TasNetworks
Delivering your power

Central planning area strategy

Area strategies for Tasmania's electricity network

Version Number 2.0
October 2017

Authorisations

Action	Name and title	Date	Signature
Prepared by	Network Planning		
Reviewed by	Network Planning	Oct 2015	
Authorised by	Network Planning Team Leader	Feb 2016	
Review cycle	2 Years		

Document control

Date	Version	Description	Author	Approved by
October 2015	1.0	Original Issue	Network Planning	Network Planning Team Leader
October 2017	2.0	Update and structure modification for R19 submission	Network Planning	Network Planning Team Leader

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.

Minimum requirements

The requirements set out in TasNetworks' documents are minimum requirements that must be complied with by TasNetworks staff, contractors, and other consultants.

The end user is expected to implement any practices which may not be stated but which can be reasonably regarded as good practices relevant to the objective of this document.

Disclaimer

Record of revisions

Section number	Details
Version 2.0	
Whole document	Update and structure modification for R19 submission

Executive summary

The Central planning area is large and diverse extending from New Norfolk northward towards the Meander Valley and from Bothwell westward to Derwent Bridge. Most of the transmission network in the area acts to connect the hydroelectric generators in the area to the rest of the Tasmanian transmission network, with only two terminal substations acting to service retail load alone, New Norfolk and Derwent Bridge.

Majority of transmission network in this area forms part of core grid in Tasmanian transmission network, of which the issues will be discussed in Core Grid strategy.

[redacted] Currently there are no forecast large load connections for the area.

The long term network development plan for the Central planning area is small in terms of network augmentation requirements to 2050.

Within the 15-year planning period, the network development strategy at the transmission and major distribution supply level is small and mostly focussed on asset replacements as well as improvement of customer supply reliability when opportune. The proposed development plan for the planning period is listed in Table 1 and detailed within this strategy.

Table 1: Network development strategy for the Central planning area

Location	Proposed development	Investment need	Estimated cost ($m)	Forecast completion
Gretna area	Continue staged conversion of 11 kV rural feeders to 22 kV operation	Asset condition and long term strategy	0.4[1]	June 2021
Meadowbank area	Reconfigure the Waddamana–Bothwell section of the 110 kV transmission line TL400 to 22 kV operation following the decommission of TL400 (planned in 2018/19 FY)	Jurisdictional network performance requirements – Clause 5(1)(a)(iv)	0.8	June 2021
Derwent Bridge area	Decommission Derwent Bridge Substation and provide supply from distribution network	Asset condition and market benefit	2.6	June 2022
Waddamana Substation	Replace supply transformer	Asset condition	4.0	June 2022

[1] Stage 3 and Stage 4 only

Table of contents

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 Central planning area.

1.3 Scope

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

1.4 Objectives

The objectives of this area strategy are to:

- provide an overview of the Central 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.

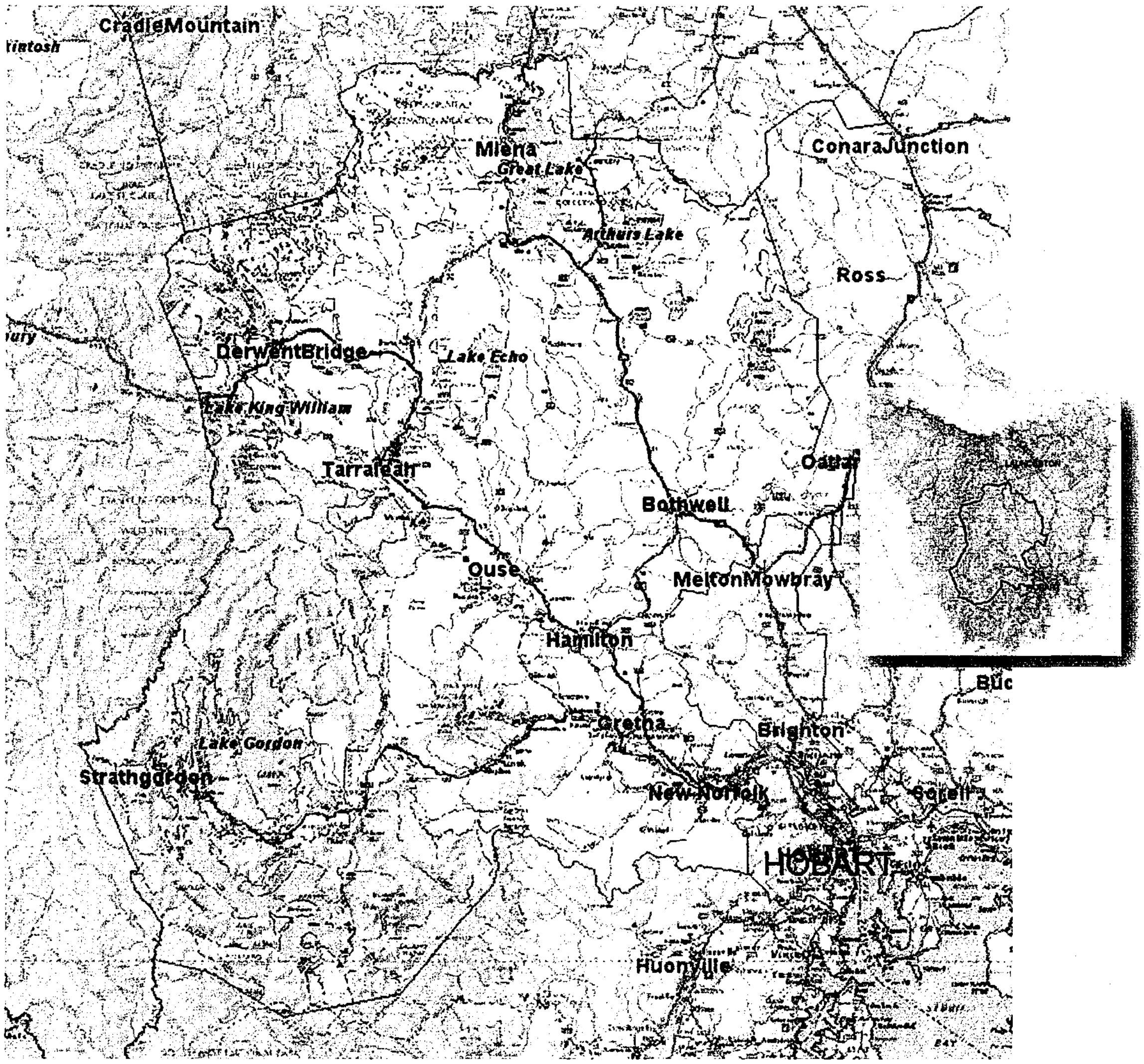
Strategic documents which the area strategies support include:

