demand forecast in the area.

This strategy has been developed in the Westbury area strategy.⁶

⁶ Westbury area strategy – R453758 (Network Planning team zone)

Figure 7: Westbury supply area



3.3.2 Launceston CBD supply area

As presented in Section 3.2.1, the long term network development plan for the Launceston 110 kV transmission loop is to manage demand on a group firm basis. This means rationalising the distribution network supplied from these substations to maintain firm supply to the Launceston CBD supply area. As maximum demand in Launceston CBD is forecast to grow, this will be met initially through continued development of the 22 kV distribution network deferring a requirement for any new transmission-distribution connection points (substations). A Launceston CBD substation, in the vicinity of Cimitiere Street may be required within the forecast period to manage aggressive developments (not included in the forecast) within the CBD area. TasNetworks own a site (ex-East Launceston 22/6.6 kV zone) in Cimitiere Street that may be developed as a new connection point.

4 Planned investments and forecast limitations

This section presents the planned investments and forecast limitations in the Northern planning area for the 15-year planning horizon to 2032. The planned investments present the investment need, timing, deferral opportunity and proposed solution with expected cost and other options considered. Forecast limitations present the location and timing of limitations, requirements to defer the limitation, and potential options to alleviate them.

4.1 Planned investments

This section presents the planned investments within the network during the next 15 years. These projects have been identified as the preferred solutions through technical and economic analysis.

4.1.1 Hadspen–Norwood 110 kV transmission line dead end assembly rating upgrade

Identified need

We identified a number of transmission lines where dead end assemblies were not rated to the rating of the conductor. As a result, the thermal capacity of the lines was de-rated, constraining the amount of power flow through them.

Proposed solution

We have developed a program to upgrade the assemblies that constrain the transmission line ratings. We are implementing this program as part of our Network Capability Incentive Parameter Action Plan, part of our transmission Service Target Performance Incentive Scheme for the 2014–19 regulatory period. The Hadspen–Norwood 110 kV transmission line is being performed under stage 2 with the Liapootah–Chapel Street 220 kV transmission line.

The estimated cost of stage 2 of this program is \$388,000 and it is planned to be operational by March 2018.

4.1.2 Palmerston Substation disconnectors and earth switch replacements

Identified need

The population of Stanger type DR2 disconnectors are unreliable and are approaching the end of their service lives, with spare parts no longer available.

Proposed solution

As part of the replacement programs for these assets, we propose a project at Palmerston Substation to replace the 23 type DR2 disconnectors and associated earth switches. This will reduce the risk of failure of equipment due to poor condition, and increase transmission circuit availability.

We assessed whether to replace the assets by 2019 or defer replacement past this time. The most economic option to address the need is to replace the disconnectors and earth switches.

The estimated cost of this project is \$5.8 million and it is planned to be operational by June 2019.

4.1.3 George Town–Temco 110 kV transmission line replacement

Identified need

The George Town–Temco 110 kV transmission line is a double-circuit radial transmission line supplying transmission-connected customer TEMCO. The line is approaching the end of its service life, with asset inspection and condition monitoring identifying deteriorated tower bolts and members. The failure of these tower structural components could lead to collapse of the tower. This could result in live conductors coming into contact with the ground and initiating fires, injuring the public, or causing damage to third party property, and a sustained interruption to supply.

Proposed solution

We propose to renew the transmission line with a new standard steel pole double-circuit transmission line. This will mitigate the risk of asset failure, preventing an unacceptable increase in risk and is the most prudent economic option.

Other options considered were to (1) perform corrective maintenance and emergency replacement of the line, when required, and (2) continue preventive maintenance, including tower painting (15-year cycle), foundation works and conductor replacement. Option (1) does not suitably address risks associated by the deteriorating line condition, and option (2) is not as economic as the preferred option.

The estimated cost of this project is \$5.3 million and it is planned to be operational by June 2023.

4.1.4 George Town–Comalco 220 kV transmission line replacement

Identified need

The George Town–Comalco 220 kV transmission line is a double-circuit radial transmission line supplying transmission-connected customer Bell Bay Aluminium. The transmission line is a number of priority 3 defects which have a nominal 12-month replacement time. Condition assessment identified 32 priority three defects across the line’s five spans, all as a result of corrosion.

