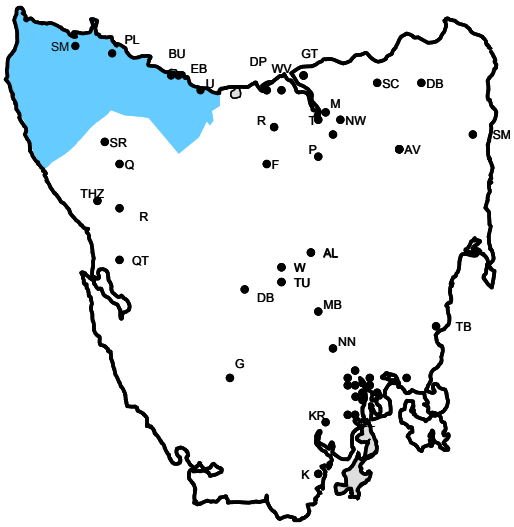
ABN 85 082 464 622



NORTH WEST

DEVELOPMENT PLAN

REV NO.	DATE	REVISION DESCRIPTION	APPROVALS	
0		Working Draft	Prepared by	
			Reviewed by	
			Approved by	

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1. EXECUTIVE SUMMARY

The North West (NW) covers an area along the northwestern coastline from Smithton to Ulverstone.

The area has strong rural and tourism industries and moderate residential and commercial developments along the coastline, particularly in the central business district of the one major city, Burnie. There is a high penetration of alternative gas energy source with a number of major customers implementing co-generation.

The Circular Head and Waratah-Wynyard areas are supported by a number of different industries including dairy production, agriculture, vegetables, commercial fishing and aquaculture, forestry, timber production and tourism.

There is moderate to strong load growth in the CBD of Burnie. The CBD is supplied at 11 kV from Emu Bay terminal substation, compared to 22kV distribution in the rest of the North West area. There is no existing inter-connectability between the 11kV & 22kV feeders in Burnie CBD. The four 22kV feeders supplying the Burnie suburban area south of the CBD are susceptible to airborne salt contamination for overhead lines close to the coast.

To facilitate the current and forecast load, the NW planning area maintains a 22kV distribution network and a small isolated 11kV network. There are 6 Transend owned substations in the area, which supplies 34,999 connected customers via 2,431 km of OH and UG circuit.[1]

The identified or known large constraints are as follows:

-

To address the above constraints the following is being proposed:

-

[1] Data available in NW-#30146137-Feeder Data for Development Plans.

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2. EXISTING SYSTEM

2.1 Substations

The substations supplying the Northwest planning area are listed below.

Note: hyperlinks in the section below will display the power circuit one line diagram from Transend's Operational Diagram System.

Transend owned substations

- Burnie (click here to see the 220/110/22kV single line diagram)
- Emu Bay (110/11kV)
- Port Latta (110/22kV)
- Smithton (110/22kV)
- Ulverstone (110/22kV)

Aurora owned substations

- There are no Aurora owned zone substations in the North West Planning Area.

2.2 Supply Network

Distribution within this planning area is at 11kV and 22kV, supplied by four 110/22kV terminal stations and one 110/11kV terminal station.

The Burnie CBD is supplied at 11 kV from Emu Bay terminal substation, with the rest of the NW area supplied at 22kV. There is no existing inter-connectability between the 11kV & 22kV feeders in Burnie.

2.3 Network Statistics

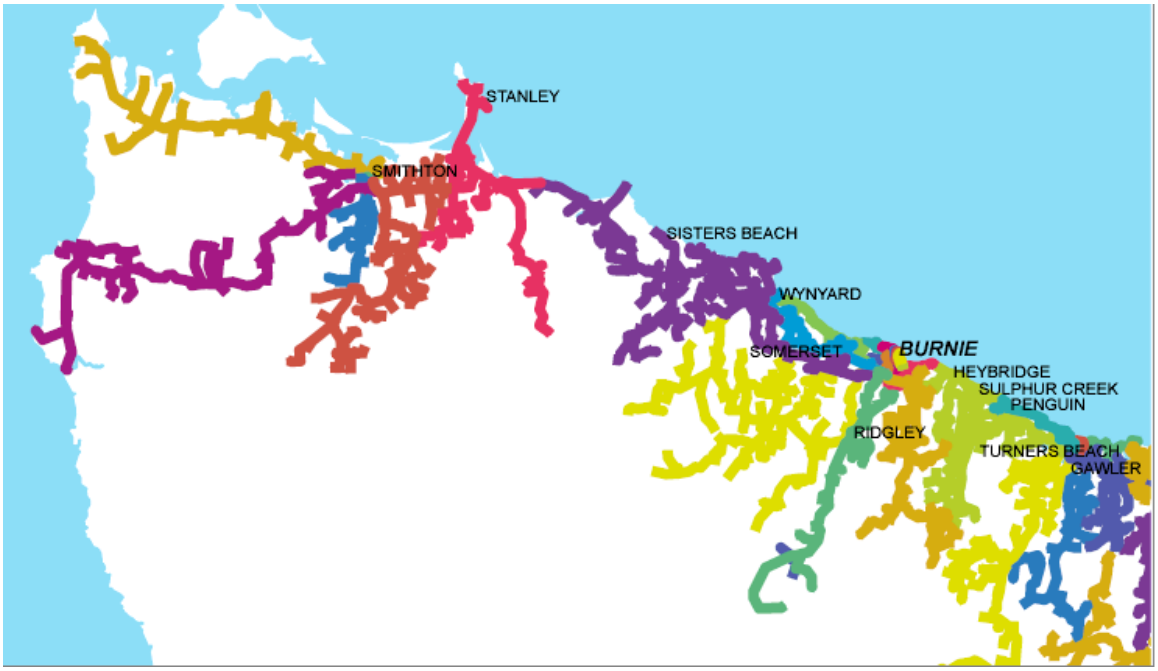
NW area network statistics [2]

22kV circuit length	2,389	km
Connected customers	34,050	
Connected transformer capacity	464,621	kVA
Customer density	14	per 22kV circuit km
Transformer capacity density	195	kVA per 22kV circuit km

[2] Data sourced from Gtech, query DISTFDR. See NW-#30146137-Feeder Data for Development Plans.

11kV circuit length	24	km
Connected customers	949	
Connected transformer capacity	30,650	kVA
Customer density	39	per 11kV circuit km
Transformer capacity density	1,263	kVA per 11kV circuit km

The map below shows the geographic area referred to asNorthwest.




Trefoil Island
Robbins Prime Seal Island
Stanley
Smithton
A2
Wynyard
Somerset
Burnie
Penguin
Ulverstone
A10
© 2010 Cnes/Spot Image
© 2010 Europa Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 MapData Sciences Pty Ltd, PSMA
41°10'30.37" S 144°58'39.65" E elev 190 m
©2009 Google
Eye alt 115.29 km

3. LOCAL PLANNING ISSUES

3.1 Long Term System Strategy

The Northwest planning area will continue the development of its 22kV distribution network. 22kV feeders are operated in radial configuration with normally open connections to adjacent feeders. This operating arrangement will continue for the foreseeable future.

The existing distribution arrangement of Transend owned Major Injection Points and Aurora owned 22kV distribution network will co-exist for the foreseeable future.

The 11kV network supplying Burnie CBD has no alternate supply in the event of a major failure at Emu Bay substation. Options for addressing this shortcoming are being addressed.

In the urban areas, interconnected Low Voltage reticulation will continue to develop at 433V.

Embedded Generation options will be encouraged at the 22 kV and 433V connection points.

Demand Side Management solutions will be encouraged to reduce system peaks and defer large system upgrades where possible.