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

2 Area overview

The Central planning area is large and diverse extending from New Norfolk northward towards the Meander Valley and from Bothwell westward to Derwent Bridge. Figure 1 shows a geographical map of the area.

Figure 1: Geographic diagram of the Central planning area



2.1 The network

Most of the transmission network in the Central planning area acts to connect the hydroelectric generators in the area to the rest of the Tasmanian transmission network, with only two terminal substations acting to service retail load alone, New Norfolk and Derwent Bridge.

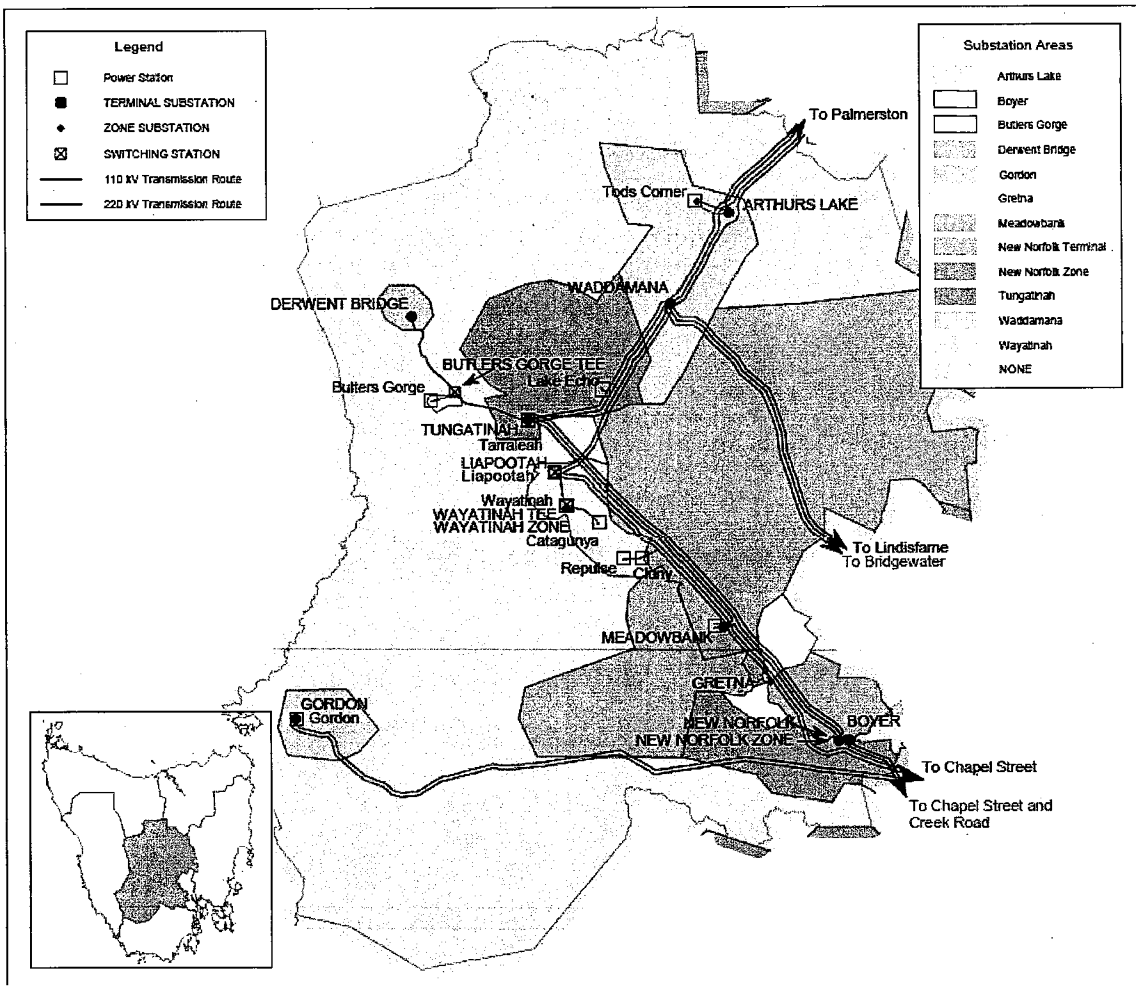
Among the 220 kV connected generation is Gordon Power Station with 432 MW of generation and less than 0.5 MW of load. Gordon Power Station is not connected to rest of the network in the Central planning area and it is connected radially to Chapel Street Substation via a double circuit Gordon–Chapel Street 220 kV transmission line TL516.