Proposed solution

We propose to renew the transmission line with a new standard double-circuit transmission line. This will mitigate the risk of asset failure, preventing an unacceptable increase in risk and is the most prudent economic option.

We also considered the option to refurbish the transmission line. This includes tower painting (15-year cycle), insulator and conductor replacement, and foundation works. This options addresses the risks associated with the condition of the line, however is not as economic as the preferred option.

The estimated cost of this project is \$2.1 million and it is planned to be operational by June 2019.

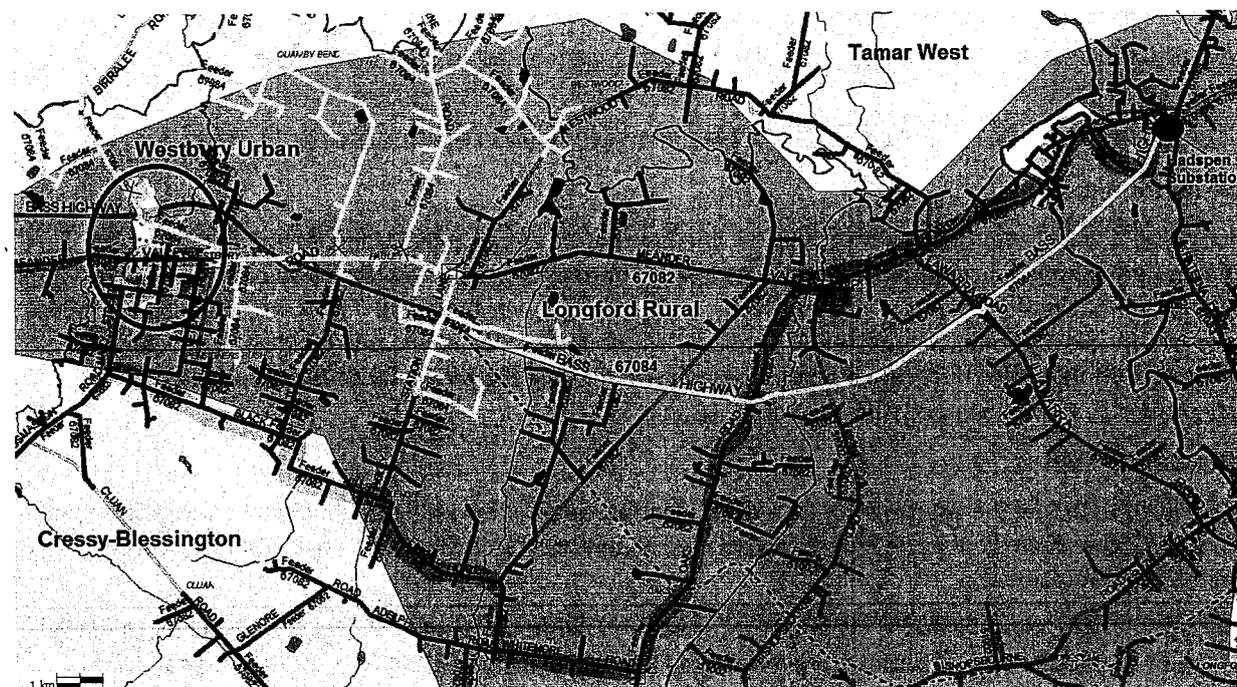
4.1.5 Westbury Urban community reliability improvement

Identified need

Westbury Urban supply reliability community is supplied from two distribution feeders from Hadspen Substation. Within this community, feeder 67082 (approx. 37 km supply length) supplies the 724 customers in the Westbury township and feeder 67084 (approx. 27 km supply length) supplies the 57 customers in the portion of the Westbury industrial estate covered by this community.

Figure 8 shows the supply from Hadspen Substation to Westbury Urban supply reliability community, with the main supply trunk of feeder 67082 to Westbury highlighted.