3.2 Local Government Authorities

For planning purposes, Aurora consults closely with the following local government authorities in the NW planning area:

- Circular Head Council,
- Waratah-Wynyard Council,
- Burnie Council and
- Central Coast Council

Other relevant authorities include:

- Department of Infrastructure, Energy and Resources (DIER); and
- Cradle Mountain Water

3.3 Existing Critical Loads

NW planning area has a number of existing critical loads requiring a higher level of supply security or a limit to operational flexibility. Table 1 below details critical loads in the area:

Load Type	Description	Substation(s)	Feeder(s)	Asset Connection Point(s) - if applicable
Commercial / Major Retail	Port Arthur			
Medical				
Rehabilitation Services				
Industrial				
Sewerage Treatment Plants				
Education				

Table 1 – North West Planning Area - Critical Loads

Improvements to supply security for the above connections and supply areas are encouraged.

3.4 Future Developments and Restrictions

- Council planning schemes

Each council has its own planning schemes and strategic plans for their area.

Circular Head

The Circular Head Council has a strategic plan document for 2009-2014. This document outlines a regional snapshot of the area, the vision, core values and mission for the area and the strategic planning framework. The priorities of the Circular Head council include development of the tourism sector, sustainable

management of the natural resources in the area, development in the best interest of the community and running a well managed council.

The Circular Head Council planning scheme was originally published in 1995 and was updated in 2006. The planning scheme outlines a number of different zones and the development that is allowed in each zone. These intents will be taken into account in the development of the strategic plan for the North West.

Waratah-Wynyard

The Waratah-Wynyard Council has a strategic plan document for 2009-2014. This document outlines a municipal snapshot of the area, the vision, core values and mission for the area and the strategic planning framework. The priorities of the Waratah-Wynyard council include economic prosperity, community focus, sustainable management of the environment and a well managed council.

The Waratah-Wynyard Council planning scheme was originally published in 2000 and the most recent amendment was in 2008. The planning scheme outlines a number of different zones and the development that is allowed in each zone. These intents will be taken into account in the development of the strategic plan for the North West.

Burnie

The Burnie Council has a 'Settlement and Investment Strategy for Burnie to 2026'. This document was published in May 2007 and outlines an approach to future land use planning and urban development.

The scheme discusses local settlement patterns and strategy directions.

- Residential – the residential growth development areas include Malonga Heights, Mooreville and Singline estate in the south west, Brickport Road, Cooee, Shepton Park and Camdale in the west and Heybridge to the east.
- Retail – CBD preferred location, dining and entertainment to be encouraged towards the waterfront, new retail like supermarkets to be local close to new housing developments
- Commercial – promotion of efficient use of existing buildings balanced with new offices to attract new businesses, small commercial zones outside CBD to be considered in Upper Burnie and Cooee.
- Industrial – growth will be encouraged at Heybridge, South Burnie and a residential area at Wivenhoe will be converted to a new industrial zone.
- Community – No observed existing service gaps, changing age demographic require more health services and aged care facilities
- Tourism - lack of accommodation and tourism product, view to develop accommodation in the CBD and along the Waterfront

The Burnie Council planning scheme was originally published in 1989 and incorporates amendments up to September 2008. The planning scheme outlines a number of different zones and the development that is allowed in

each zone. These intents will be taken into account in the development of the strategic plan for the North West.

Central Coast

The Central Coast Council has a strategic plan document for 2009-2014. This document outlines the strategic directions for the area including the shape of the place, a connected central coast, community capacity and creativity, environment and sustainable infrastructure and council sustainability and governance.

The Central Coast Council planning scheme was originally published in 2005 and incorporates amendments up to June 2008. The planning scheme outlines a number of different zones and the development that is allowed in each zone. The council also has a number of plans for specific areas within the council. This includes land use planning within each area. These intents and plans will be taken into account in the development of the strategic plan for the North West.

3.5 Reliability for the area

The North West Area includes the following Reliability communities:

- High Density Commercial - Burnie CBD
- Urban - Burnie – Penguin, Somerset – Wynyard, Smithton, Turners Beach, Ulverstone
- High Density Rural - Cradle Coast, Smithton Rural
- Low Density Rural - Burnie Rural, North Coast, North West

Details of actual reliability performance in the 09/10 financial year are available in here. (DM ref# 30061377)

On figures for the 9 months to March 2010 the following communities appear likely to have reliability performance worse than target in 2010:

- Urban - Burnie – Penguin, Somerset – Wynyard, Turners Beach, Ulverstone
- High Density Rural - Cradle Coast, Smithton Rural
- Low Density Rural - Burnie Rural, North Coast, North West

Only two reliability communities in the North West Planning area have shown adequate reliability performance in 2009/10 up to March 2010.

- High Density Commercial - Burnie CBD
- Urban - Smithton

3.6 Asset issues

There are no North West substation transformers at or beyond their nominal end of life or in poor condition.

There are no existing Aurora owned zone substation transformers in the North Coast Area.

Further information is detailed in the following Asset Management Plans relevant to the NW planning area:

NW30084385 - Management Plan 2010: Ground Mounted Substations

NW30070052 - Management Plan 2010: High Voltage Regulators

NW30084411 - Management Plan 2010: Overhead System and Structures

NW30043361 - Management Plan 2010: Underground System

3.7 Links

LAM Area Management Plans relevant to the North West planning area are:

- North West NW-#30107969-Northwest Area Management Plan
- North Coast NW-#164939-Area Management Plan - North Coast
- Burnie NW-#183754-Area Management Plan Burnie

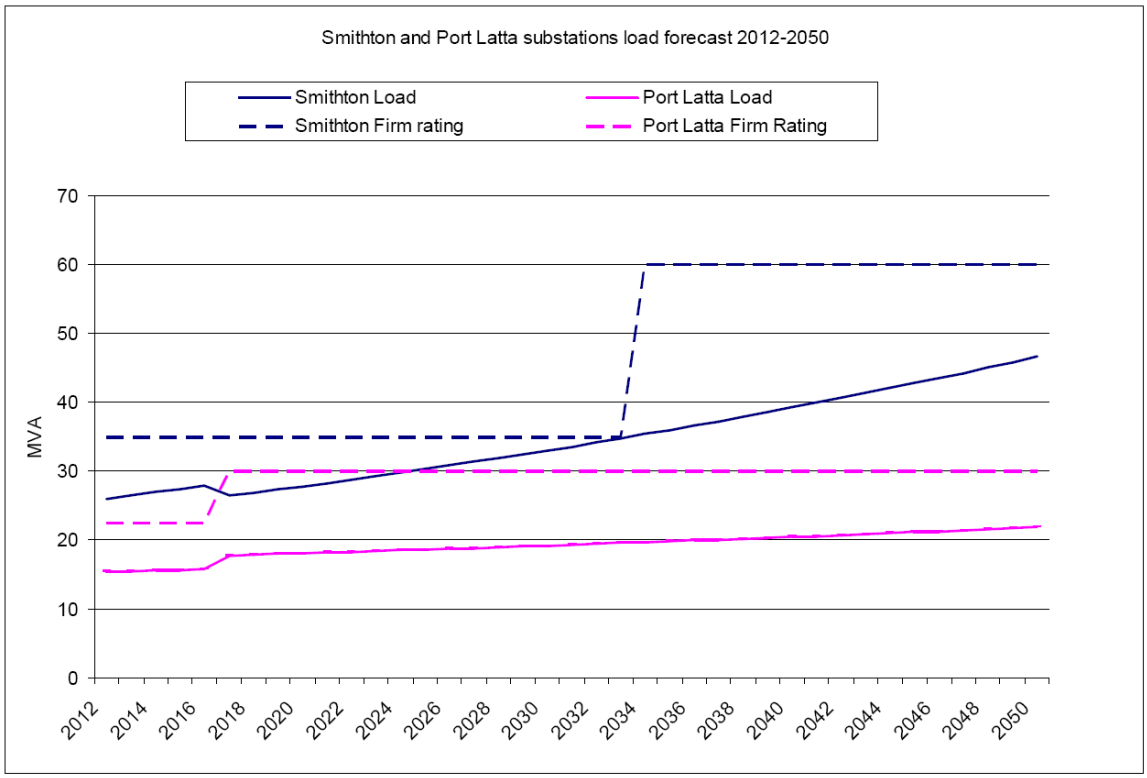
In addition Transend's Annual Planning Report contains relevant information. It can be found on their website www.transend.com.au.