The rest of the generation in the area is connected to the 110 kV and 220 kV networks between New Norfolk and Waddamana substations. Much of the 110 kV transmission network in the area services the older hydro power stations such as Tungatinah, Tarraleah, Meadowbank, Lake Echo and Butlers Gorge. The newer stations, those in the lower Derwent and Liapootah, are connected at 220 kV to transfer generation to Chapel Street Substation in the south and Waddamana Substation in the north.

There is no transformation capacity between the 110 kV and 220 kV networks. Furthermore, these 110 kV and 220 kV networks are part of the interconnected transmission network of the state, therefore for planning purposes the 220 kV and 110 kV networks in the area are considered in the Core Grid strategy.

The transmission network, and substation supply area is shown in Figure 2.

Figure 2: Transmission network and substation supply area in Central planning area



A number of protection schemes apply to the area in order to maintain system reliability and security:

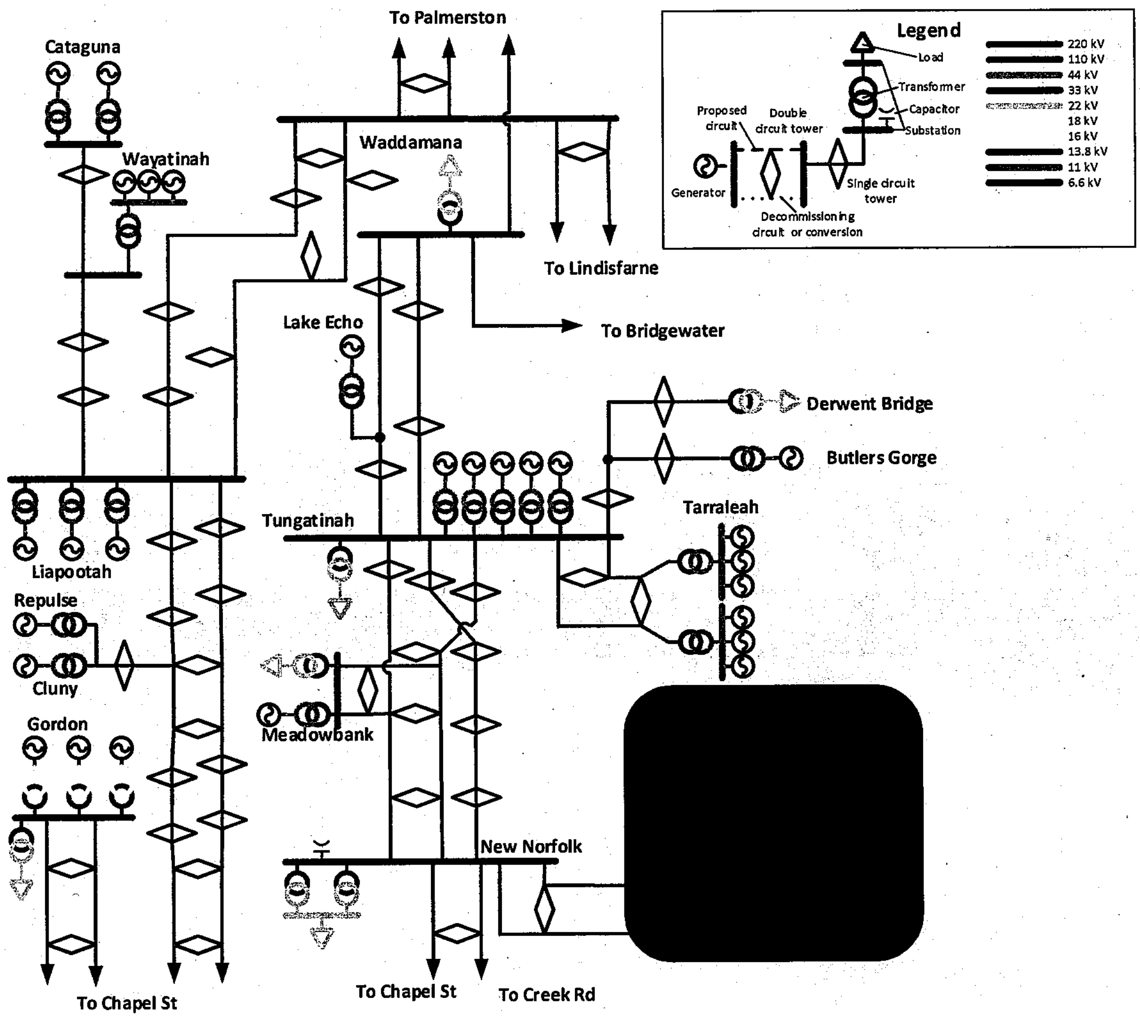
- SPS – FCSPS (System Protection Scheme – Frequency Control System Protection Scheme): Following a contingency of Basslink, the FCSPS will trip pre-armed generation (for Basslink export) or pre-armed load (for Basslink import) to ensure that the Tasmanian system frequency remains within operational standards. This scheme is linked to Catagunya and Gordon generators, [redacted]
- SPS – NCSPS (System Protection Scheme – Network Control System Protection Scheme): The purpose of this scheme is to remove potential thermal overloads in transmission circuits following a contingency on a critical circuit. This has been achieved by tripping generation and the scheme is in enable mode for Basslink export only;
- Backup NCSPS: These schemes are located locally in order to remove the overload in case of NCSPS fails to act. In Central planning area, Backup NCSPS is located at Gordon and Liapootah only;
- OFGSS (Over Frequency Generator Shedding Scheme): This scheme trips generators in over frequency events. In Central planning area, the scheme is installed at Gordon Power Station;