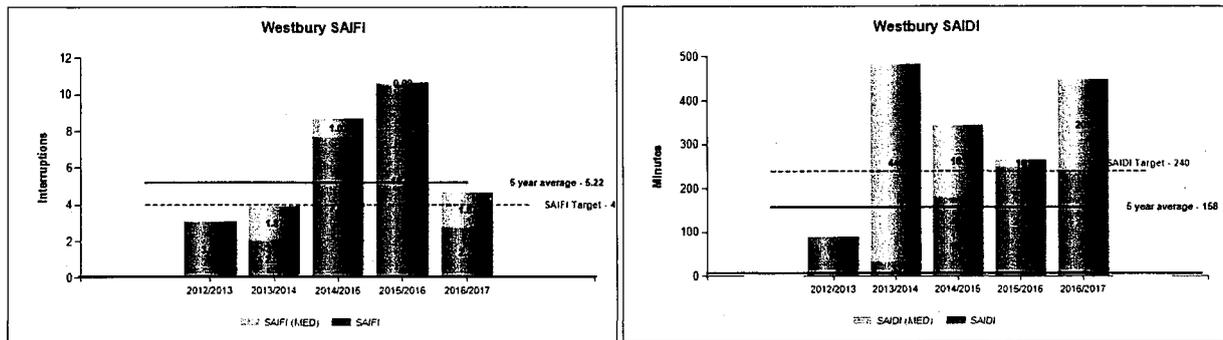
Figure 8: Westbury Urban reliability community supply



Westbury Urban supply reliability community does not meet its reliability requirements, both SAIFI and SAIDI, as specified in Table 3 of section 8.6.11 Interruptions to supply of the Tasmanian Electricity Code (the Code). The Code requires us to use “reasonable endeavours” to meet reliability targets.

Figure 9 presents the five-year average reliability performance of the community. Note that the average shown does not include the contribution from major event days (MEDs). This contribution is included in performance measured against the Code and, as such, the community does not meet reliability requirements under both measures.

Figure 9: Westbury Urban reliability community performance



Proposed solution

The preferred option is to reduce community exposure to outages through reducing the length, and hence exposure, of feeders supplying it. The project will ensure feeder 67082 provides a cleaner, more direct supply to Westbury Urban supply reliability community. Under this project, the supply length of distribution feeder 67082 to Westbury (which supplies over 90 per cent of the customers in the community) will be reduced from approximately 37 km to 23 km, reducing the exposure to faults on this feeder by over 35 per cent.

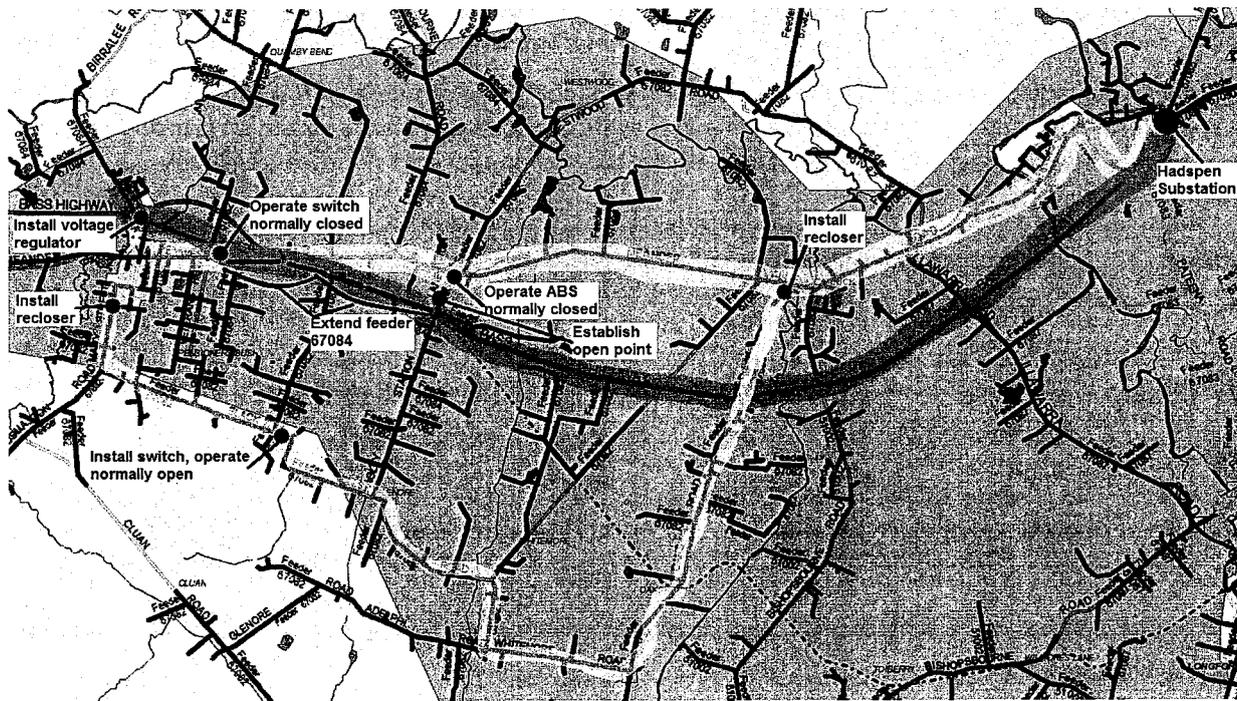
The options analysis performed here was a desktop assessment of the options available. The preferred option is the only one considered that is technically and economically feasible. There are no credible non-network options to address the identified need.