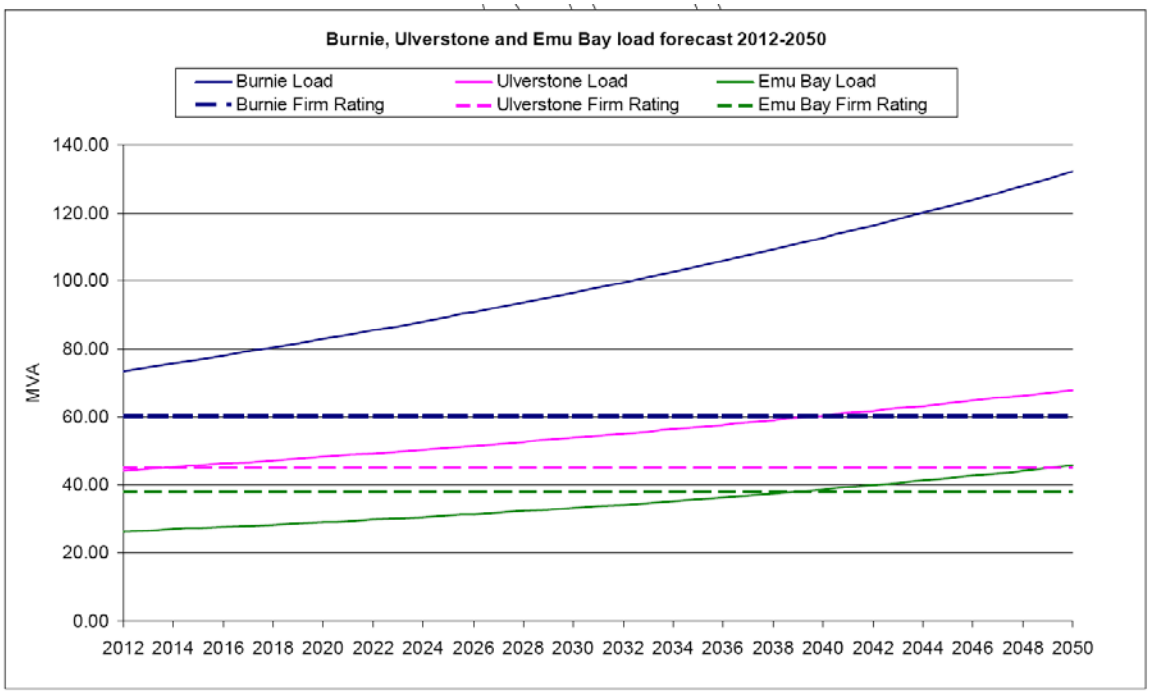
4. LOAD FORECAST

Due to the rural industrial nature of the load in the Smithton and Port Latta areas, significant growth above the medium rate is considered unlikely. As a result, for the purposes of the long term strategic study, medium growth has been applied at the Smithton and Port Latta terminal substations. It is expected that the growth in these areas will be dependent upon applications for new point load installations, particularly for industrial development.

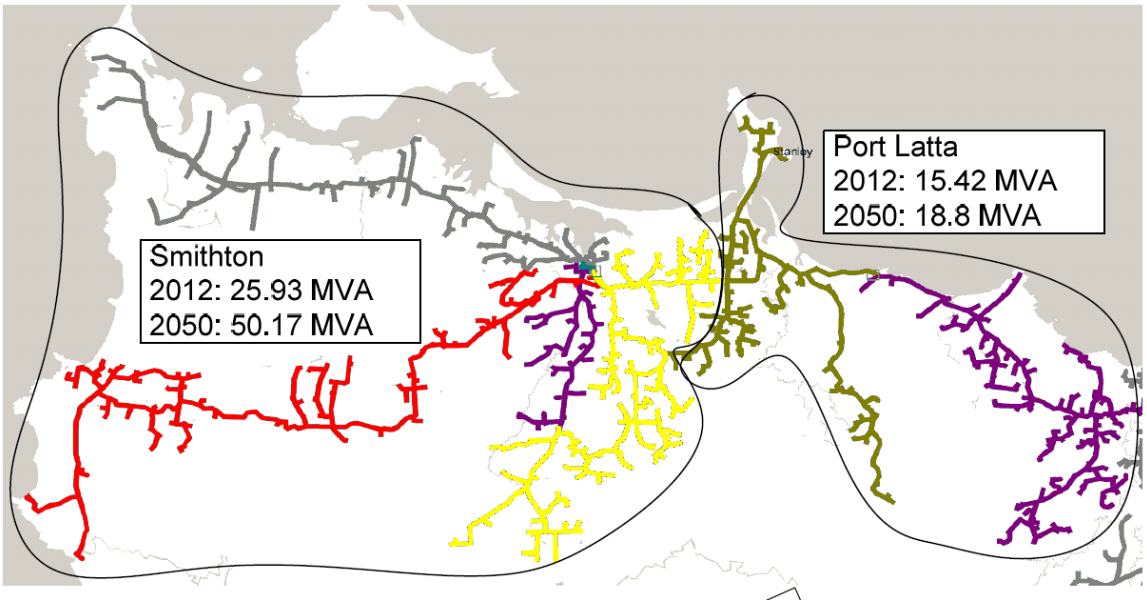
The growth in the areas around Burnie, Emu Bay and Ulverstone terminal substations vary between medium and high growth development. For the purposes of the long term strategic study, the assumed high growth areas include Wynyard, South Burnie and surrounds, Burnie CBD (supplied by Emu Bay), Wivenhoe, Shorewell Park, Heybridge and Penguin. The assumed medium growth areas include south west of Burnie past Mooreville, developed areas adjacent to the Burnie CBD, Ulverstone CBD and south east of Ulverstone.