[redacted] UFLS (Under Frequency Load Shedding Scheme): This scheme aims to reduce the extent of disruption to power supplies following major system disturbances and maintains the balance between power supply and demand to prevent power system and customer assets from continued operation at abnormal frequencies [redacted]

2.1.1 Transmission

The simplified one line diagram for the transmission network in the Central planning area is shown in Figure 3.

Figure 3: Central planning area simplified one line diagram



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

2.1.2 Distribution

The distribution network in the Central planning area is supplied from seven transmission–distribution connection points: New Norfolk, Meadowbank, Arthurs Lake, Tungatinah, Waddamana, Gordon and Derwent Bridge substations, as well as four rural zone substations: New Norfolk Zone, Wayatinah Zone, Gretna Zone and Tods Corner Zone.

The following development projects are either underway or committed in the distribution network in the Central planning area:

- Staged conversion of 11 kV feeders from Gretna Zone to 22 kV operation;
- Rationalisation of the New Norfolk Zone Substation, including the replacement of the four 2.5 MVA power transformers with four new feeder connected 5.0 MVA autotransformers within the New Norfolk Terminal Substation yard, of which one will serve as an in-service system spare connecting new 11 kV Feeder 35013 from New Norfolk Substation by splitting the existing Feeder 35011, to backup Bridgewater Feeder 48185.

2.2 Customers

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

2.2.1 Generation

There are 11 transmission-connected hydro generation sites in the Central planning area, which will be discussed in the Core Grid strategy. There is a single 1.6 MW embedded hydro generator (Tods Corner) connected at 6.6 kV from Arthurs Lake Substation. This generator can only operate when the Arthurs Lake pump is running. Another 0.55 MW embedded hydro generator (Maydena) is connected at 22 kV from New Norfolk Substation Feeder 39571.

[redacted] Other than this, there is no known generation development proposal in the Central planning area.

2.2.2 Load

[redacted]

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

There are a number of irrigation customers, such as the recently commissioned Southern Highlands Irrigation Scheme, within the distribution network in the Central planning area.

2.3 Reliability

Like most of Tasmania, the Central 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 six reliability communities in the area, of which the average performance of previous five years all meet reliability requirement for both SAIFI and SAIDI criteria.

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 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 3: 2050 maximum demand forecast

System	2017 maximum demand (MW)		Maximum demand forecast for 2050 (MW)
	Actual	Weather corrected	
Arthurs Lake Substation	6.4	6.4	6.4
Derwent Bridge Substation	0.3	0.3	0.3
Gordon Substation	0.4	0.4	0.4
Meadowbank Substation	6.8	6.9	9.4
New Norfolk Substation	18.3	18.3	18.3
Tungatinah Substation	1.1	1.1	1.1
Waddamana Substation	0.6	0.6	0.8

3.1.2 Generation

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

Transmission network development driven by proposed grid-scale generation [redacted] will be discussed in Core Grid strategy.

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 material affect flows within the transmission and sub-transmission networks part of this long term network development plan.

3.2 Long term network development plan

There is no long term network development plan specifically identified for this area other than what would be considered in Core Grid strategy.

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 Central planning area, no material distribution network supply vision has been identified.

4 Planned investments and forecast limitations

This section presents the planned investments and forecast limitations in the Central 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 Staged conversion of 11 kV rural feeders to 22 kV operation

Identified need

Gretna Zone Substation is a 22/11 kV rural zone substation located on the southern side of the Gretna township. It is supplied from the New Norfolk Terminal Substation and steps the 22 kV supply voltage down to 11 kV to supply a rural area extending from New Norfolk to Hamilton. The substation was commissioned in 1960.

Due to the deteriorating condition of the substation, refurbishment of the substation in the near future is required to ensure adequate network reliability and security is maintained for the high voltage feeders supplied from the zone substation. Failure to do so would result in significant supply disruptions when asset failures occur.

TasNetworks has a strategy in converting 11 kV rural feeders to 22 kV when opportune, given that 22 kV feeders are usually much more cost effective in supplying remote rural areas with its capabilities in maintaining power reliability and supply quality, particularly for motor starts in the remote area. The existing 11 kV network in the rural area persists from its historical origins and usually carries dozens of small loads. This puts the general conversion of 11 kV to 22 kV for these feeders into a non-cost effective solution due to the significant expense in converting large numbers of distribution transformers.