The estimated cost of this project is \$1.7 million and it is planned to be operational by June 2023.

The development strategy, outlined in Section 3.3.1, for Westbury and surrounds is to continue to reinforce the distribution network supplying it. The preferred option supports this strategy.

Figure 10 shows the scope of works for this project. The thick lines show the new supply routes for feeders 67082 to Westbury township (yellow) and 67084 to Westbury industrial estate (orange). The thin yellow line shows the longer, less direct existing supply route for feeder 67082 to Westbury township. Also shown are the new control stations and open/close points required to support the new feeder configurations.

Figure 10: Westbury Urban reliability community improvement works



4.2 Forecast limitations

This section presents the forecast limitations, not addressed by a planned investment in Section 4.1, within the network during the 15 year planning period. These limitations identify the points in the network that are currently inadequate to cater for the future demand on the network due to the following considerations:

- demand forecast
- asset refurbishment replacement or retirement requirements
- security and reliability requirements
- regulatory and jurisdictional requirements
- power quality
- fault levels
- generation, demand-side and other developments
- operational constraints
- national transmission network development plan
- power system risk review
- market benefits assessment

The limitations identified here are those in the transmission network and those in the distribution network that are likely to have a material effect on operation of the network.

4.2.1 Mid-Tamar (Exeter etc) reliability community performance

Identified need

The Mid-Tamar (Exeter etc) reliability community is a High Density Rural community along the west of the Tamar River. It is located approximately halfway between George Town and Trevallyn substations and is supplied through three 22 kV feeders, one from George Town Substation (feeder length approximately 35 km) and two from Trevallyn Substation (feeder lengths approximately 25 km and 40 km).

Figure 11 shows the supply arrangement to the Mid-Tamar (Exeter etc) reliability community. Feeder 53004 (pink) from George Town Substation supplies the northern section of the community, and feeders 61023 (purple) and 61028 (dark red) from Trevallyn Substation supply the centre and southern sections of the community, respectively.

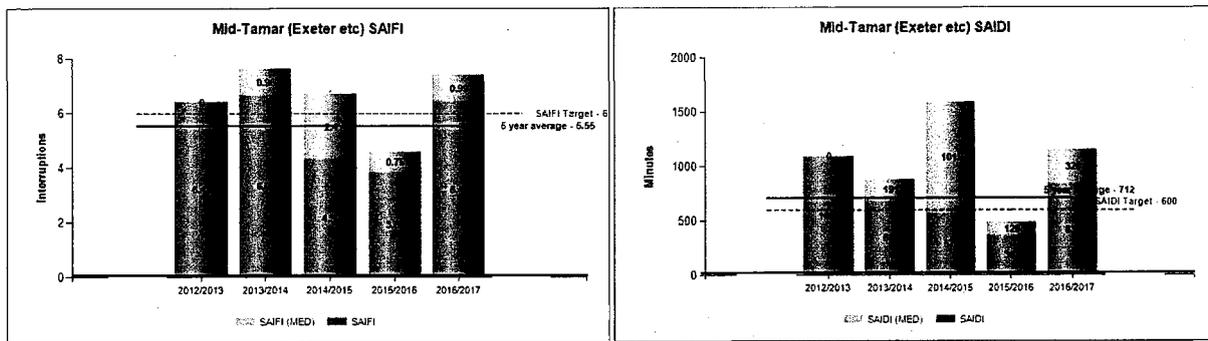
Figure 11: Mid-Tamar (Exeter etc) reliability community supply



The Mid-Tamar (Exeter etc) reliability community is poor performing. It has not met its SAIFI and SAIDI thresholds, on average, since 2012–13. Figure 12 presents the SAIFI (frequency) and SAIDI (duration) yearly and five-year average reliability performance against the standards for urban reliability communities.⁷ The five-year average does not include the contribution from outages on major event days (MED); however outages on MEDs have had a material impact on supply reliability to this community and is included in reliability performance reported to the jurisdictional regulator (Office of the Tasmanian Economic Regulator) against the community thresholds.