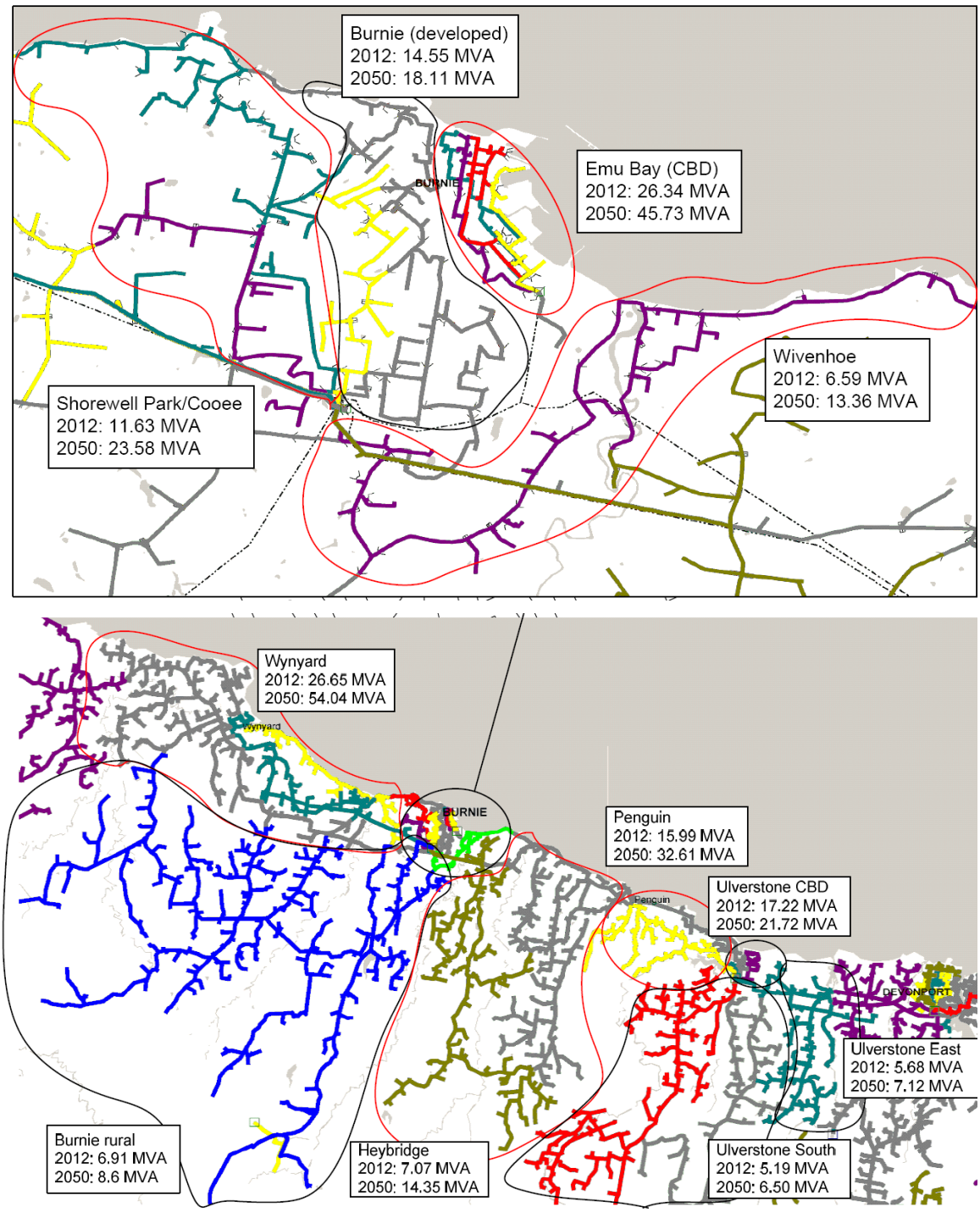
The resulting 38 year load forecast and firm ratings for North West planning area substations are provided below.





The following figures provide a geographic view of the resulting load distribution in 2012 and 2050.





The 2009 10 year load forecast report by UES is used as the basis for this plan. NW30089965 - Aurora 2009 Maximum Demand & Consumption 10 year Forecast Report

Forecast load growth tables are stored in the spreadsheet NW-#30040697-Zone and Area MD and consumption tables 2009

	Planning Area	Connection Point Substation	Forecast Growth pa
	Northwest	Burnie	1.00%
	Northwest	Emu Bay	1.40%
	Northwest	Port Latta	4.00%
	Northwest	Smithton	2.90%
	Northwest	Ulverstone	0.50%

The 2009 load model is available at NW-#30069008-North West Coast area load model (2009)

Copy of load profile

4.1 Future committed point loads (> 1 MVA)

- None identified

4.2 Possible point loads (> 1 MVA)

- Major Subdivisions (>200 lots)
  - None identified

4.3 Possible point loads to be removed (> 1 MVA)

- None identified

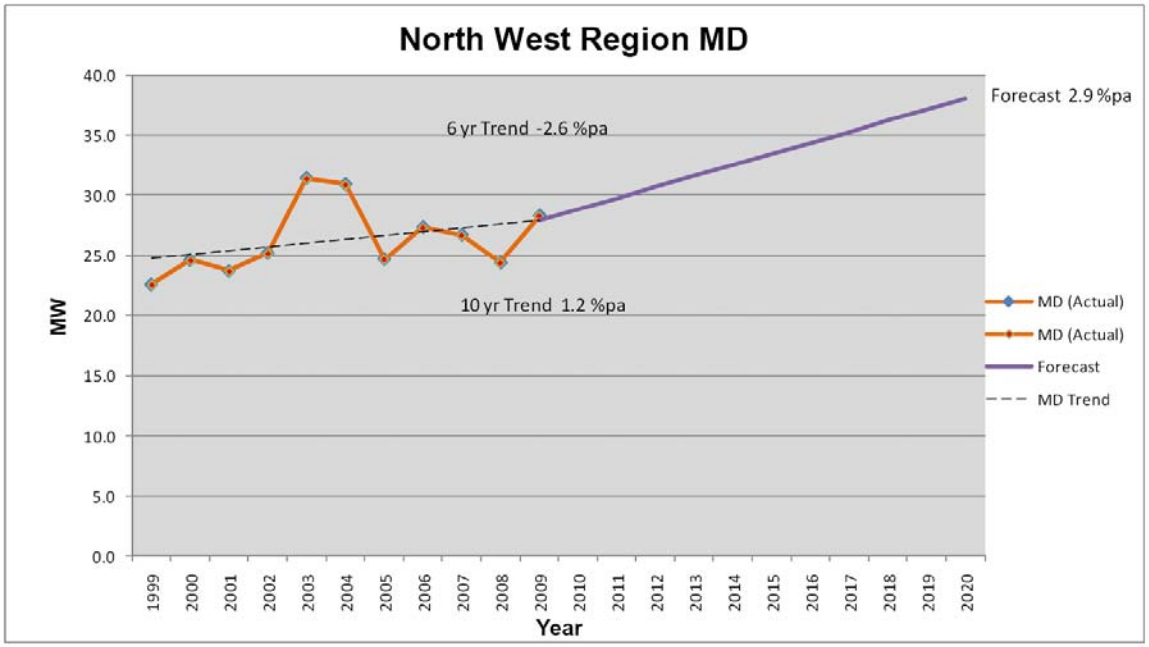
4.4 Possible future embedded generation (> 1 MVA)

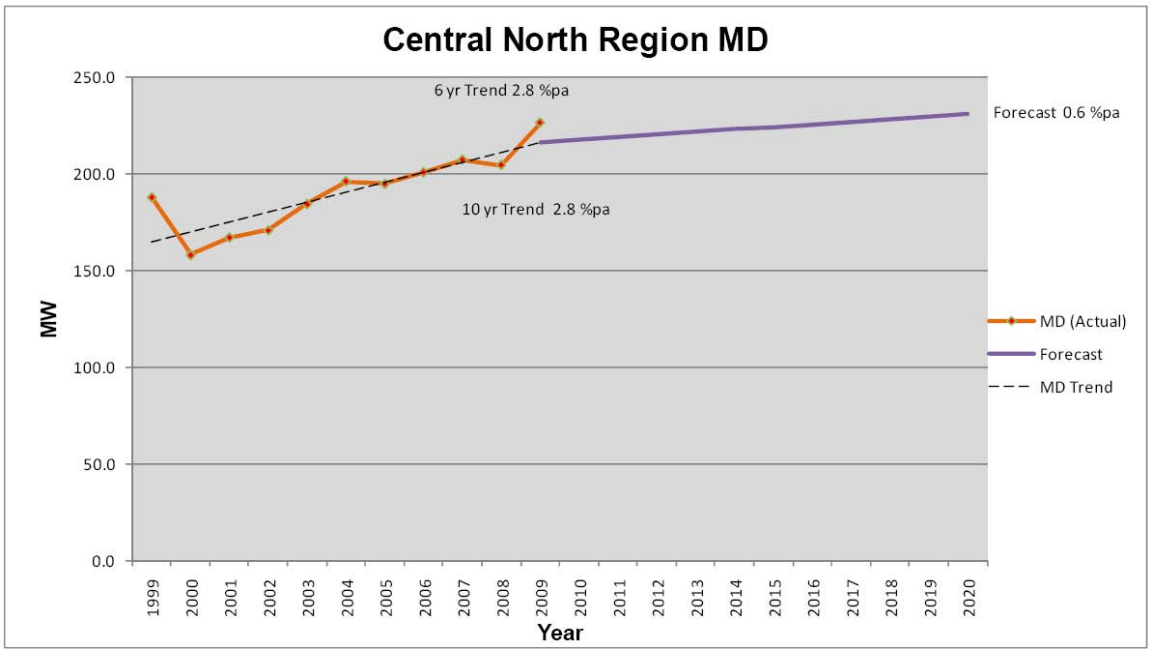
- None identified

4.5 Analysis of Load Forecast

- Load model hyperlink / reference NW-#30069008-North West Coast area load model (2009)
- Copy of load forecast graph NW30089965 - Aurora 2009 Maximum Demand & Consumption 10 year Forecast Report

The North West planning area overlaps with two of the areas used by UES for load forecasting: North West and Central North. Forecast growth charts for the two areas are shown below.