However, should the 11 kV to 22 kV conversion be implemented in stages and combined with routine assets' refurbishment, a cost effective solution would be much more likely. This is found to be true for the Gretna Zone Substation refurbishment case.

Gretna and rural regions directly North-East of Gretna are supplied by Gretna 11 kV Feeder 37001. The maximum demand of this feeder is approaching 550 KVA. The maximum total demand downstream of Pole 365381 is however well below 500 KVA.

This offers the following opportunity for staged transfer of the load connected to Gretna Zone Substation from 11 kV to 22 kV. The stages are detailed below:

- **Stage 1:** Replace 4 transformers & install a pole mounted 500 kVA 11/22 kV autotransformer at Pole 365381 on Feeder 37001 (this stage is currently underway and is expected to complete before June 2019);
- **Stage 2:** Replace 10 distribution transformers (from 11,000/415 V to 22,000/415 V) on Feeder 37001 (this stage is currently underway and is expected to complete before June 2019);
- **Stage 3:** Replace 5 distribution transformers and reinsulate 12 poles to 22 kV on Feeder 37001 (proposed); and
- **Stage 4:** Install a pole mounted 500 kVA 11/22 kV autotransformer and regulator for Feeder 37002 (proposed). This stage makes it possible for the installed pole mounted 500 kVA autotransformer to move progressively as Feeder 37002 is converted to 22 kV operation.

Proposed solution

To implement TasNetworks' long term network development strategy while carrying out condition based asset replacement at Gretna Zone Substation, it is recommended to continue the Stage 3 and the Stage 4 of the above mentioned staged conversion from 11 kV to 22 kV on the feeders 37001 and 37002 emanating from Gretna Zone Substation. The estimated cost for the Stage 3 and the Stage 4 is $415,000 and is expected to be commissioned before June 2021.

4.1.2 Reconfigure the Waddamana–Bothwell section of the 110 kV transmission line TL400 to 22 kV operation

Identified need

The transmission security of Meadowbank Substation has been assessed with regard to the Electricity Supply Industry (Network Planning Requirements) Regulations 2007 and identified that following a transformer contingency, this single transformer substation does not meet the performance requirements of clause 5(1)(a)(iv) in that the amount of unserved energy would exceed 300 MWh.

Proposed solution

The 110 kV transmission line TL400 is an 86 km single circuit transmission line between Waddamana Substation and Bridgewater Tee and was built in 1943. This line is planned to be decommissioned in 2018–19 to save maintenance cost, of which three components of maintenance expenditure are forecast in the future. They are:

- $4 million for insulator replacement in 30 year intervals starting from 2019;
- $9.1 million for painting 50% of towers in every 10 years starting from 2033; and
- $1.9 million for foundation refurbishment and other tower structure works in every 5 years starting from 2019.

The above maintenance cost would however reduce to minimal should the circuit be converted to 22 kV operation.

We propose a project to converting the northern section of the then decommissioned 110 kV TL400 to 22 kV operation by carrying out the following works:

- Install N/O ABS on Tower 182 of TL400 to sectionalise the then decommissioned TL400, only the northern section of TL400 will be energised at 22 kV;
- Convert ~200 m of SWER line from Pole 1A/417391 to Pole 3/417393 to 22 kV 3-phase line using 19/3.25 AAC conductor and move SWER isolator T720050 from Pole 1A/417391 to Pole 3/417393;
- At Pole 3/417393, design, install and commission a 22 kV Noja recloser, configured as a remote switch, with a switching by pass, the upstream of this recloser will tee connect Feeder 49202 while the downstream of this recloser will connect to the then decommissioned TL400 at Tower 3 using ~400 m of 240sqmm UG Al;
- At Pole 234/369308, install HABS as N/O point between 45002 and 49202, connect HABS to 49202 at Tower 182 of TL400 using ~35 m of 19/3.25 AAC conductor; and
- At Pole 62/399086, install HABS as N/O point between 45002 and 49202, connect HABS to 49202 at Tower 135 of TL400 using ~70 m of 19/3.25 AAC conductor.

The estimated cost of this project is $0.8 million and it is planned to be operational by June 2021.