⁷ Service Performance - Community list by customer, retrieved October 2017.
[http://reportzone.tnad.tasnetworks.com.au/bi/_layouts/15/ReportServer/RSViewerPage.aspx?rv:RelativeReportUrl=/bi/ASP/Performance%20Report%20-%20Internal/Service%20Performance%20by%20Community%20\(Customer\).rdl](http://reportzone.tnad.tasnetworks.com.au/bi/_layouts/15/ReportServer/RSViewerPage.aspx?rv:RelativeReportUrl=/bi/ASP/Performance%20Report%20-%20Internal/Service%20Performance%20by%20Community%20(Customer).rdl)

Figure 12: Mid-Tamar (Exeter etc) reliability community performance



There is no dominant contributor to the community’s poor reliability performance, with supply interruptions coming almost equally from many causes.

Potential solution

We propose to continue to monitor the Mid-Tamar (Exeter etc) reliability community performance. We will assess the suitability of reliability improvement investments under ongoing TRIP-P, TRIP-S and other reliability improvement programs. We may review the reliability management plan for Mid-Tamar (Exeter etc) reliability community should the five-yearly average reliability performance deteriorate.

4.2.2 Trevallyn Substation 22 kV fault level

Limitation overview

The maximum allowable fault current contribution at transmission-distribution connection points in the network is 13 kA. This is stated in connection agreements that must exist between the transmission and distribution network service providers, despite TasNetworks being bot. Clause 5.2.3 (e1)(2) of the Rules states that “a network service provider must ... arrange for operation of its network such that the fault level at any connection point ... does not exceed the limits that have been specified in a connection agreement”.

The maximum three-phase fault level on the 22 kV busbar at Trevallyn Substation is 14.1 kA. To meet the connection agreement, a circuit breaker is opened to remove a supply transformer from service. With this arrangement, the maximum fault level is reduced to 10.2 kA. An auto-close scheme is in place to immediately close the circuit breaker and maintain supply for the loss of one of the in-service transformers. Despite the auto-close scheme, some sensate customer will have their supply interrupted.

Proposed solution

We propose to continue the current solution and auto-close scheme. A detailed study is required to provide the technical and economic justification to again operate the substation with all elements in service. To ensure sufficient fault rating in the distribution network, primary and secondary equipment in the high fault level zone will need to be reviewed and upgraded as necessary, with possible new technology deployed such as intelli-rupters.

4.2.3 Scottsdale Tee–Derby 110 kV transmission circuit section thermal capacity

Identified need

Musselroe Wind Farm is rated at 168 MW and is connected at Derby Substation and supplies into the network via the single Scottsdale Tee–Derby 110 kV transmission circuit section. The summer static rating of this circuit is 156 MVA, with work book ratings are applied to this circuit. A constraint equation is in place to constrain generation from Musselroe Wind Farm to prevent overloading the circuit. This equation bound for 221 hours over 2014–15 and 2015–16, 1.3 per cent of the time.

Proposed solution

A weather station at Derby Substation would enable dynamic (real time) line ratings to be applied to this circuit. This would generally provide higher thermal capacity to the Scottsdale Tee–Derby 110 kV transmission circuit, enabling less or no constraint on Musselroe Wind Farm generation. This is estimated to cost approximately \$140,000.

We have conducted a market benefit analysis on this solution; however it represented a net cost because of the ongoing maintenance cost of the weather station. As such, we will continue to

4.2.4 Minor distribution network limitations

There are a number of non-material distribution network limitations identified in the Northern planning area. Table 7 provides an overview of these with the issue, probable strategy to address it, and the type of issue presented. All the issue and strategies identified here are subject to further study before a solution will be implemented.