North West Region MD
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
MW
6 yr Trend -2.6 %pa
10 yr Trend 1.2 %pa
Forecast 2.9 %pa
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year
MD (Actual)
MD (Actual)
Forecast
MD Trend


Central North Region MD
250.0
200.0
150.0
100.0
50.0
0.0
MW
6 yr Trend 2.8 %pa
10 yr Trend 2.8 %pa
Forecast 0.6 %pa
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year
MD (Actual)
Forecast
MD Trend

5. PLANNING CRITERIA

Aurora's Distribution Network Planning Manual issued in May 1999 is available in DM, ref NW10250570.

More up to date information is included in this document in Appendix B on page 40.

6. CONSTRAINTS (LIMITATIONS)

Constraints in the NW planning area are classified under the following management groups:

Constraint	Description	Definition
Capacity	Substation Firm Capacity	Substation Maximum Demand > Substation Firm Capacity (N-1)
	Feeder Tail Capacity	Feeder Maximum Demand > 5 MVA for 11 kV OR 10 MVA for 22 kV
	Feeder Section Capacity	Load through conductor >conductor continuous rating
	Feeder Tie Capacity	Transfer Capacity limited due to undersized conductor/equipment
Fault Level	Substation Bus Fault Level	Maximum 3-phase fault level > 13.1 kA OR Maximum 1-phase > XX.X kA
	Equipment Rating Fault Level	Maximum 3-phase OR 1-phase fault level > equipment rating
Voltage	Normal load Voltage Drop	Voltage drop exceeds ± 6%
	Emergency load Voltage Drop	Voltage drop exceeds ± 10%
Reliability	SAIDI	Reliability community SAIDI performance has or is likely to exceed target
	SAIFI	Reliability community SAIFI performance has or is likely to exceed target

Table 2 - Constraint Definitions

Constraints are managed at the following levels

- Zone Substation
- Subtransmission Feeder
- Distribution Feeder
- Distribution Substation
- LV Systems

This document details constraints at the Zone Substation (inc Rural Zone Substations), Subtransmission Feeder and Distribution Feeder levels only. Refer to XXXXXXXXX for State wide management plans for the Distribution Substation and LV System planning levels

6.1 Summary of Constraints

6.1.1 Terminal Substation Constraints

Capacity Constraints				
Substation	**Firm Capacity (MVA)**	**Current Load (MVA)**	**Forecast to exceed (year)**	**Comments**
Port Latta Terminal				Aged Asset: Transformers recommended for replacement in 2017.
Smithton Terminal			2030	Aged Asset: Transformers recommended for replacement in 2034.
Burnie Terminal			Already exceeded	Aged Asset: Transformers recommended for replacement in 2021.
Emu Bay Terminal			2039	Aged Asset: Transformers recommended for replacement in 2023.
Ulverstone			2014	Aged Asset Transformers recommended for replacement in 2028 and 2033.

Fault Level Constraints			
Substation	**Fault Level Description**	**Forecast replacement (year)**	**Comments**
			None identified

6.1.2 Zone Substation Constraints

The SP planning area does not include any zone substation assets.

6.1.3 Subtransmission Constraints

The SP planning area does not include any subtransmission assets.

6.1.4 Distribution Feeder Constraints

Capacity Constraints				
Substation	**Feeder**	**Capacity constraint type**	**Forecast to exceed (year)**	**Comments**
		Feeder Tail		
		Feeder Section		
		Feeder Tie		

Voltage Constraints			
Substation	**Feeder**	**Forecast to exceed (year)**	**Comments**
			None identified

Reliability Constraints			
Substation	**Feeder**	**Forecast to exceed (year)**	**Comments**
			None identified

6.2 Security

Aurora's zone substations are typically run in N-1 secure mode. This means that in the event of any single outage of a network element all load can still be supplied.

Since there are no Aurora zone substations in the NW area this level of security is not considered. Security of the Burnie CBD 11kV network is an issue to be addressed in future.

6.3 Transfer and Operational Capability

The table below shows the rating, peak load and transfer capacity for substations in the area. The peak load figures are those forecast for winter 2010. Since Aurora's substations are subject to winter peaks, these are the most onerous.

	MVA				
Substation	**Rating**	**N-1 Rating**	**Peak Load**	**Transfer Capacity (2010)**	**Transfer Substation**
Ulverstone				7.5	Devonport
				1.9	Burnie
Burnie				0.0	Ulverstone
Port Latta				3.0	Smithton
Smithton				6.2	Port Latta

The table shows that ….

Details of the analysis carried out on load transfers in the NW area are available in NW-#30075510-North_West_area_area_load_transfer_(2009).

6.4 Power Factor

- Customer power factor correction
- Network power factor correction

6.5 LV issues

There are no locations in the NW Planning area where widespread LV network issues have been identified.

The table below shows the count of transformers in the planning area and the count of those that are at risk of overloading. This is determined by the count of connected customers indicated a load greater than 130% of nameplate

rating. It should be noted that the actual load on a transformer may be much different to its value calculated in this way.

	Total		>130% of rating[3]	
Tx size	**Count**	**Customer Count**	**Count**	**Customer Count**
< 50 kVA	2,292	5,230	88	526
>= 50 kVA	2,464	29,865	71	4,072

7. SHORT TERM PLAN (<5YR)

The North Coast Area Strategic Plan provides the background to much of the planning information in this document. It can be found at: NW-#30103847-North West area strategic plan Rev_3

A summary of the proposed works from 2010 to 2015 in the North Coast planning area is outlined in the following table.

Year	Proposed Project	Proposed Outcomes
2013	Wynyard terminal substation	Address firm capacity issues at Burnie and Ulverstone substations, improved supply to Wynyard area
2013	Alternate supply to Burnie CBD	Improved reliability to Burnie's high commercial area

Details of the constraints, options and possible solutions analysed to arrive at these proposed projects are included in Appendix A on page 28.

8. MEDIUM TERM PLAN (5 TO 10YR)

The North West Area Strategic Plan provides the background to much of the planning information in this document. It can be found at: NW-#30103847-North West area strategic plan Rev_3.

A summary of the proposed works from 2016 to 2020 in the North West planning area is outlined in the following table.

Year	Proposed Project	Proposed Outcomes
2017	Port Latta transformer replacement	Addresses age limitation at Port Latta, increase in firm

[3] Data sourced from NW-#30075639-Statewide Distribution Transformers Customer Count Nov 09. Transformer data extracted from Gtech in November 2009.

		capacity for Port Latta an Smithton areas
2021	Burnie transformer replacement	Addresses age limitations at Burnie substation

Details of the constraints, options and possible solutions analysed to arrive at these proposed projects are included in Appendix B on page 32.

9. LONG TERM PLAN (10YR+)

The North West Area Strategic Plan provides the background to much of the planning information in this document. It can be found at: NW-#30141803-North West area strategic plan Rev_5_2010 final report

A summary of the proposed works from 2021 to 2050 in the North West planning area is outlined in the following table.

Year	**Proposed Project**	**Proposed Outcomes**
2023	Emu Bay transformer replacement	Addresses age limitations at Emu Bay substation, prevention of predicted future overload in 2039
2028 or 2028/2033	Ulverstone transformer replacement	Addresses age limitations at Ulverstone, prevention of predicted future overload in 2036, addresses firm capacity issues at Burnie
2034	Smithton transformer replacement	Addresses age limitation at Smithton, increase in firm capacity for Smithton and Port Latta areas
2040 or 2048	Penguin terminal substation or Third transformer at Emu Bay substation	Address firm capacity issues at Burnie and Ulverstone substations, improved supply to Penguin area

Details of the constraints, options and possible solutions analysed to arrive at these proposed projects are included in Appendix C on page 34.