4.1.3 Decommission Derwent Bridge Substation and provide supply from distribution network

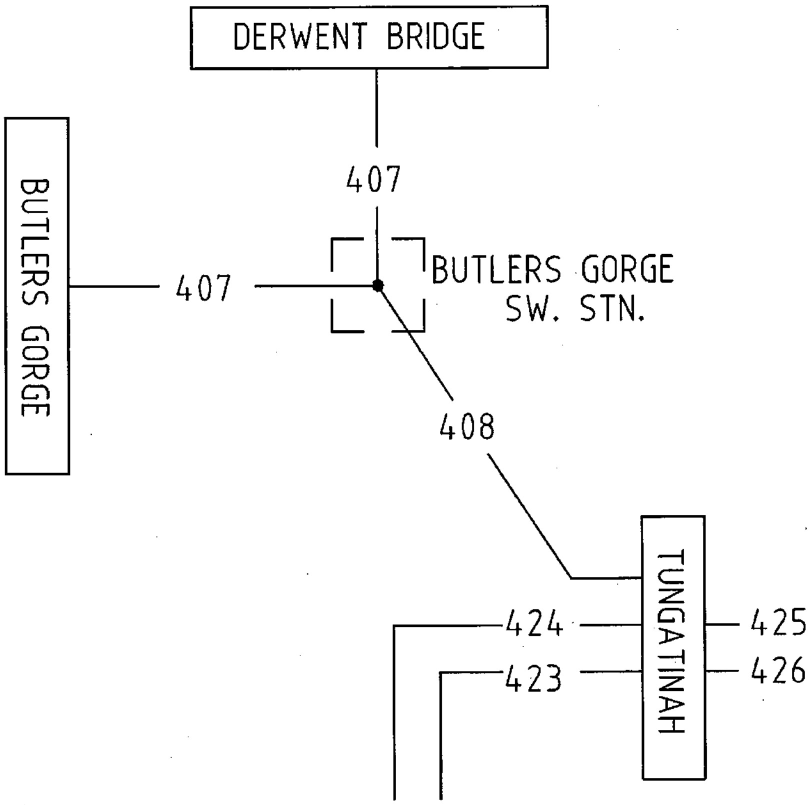
Identified need

Currently Derwent Bridge Substation is supplied by a single circuit 110 kV line. The 110 kV line tees off from Butlers Gorge switching station (Figure 4). At Derwent Bridge Substation, a TasNetworks standard Type One 25 MVA[2] supply transformer (T1, 2008 built) steps down the 110 kV to 22 kV and supplies a very small load, which peaked to only 282 kW with an average demand of 150 kW in 2015–16. This load is not expected to have significant growth in the foreseeable future. Therefore the T1 at Derwent Bridge is expected to be

[2] The rating of the transformer would be 25 MVA once the transformer fans are added. The existing rating of the transformer without fans is however 10 MVA.

very much under-utilised should the supply arrangement at Derwent Bridge be kept as is. However, improvement opportunity does exist if the supply to Derwent Bridge load can be achieved via a 22 kV distribution network while the T1 at Derwent Bridge can be repurposed elsewhere within TasNetworks' electricity network.

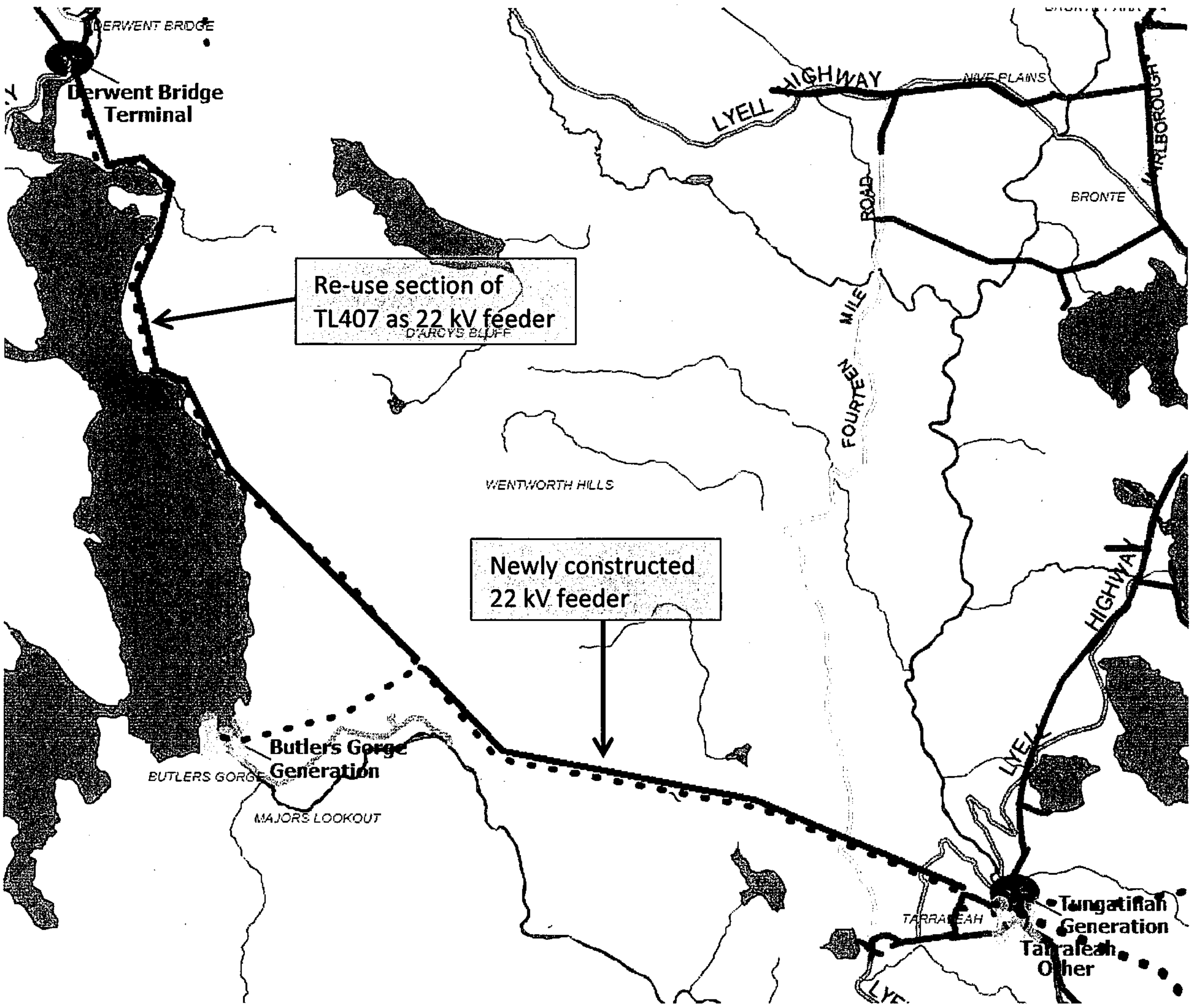
Figure 4: Topological map of current Derwent Bridge 110 kV transmission supply