Table 7: Minor distribution network limitations

Issue	Probable strategy	Issue type
Limited load transfer capability at George Town Substation which impacts customer reliability	Reconfigure network to supply East Tamar area from Mowbray Substation, allowing increased transfer capacity	Operational limitation
Limited transfer capability between the three 22 kV express feeders from Trevallyn Substation to the Launceston CBD, 61024, 61039 and 61040, unable to transfer the full load quickly	Utilise the ex-super feeders between Mowbray and Trevallyn Substations to supply the Launceston CBD	Operational limitation
Trevallyn feeders 61037 and 61041 pass through the Trevallyn Nature Recreation Area and in close proximity to Cataract Gorge. The terrain in this location presents safety, environmental, reliability, and maintenance risks. The poles in this section are approaching their end of life.	Remove this section of feeders and reconfigure network when asset condition dictates	Asset condition
Windermere, Dilston and Swan Bay area is supplied from Trevallyn feeder 61043. Voltage in the area can be difficult to manage during peak periods.	Strategy in the area is to split the feeder 61043 into two parts (Legana area and Dilston area) to enable better voltage regulation for the entire area. The Legana area will continue to be supplied from Trevallyn Substation and the Dilston area will be supplied from Mowbray Substation.	Voltage compliance
St Leonards feeder 66106 provides back up supply to Launceston General Hospital. The feeder has insufficient capacity to provide full back up to the hospital during peak loading periods.	Sufficient back up supply arrangement not yet identified	Operational limitation

Issue	Probable strategy	Issue type
Voltage near the existing Bridport regulator operates with a larger than 6% voltage drop. A large connection enquiry for a dairy and irrigation scheme in nearby Tomahawk will require the installation of a new regulator near Jetsonville to ensure voltage compliance.	Continue engagement with the potential new customer connection to ensure the most economic and strategic network augmentation is adopted	Voltage compliance
Perth township is supplied via Hadspen feeder 67090. During peak demand periods, voltage drop along this feeder has been greater than 6%.	Consider options such as installing voltage regulation near Devon Hills, or reconfigure the network to transfer some load to Norwood Substation	Voltage compliance

5 Network opportunity

The Northern planning area has a number of load connection points with sufficient capacity such that new loads could connect with minimal or no augmentation to the connection point substation to accommodate it. Note that although capacity at the substation may be available, the new load may result in other augmentation work required for capacity increases deeper in the transmission network or for network security or reliability reasons.

Table 8 shows the available firm capacity at each connection point substation now and at the end of the planning period where redundancy is available, and the non-firm capacity at single transformer substations.

Table 8: Available substation capacity (MVA)

Substation	Firm capacity	Existing		2032	
		Demand	Available capacity	Forecast demand	Available capacity
George Town	50	17.0	33.0	14.6	35.4
Palmerston	25	10.3	14.7	13.7	11.3
Hadspen	50	50.4	0	56.8	0
Trevallyn	100	69.0	31.0	65.3	34.7
Norwood	50	27.2	22.8	21.8	28.2
Mowbray	50	33.4	16.6	49.5	0.5
St Leonards	60	26.8	33.2	32.5	27.5
Scottsdale	31.5	10.7	20.8	11.0	20.5
Derby (single transformer)	25	6.5	18.5	7.5	17.5

Appendix A – Area capability information

This appendix provides information on the network capability in the Northern planning area. The supply transformer capacity at each substation is provided in Table 9. The transfer capability from each substation is provided in Table 10. Table 11 provides an overview of the demand reduction capability for large customers in the distribution network.

Table 9: Substation supply transformer capacity

Substation	Number of transformers	Transformer capacity (MVA)	Transformer primary/secondary voltage
George Town	2	50	110/22
Trevallyn	3	50	110/22
Mowbray	2	50	110/22
St Leonards	2	50	110/22
Norwood	2	50	110/22
Derby	1	25	110/22
Scottsdale	2	30	110/22
Hadspen	2	50	110/22
Palmerston	2	25	110/22

Table 10: Transfer capability

Northern planning area		From								
		Derby	Scottsdale	George Town	Trevallyn	Mowbray	Norwood	St L Leonards	Hadspen	Palmerston
To	Derby		4.8							
	Scottsdale	5.3		2.1						
	George Town		3.2		3.6					
	Trevallyn			2.1		31.4	16.2	3.0	26.7	
	Mowbray			2.1	36.1		10.8	3.0		
	Norwood				21.7	6.3		10.0	13.4	2.0
	St Leonards				21.7		27.0			
	Hadspen				14.4		16.2			5.0
	Palmerston								5.3	

Table 11: Demand reduction capability

Customer	Demand reduction (MVA)	Description
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]