10. PROGRAM OF WORK DRAFT

Project	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Install UG HV - 6 feeder tails New Norfolk Zone		$ 173,000				
(Project BW 006] Install 0.2 km HV UG Huntingtier Rd PID 221007 to Hardwicks Rd Bagdad PID 390836	$ 80,000					
Augment OH HV - 14 Mile Rd, Tarraleah					$ 210,000	
Augment OH HV - Fdr 37002 stage 1 Gretna Zone associated with Zone replacement					$ 411,000	
Augment OH HV - Fdr 37002 stage 2 Gretna Zone associated with Zone replacement					$ 411,000	
Augment OH HV - Fdr 37002 stage 3 Gretna Zone associated with Zone replacement					$ 206,000	
Derwent Bridge - Install 3rd wire Lyell Hwy (generator stability) 2 kms	$ 40,000					
Derwent Bridge - Install permanent connection point generator	$ 25,000					
Install 1 x 6.6/ 22 kV step up stations at todds corner						$ -
Install 19/3.25 AA OH link Hamilton - F45003 2 kms	$ 130,000					
Install OH HV - Auburn Rd to Macquarie Rd						
Install OH HV - Derwent Bridge to Bronte Link					$ 630,000	
Install OH HV - link Meadowbank 45003 to Wayatinah 49412 to Tunagtinah 49305						$ 420,000
Install OH HV - link to Lake Cresent 3 ph (to assist in removal of SWER)				$ 630,000		
Install OH HV - link Victoria Valley SWER to Tungatinah fdr 49303, Dee Lagoon					$ 124,000	
Install OH HV - new Feeder, Elderside						$ -
Install OH HV - Upgrade SWER, Dee Lagoon Link, Victoria Valley Rd				$ 294,000		
Project BW 004 Reinsulate7.6 k & 8 tx Bridgewater F48 190 to 22 kV and supply from Meadowbank TS	$ 300,000					
Project BW 005 Reinsulate 10.0 k &11 tx Bridgewater F 48 190 to 22 kV and supply from Meadowbank TS		$ 352,000				
Project MB 001 - Westerway 38002 OH conversion to 22 kV (10 km OH and 15 tx's)		$ 400,000				
Project MB 002 - Westerway 38002 OH conversion to 22 kV (12 km OH and 22 tx's)			$ 460,000			
Project MB 003 - Westerway 38002 OH conversion to 22 kV (11 km OH and 15 tx's)					$ 360,000	
Tods corner - Convert 6.6 kv line to 22 kv						$ -
Augment pole sub 300 kVA First Avenue New Norfolk	$ 40,000					
Augment pole sub Fairfax Terrace New Norfolk	$ 40,000					
Install new pole sub George Street New Norfolk	$ 40,000					
Install Substation - new or augment pole type 300 kVA				$ 30,000	$ 30,000	$ 30,000
Augment OH LV - overloaded LV ccts Highlands stage 2		$ 14,000				
Augment OH LV - overloaded LV ccts Midlands South stage 2		$ 14,000				
Augment OH LV - overloaded LV ccts Midlands South stage 3		$ 14,000				
Augment OH LV - overloaded LV ccts Midlands South stage 4				$ 14,000		
	$ 695,000	$ 967,000	$ 460,000	$ 968,000	$ 2,382,000	$ 450,000

11. OPERATIONAL PLANS

- Contingency plans (not at operational level)

Operations Group have developed a number of contingency plans to define operational actions to be taken in the event of substation, busbar and feeder outages. The document NW-#30126392-Contingency Plan Register provides links to contingency plan documents as they are produced.

12. REFERENCE DOCUMENTS

Self explanatory but listed documents for system studies, council plans etc

- Listing of DINIS personal files
- Links to other work documents

13. NOTES

- System development plans identified for the area should link to other plans. Consultation with other work groups, in particular System Performance, Distribution Operations, Area Managers and key external stakeholders e.g. Councils and Government Departments, is essential to ensure optimum outcomes.
- It would be useful to include any details of reference documents and schematic diagrams indicating current substation layout and HV feeder arrangements.

Appendix A. Short Term Plan (<5 years) - Constraints Options and Solutions

A.1 Wynyard terminal substation

A.1.1. Constraints

Burnie substation supplies the surrounding suburbs of Burnie, west to Wynyard, east to Heybridge and a large rural area to the south.

There are two 60 MVA 110/22-11 kV transformers at Burnie and eleven 22 kV distribution feeders.

The forecast substation load in 2012 was 73.4 MVA which exceeds the firm rating of the terminal substation. There are no spare circuit breakers available on the 22 kV bus.

The Wynyard area is supplied from Burnie on feeders 91004, 91005, 91006 and 91009. The feeders are running close to maximum demand. Further growth is predicted in the Wynyard area and the council has just created a new industrial subdivision adjacent to the Burnie airport, which is located in Wynyard. This area is classified as urban for reliability purposes.

The main distribution feeder, 82002, supplying the Penguin area from Ulverstone was overloaded in 2009. High industrial growth is predicted in the Heybridge area and residential growth in Penguin.

Ulverstone is forecast to overload in 2024 and there are currently no spare circuit breakers at the substation.

There are a number of ravines that form natural barriers along the North West Coast and make it difficult when installing new 22 kV distribution feeders between the main centres.

A.1.2. Options considered

1. Establish a new connection point at Wynyard
2. Install a third transformer at Burnie substation
3. Natural gas co-generation (non-network option)
4. Do nothing option

Option 1 – Establish a new connection point at Wynyard

It is recommended that a new terminal substation with two 110/22 kV 60 MVA transformers be installed at Wynyard in 2013 to deload the Burnie terminal substation and provide a reliable supply to the Wynyard area. The new terminal substation will take approximately 28 MVA off the Burnie terminal substation which includes load off feeders 91004, 91005, 91006, 91009 and

91012. This will align with the planning philosophy to remove load from the Burnie substation so that it can supply the closer surrounding areas.

Option 2 – Install a third transformer at Burnie substation

It is recommended that a third transformer and 22 kV switchgear be installed at Burnie in 2013 to deload the two existing transformers. This will provide additional firm capacity and spare circuit breakers for new feeders. This will also align with the future project to upgrade the existing transformers due to age limitations. One new feeder will need to be installed towards the Wynyard area, one to the north of the substation and one towards Penguin to assist Ulverstone.

Option 3 – Natural gas co-generation (non-network option)

There are potential natural gas co-generation sites around the Burnie area that may be available to import into the distribution network. This will be a temporary measure to address peak loading in the distribution network.

Option 4 – Do nothing option

The do nothing option is not considered a feasible option as the firm capacity at Burnie substation has already been exceeded.

Technical comparison

Option	Description	Advantages	Disadvantages
1	Establish a new connection point at Wynyard	• Addresses firm capacity issue at Burnie • Will free up at least two breakers for use in supplying the Burnie area • Improves reliability in the Wynyard area • Higher operational flexibility • Utilises existing 22 kV feeders that run past the site • Aligns with the strategic plan	• Does not increase feeder congestion around Burnie substation • Requires a new site and a new 110 kV overhead DCCT transmission line
2	Install a third transformer at	• Addresses firm capacity issue	• Feeder congestion around Burnie

	Burnie substation	at Burnie • Provides additional circuit breakers at Burnie substation • Utilises existing site	substation • New long feeder routes required towards Wynyard • Does not align with plan to decrease the geographical size of Burnie's supply area

The above technical comparison of options indicates that option 1 provides the best technical solution.