Proposed solution

We propose to decommission the transmission–distribution connection point at Derwent Bridge when the supply transformer T1 can be re-dispatched. Alternative supply to Derwent Bridge load via 22 kV distribution network can be achieved by carrying out the following works:

Figure 5: Recommended route for the alternative 22 kV supply to Derwent Bridge



- Construct ~13 km 22 kV distribution feeder from Pole 18/416001 to Butlers Gorge Tee along the easement of TL408 using 19/3.25 AAC conductor;
- At Pole 18/416001, design, install and commission a 22 kV Noja recloser, configured as a remote switch, with a switching by pass, the upstream of this recloser will tee connect Feeder 49307 while the downstream of this recloser will connect to the newly established 22 kV feeder;
- Disconnect the Butlers Gorge to Lake St Clair 110 kV T/L at the Butlers Gorge Tee switching station;
- Connect the TL407 at Derwent Bridge to Feeder 49621 using an N/C HABS;
- Energise the section of TL407 from Butlers Gorge Tee to Lake St Clair to 22 kV operation by connecting this section of the then disconnected 110 kV T/L with the newly established 22 kV distribution feeder at the Butlers Gorge Tee switching station using an N/C HABS; and
- Remove 110/22 kV T1 to be repurposed elsewhere.

This option will retain grid supply to Derwent Bridge and enable the 110/22 kV supply transformer T1 to be repurposed.

The estimated cost of this project is $2.6 million and it is planned to be operational by June 2022.

4.1.4 Replace supply transformer T1 at Waddamana Substation

Identified need

The supply transformer T1 (5.0 MVA unit, 1950 built) at Waddamana Substation is approaching its end of service life. It will be replaced within the 2019–24 regulatory period. Given the small size of connecting load (~0.6 MW) at Waddamana, the most economical solution would be to replace the transformer with an existing old transformer in the supply transformer fleet of TasNetworks, while a new standard Type One unit can be used elsewhere.

Proposed solution

We propose to replace the supply transformer T1 at Waddamana with an old unit (probably one of the St Marys supply transformers).

The estimated cost of this project is however $4.0m, based on a new supply transformer (TasNetworks' standard Type One unit) and it is planned to be operational by June 2022.

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 Replacement of Mount Tim Shea SWER line

Identified need

Mount Tim Shea is a combined use communications site with assets owned by Hydro Tasmania, TasNetworks and Telstra. The site is located a significant distance from other distribution loads and is connected via a 12.7 kV SWER (after the Westerway Zone Substation decommissioning). Although the SWER system is effective in supplying the load, the use of a 16 km long feeder to supply only 7 kW of peak load is not deemed to be economical when line maintenance costs are considered.

Potential solution

We propose to continue to decommission the existing SWER system and replace it with a Remote Area Power Supply (RAPS) system at the summit of Mount Tim Shea. The exact configuration of the RAPS system is still under investigation but the current approach calls for a combination of diesel, solar and possibly wind energy. Due to difficulty of access the location of a purely diesel system has been determined as non-economical.

4.2.2 Tods Corner Rural Zone Substation asset condition

Identified need

Tods Corner Rural Zone Substation lies not far from Tods Corner Power Station and is a bi-directional 22/6.6 kV substation. The 6.6 kV side is supplied from Arthurs Lake Terminal Substation and the 22 kV side is supplied from Waddamana Terminal Substation. The substation exists to allow secure supply to the Tods Corner Township (22 kV) and several 6.6 kV loads in the area if supply from either Waddamana or Arthurs Lake is unavailable. Under normal operating conditions the substation is energised from the 22 kV side and carries no load, i.e. it acts purely in a standby role.