Cost comparison

Option	Initial Capital Cost ($M)	Total Capital Cost ($M)	Net Present Value ($M)
1	24.2	31.2	21.0
2	11.0	43.2	23.9

The above cost comparison of options indicates that option 1 provides the lowest cost solution. Details of the NPV analysis are given in appendix B of NW-#30103847-North West area strategic plan Rev_3.

A.1.3. Possible Solution

Based on the technical and cost comparison, option 1 is considered the preferred option to address the forecast limitations.

Therefore it is recommended that a terminal substation be established at Wynyard.

The scope of works for Transend includes:

- Establishment of a new site in the Wynyard area
- Cut in of the new site to the 110 kV network
- Installation of 2 x 60 MVA 110/22 kV transformers
- Installation of a new switchgear and control building with two buses of 22 kV switchgear

The scope of works for Aurora includes:

- Installation of 22kV feeder tails to cut into the existing feeders to Wynyard, Somerset and south of Burnie. Further details are provided in the five year plan in NW-#30141803-North West area strategic plan Rev 5 2010 final report.

A.2 Alternate Supply to Burnie CBD

A.2.1. Constraints

The Burnie CBD is supplied by an 11 kV network from Emu Bay substation located south west of the city.

The distribution network surrounding the Burnie CBD operates at 22 kV and there is no transfer capability with the 11 kV network supplying the CBD.

A.2.2. Options considered

1. Install an alternate 11 kV connection point from a new dedicated feeder from Burnie
2. Install an alternate 11 kV connection point between F91008 and F90023
3. Non-network option
4. Do nothing option

Option 1 – Install an alternate 11 kV connection point from a new dedicated feeder from Burnie

It is recommended that an alternate 11 kV connection point be installed to enable transfer between the 11 kV and 22 kV networks in Burnie. This connection will be made by running a new dedicated feeder via a 5 MVA 22/11 kV auto-transformer to the 11 kV CBD network.

There are three options for connection of a new dedicated feeder. The first option is to utilise one of the breakers made available by the installation of Wynyard substation. This will require some 22kV network reconfiguration. The second option is to install a new circuit breaker in one of the spare positions at Burnie. The third option is to install an RMU at Burnie and run the new feeder and a station services transformer off one circuit breaker. Utilising the station services transformer breaker for a backup supply will leave the spare breaker positions available for new feeders.

The new dedicated feeder will run north towards the already heavily loaded feeders. When the alternate supply is no longer required, this feeder can be redirected to deload the surrounding 22 kV feeders.

Option 2 – Install an alternate 11 kV connection point between F91008 and F90023

It is recommended that an alternate 11 kV connection point be installed to enable transfer between the 11 kV and 22 kV networks in Burnie. This connection will be made by overbuilding 22 kV overhead conductor from P144018 (F91008 Mount St) to an appropriate site on Mount Street for a 5MVA 22/11 kV auto-transformer. The 11kV connection will be created by

overbuilding along Mount St and connecting to F90023 on P148679. The eight low voltage poles may need to be replaced depending on their suitability for overbuilding the high voltage conductor. Pole mounted reclosers will be required to make the connection normally open for normal operation. Load will need to be transferred from F91008 to F91007 and F91003 through existing connection points to provide some spare capacity on F91008.

Option 3 – Non-network option

No non-network alternatives have been considered.

Option 4 – Do nothing option

The do nothing option is not considered a feasible option as there is currently no backup supply for the high commercial area of the Burnie CBD.

A.2.3. Possible Solution

It is recommended that two alternate 11 kV connection points be installed in 2013 to enable transfer between the 11 kV and 22 kV networks in Burnie.

The first connection will be made by overbuilding 22 kV overhead conductor from P144018 (91008 Mount St) to an appropriate site on Mount Street for a 5 MVA 22/11 kV ground mounted (possibly cubicle type) auto-transformer. The 11kV connection will be created by the installation of 22 kV conductor along Mount St and connecting to 90023 on P148679. The eight low voltage poles may need to be replaced depending on their suitability for overbuilding the high voltage conductor. Pole mounted reclosers will be required to make the connection normally open for normal operation. Load will be transferred from feeder 91008 to feeder 91007 and the reconfigured feeder 91004 through existing connection points to provide spare capacity on F91008.

The second connection will be made by installing a short section of 22 kV cable from reconfigured feeder 91004 (previously 91008) to an appropriate site on Young Street for a 22/11 kV 5 MVA ground mounted auto-transformer. The 11kV connection will be created by installing of a 22 kV section of cable from the transformer along Studholme Street to Emu Bay feeder 90023 on Cunningham Street.

Appendix B. Medium Term Plan (5 to 10 years) - Constraints Options and Solutions

B.1 Port Latta transformer replacement

B.1.1. Constraints

The transformers at Port Latta terminal substation were installed in 1967. Assuming an asset life of 50 years, it is predicted that the transformers will need replacement in 2017. The distribution load is very small and will not influence the replacement of the transformers. The Transend direct connected 22 kV customer, Goldamere, had an average load of 17 MVA in 2009. An expansion at Goldamere will cause the substation load to approach the firm rating of the transformers.

The firm capacity of Smithton substation is predicted to be exceeded in 2030. If the forecast follows closer to the high growth forecast (due to large point load installations), the transformers at Smithton substation may reach firm capacity in 2021.

There are also no spare 22 kV circuit breakers at the Port Latta substation.

B.1.2. Options considered

1. Replace the ageing transformers at Port Latta substation
2. Non-network option
3. Do nothing option

Option 1 – Replace the ageing transformers at Port Latta substation

The first option is to replace the two existing 110/22 kV 22.5 MVA transformers with two 110/22 kV

30 MVA transformers and install 22 kV switchgear. This will address the age limitation of the existing transformers and the lack of spare circuit breakers. The timing of the transformer replacement will be dependent on either a request for increased supply from Goldamere or the age replacement year of 2017.

Option 2 – Non-network option

No non-network alternatives have been considered.

Option 3 – Do nothing option

The do nothing option is not considered a feasible option as the Port Latta transformers have been deemed to be end of life by 2017, and therefore must be removed from service by this time.

B.1.3. Possible Solution

It is recommended to replace the existing transformers with two new 110/22kV 30MVA transformers. The estimated cost of the upgrade is $6 million.

The scope of works for Transend includes:

- Replacement of the existing transformers with two 110/22 kV 30 MVA transformers
- Installation of two buses of 22 kV switchgear

The scope of works for Aurora includes:

- Load transfers to Port Latta to deload Smithton

B.2 Burnie transformer replacement

B.2.1. Constraints

The transformers at Burnie terminal substation were installed in 1971. Assuming an asset life of 50 years, it is predicted that the transformers will need replacement in 2021.

B.2.2. Options considered

1. Replace the ageing transformers at Burnie substation
2. Non-network option
3. Do nothing option

Option 1 – Replace the ageing transformers at Burnie substation

The first option is to replace the two existing 110/22 kV 60 MVA transformers with two new 110/22 kV

60 MVA transformers in 2021. This will address the age limitation of the existing transformers.

Option 2 – Non-network option

No non-network alternatives have been considered.

Option 3 – Do nothing option

The do nothing option is not considered a feasible option as the Burnie transformers have been deemed to be end of life by 2021, and therefore must be removed from service by this time.

B.2.3. Possible Solution

It is recommended to replace the existing transformers with two new 110/22kV 30MVA transformers. The estimated cost of the upgrade is $6 million.

Appendix C. Long Term Plan (>10 years) - Constraints Options and Solutions

C.1 Emu Bay transformer replacement

Emu Bay terminal substation has two 110/22/11 kV 30 MVA transformers that were installed in 1973.

It is recommended that two 110/22/11 kV transformers be installed at the substation. This will allow for future load growth in the Burnie CBD and South Burnie area and also for conversion to 22 kV supply if required in the future. Assuming an asset life of 50 years, these transformers will need replacement in 2023.