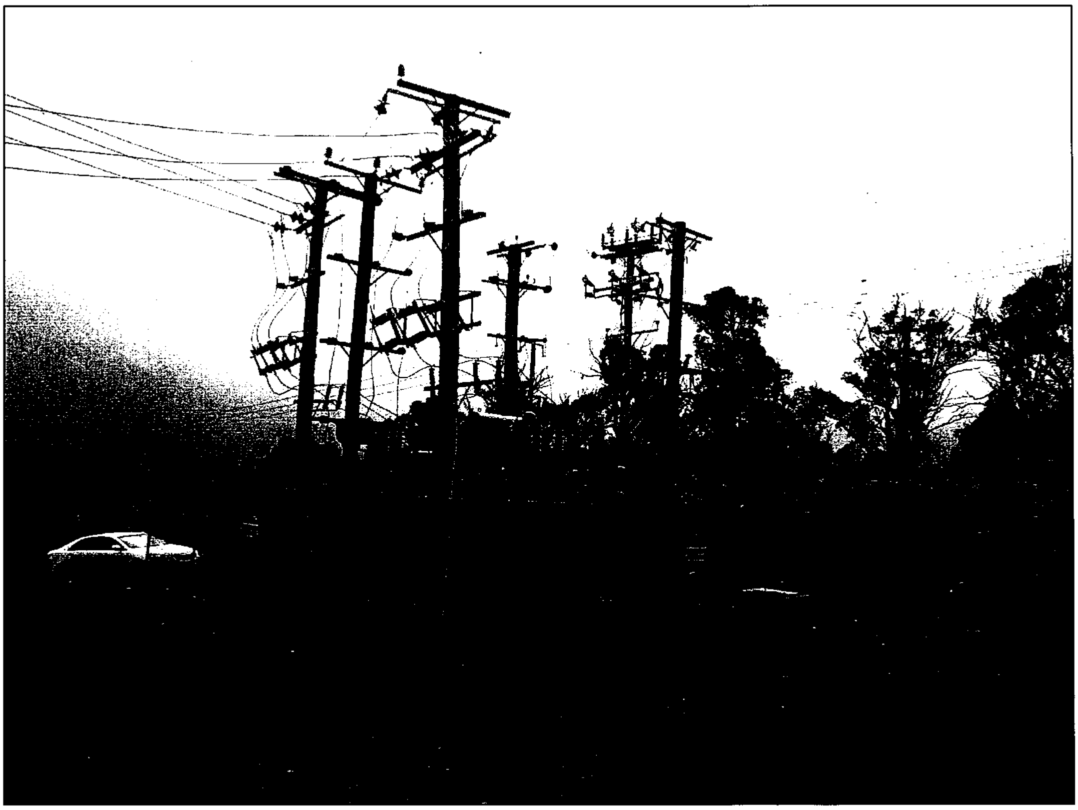
Asset condition assessment has shown that the switchgear is in a poor state of repair and is considered unserviceable. There are old oil-filled OYT reclosers, the only switches of this type remaining in the network. They are not remotely operable, are not supported by the manufacturer and the level of confidence in their correct operation under fault conditions is not as high as newer Schneider Reclosers. The transformers are 30 years old however tests have shown the transformers are in otherwise good condition with an expected remaining service life of at least 10 years.

Potential solution

The option yielding the highest net present value (NPV) is however to retain the substation. Therefore We propose to replace the protection equipment (pole mounter reclosers) with newer units then running the substation to failure; no economic benefit has been identified in replacing any other assets before they fail. At the time of asset failure, if there have been no significant changes to the network, the best option would be to replace the site with a suitable 22/6.6 kV substation.

Due to the substation's remote location and the small size of the transformers the potential risk involved with a run to failure strategy is considered low. Additionally, as the transformers are protected from both sides internal faults will be cleared quickly and reliably (following the protection upgrade), thus reducing the chances of a catastrophic failure. The substation is shown below in Figure 5.

Figure 6: Tods Corner Rural Zone Substation



5 Network opportunity

The Central 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 4 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 4: Available substation capacity (MVA)

Substation	Non-firm capacity[3]	Existing		2032	
		Demand	Available capacity	Forecast demand	Available capacity
Arthurs Lake	25	6.4	18.6	6.4	18.6
Derwent Bridge[4]					
Gordon	10	0.4	9.6	0.4	9.6
Meadowbank	10	6.8	3.2	8.9	1.1
New Norfolk	30[5]	18.1	11.9	18.1	11.9
Tungatinah	25	1.1	23.9	1.1	23.9
Waddamana	5	0.6	4.4	0.7	4.3

[3] Other than New Norfolk, all the substations shown in this table are single transformer substation, and hence non-firm capacity.
[4] Planned to be decommissioned
[5] Firm capacity

Appendix A – Area capability information

This appendix provides information on the network capability in the Central planning area. The supply transformer capacity at each substation is provided in Table 5. The transfer capability from each substation is provided in Table 6.

Table 5: Substation supply transformer capacity

Substation	Number of transformers	Total Transformer capacity (MVA)	Transformer primary/secondary voltage
Arthurs Lake	1	25	110/6.6
Derwent Bridge[4]	1	10	110/22
Gordon	1	10	220/22
Meadowbank	1	10	110/22
New Norfolk	2	60	110/22
Tungatinah	1	25	110/22
Waddamana	1	5	110/22
New Norfolk Zone	4	10[6]	22/11
Wayatinah Zone	1	2	11/22
Tods Corner Zone	2	6.0	22/6.6

Table 6: Transfer capability

Central Planning Area		From					
		Arthurs Lake	Meadowbank	New Norfolk	Tungatinah	Waddamana	Wayatinah Zone
To	Arthurs Lake					0.9	
	Meadowbank			6.6			4.9
	New Norfolk		3.4				
	Tungatinah						
	Waddamana	0.1					
	Wayatinah Zone		0.5				

Note: Substations not listed in this table have no transfer capability

[6] Will become 20 MVA after the asset replacement in 2019