If the distribution network is to remain at 11 kV, the new transformers will need to be appropriately sized so as to not affect the fault levels on the 11 kV network. If the mill is still in operation, the transformers will need to be sized to allow for CBD load growth and continued operation of the mill. A new 11 kV feeder to supply the CBD from Emu Bay substation will be required and an additional alternate supply to the CBD will also be required from the Burnie substation. Another alternative supply will be required in 2033 to provide support as the CBD network load increases. Additional supplies from Burnie will be difficult to establish as the load increases at Burnie substation and also in finding appropriate connection points.

If the distribution network is to be converted to 22 kV, this should be completed before the installation of the new transformers. The new transformers should be the standard 60 MVA transformers to provide additional capacity in the Burnie area. The existing alternate supplies can be utilised as feeder ties and the 22/11 kV autotransformers redeployed elsewhere.

Transend has advised that the 11kV switchgear at Emu Bay will need to be upgraded if the voltage is increased to 22 kV.

C.2 Ulverstone transformer replacement

Ulverstone terminal substation has two 110/22 kV 45 MVA transformers that were installed in 1978 and 1983. Assuming an asset life of 50 years, these transformers will need replacement in 2028 and

2033.

If the Emu Bay substation is still operating at 11 kV, both transformers at Ulverstone will need to be replaced in 2028 to provide additional firm capacity at Ulverstone so that it can be used to relieve Burnie.

If the Emu Bay substation is operating at 22kV, the transformer replacements can be completed in 2028 and 2033 as the age limitation is reached. Emu Bay substation will be able to provide support to Burnie until the Ulverstone substation upgrade is complete.

C.3 Smithton transformer replacement

The firm capacity of Smithton substation is predicted to be exceeded in 2030. The Port Latta substation upgrade project will deload the substation in 2017 which will alter the timing of the limitation at Smithton. It is recommended that the transformers be replaced with two 110/22 kV 60 MVA units in 2034. The load at the substation should be monitored and the timing of the project adjusted accordingly. The existing transformers were installed in 2003 and can be recovered for use at another site.

Transend has advised that the replacement of the existing transformers will be a complex and expensive project. The option of installing a third transformer should be considered as another possible solution.

C.4 Penguin terminal substation or Third transformer at Emu Bay substation

This project is very dependent upon the decision to convert the 11 kV network and also the operation of the mill at Emu Bay.

If the CBD network remains at 11 kV, Penguin substation will be required in 2035 to address the firm capacity issues on Burnie and Ulverstone substation. If the mill is still in operation at this stage, it will be supplied at 11 kV from Emu Bay.

If the CBD network is converted to 22 kV, Emu Bay substation will provide firm capacity support to Burnie and Ulverstone and Penguin substation will not be required in 2040. However, if the mill is still in operation (supplied off 22/11 kV transformers from Emu Bay substation), additional firm capacity will be required. Depending on feeder congestion and substation layouts, this can be done by installing a third transformer at Emu Bay or installing a new substation at Penguin. The additional firm capacity initially created by converting Emu Bay to a 110/22 kV substation will mean that the Penguin/Emu Bay third transformer project can be delayed until 2048.

Appendix D. Technical Data

D.1 Substation loading

Westerway			Capacity with all elements in service (N)		Capacity with one element out of service (N-1)		Maxium Demand 2008		Maxium Demand predicted summer 2009		Maximum Demand predicted for winter 2009	
Elements	No	Emergency Rating MVA	Summer MVA	Winter MVA	Summer MVA	Winter MVA	Summer MVA	Winter MVA	Summer MVA	N-1 Load at Risk	Summer MVA	N-1 Load at Risk
Transfomers	2	1	45	45	22.5	22.5			14.6	0	30	7.5
Distributed Subtransmission Feeder NNxxx												

Reference master document # 30006462

D.2 Aurora Zone Substation data sheet

There are no Aurora zone substations in the North West planning area.

Reference master document #30040697

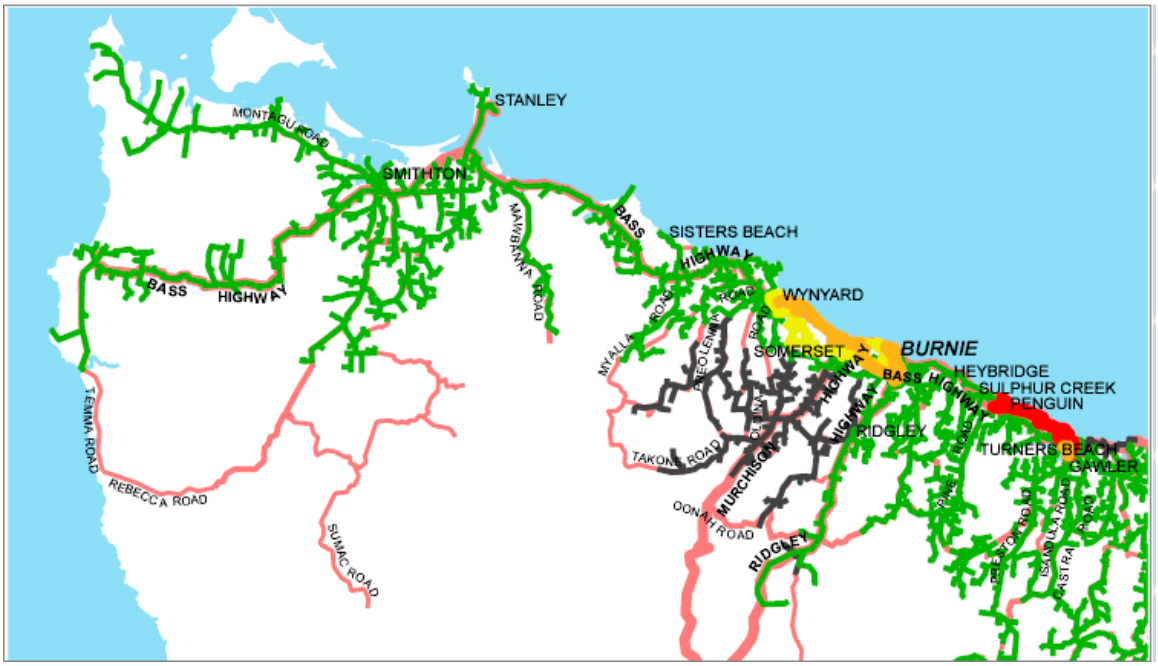
D.3 Transend Station data sheet

Planning Area	Connect Point Substation	Connection Company	Connection Voltage kV	No. Of Connection Points	Type
Northwest	Emu Bay	Transend Networks	11	4	Distribution
Northwest	Ulverstone	Transend Networks	22	7	Distribution
Northwest	Burnie	Transend Networks	22	11	Distribution
Northwest	Port Latta	Transend Networks	22	2	Distribution
Northwest	Smithton	Transend Networks	22	5	Distribution

Reference master document #30040697

D.4 High Voltage feeder loading

2008/09 financial year



Planning Area	Station	Feeder Number	Voltage	Sum of MD (MVA)	Planning Std (MVA)	Load in 5 years (MVA)
Central	Fisher	3 (C252)	11	0.9	5	1.0
		4 (D252)	11	0.0	5	0.1
	Meadowbank	45001	22	1.6	10	1.9
		45002	22	2.1	10	2.4
		45003	22	3.2	10	3.6
	New Norfolk (Terminal)	39563	22	7.5	10	8.3
		39565	22	6.2	10	6.9
		39568	22	2.3	10	2.6
		39569	22	0.1	10	0.2
		39570	22	6.1	10	6.8
		39571	22	3.6	10	4.0
	New Norfolk (Zone)	35010	11	2.9	5	3.2
		35011	11	2.3	5	2.7
		35012	11	2.3	5	2.6
	Tungatinah	T8&T9	22	1.4	10	1.6
	Waddamana	202	22	0.6	10	0.7
	Wayatinah	1	0	0.0	0	0.1
		2	0	0.0	0	0.1
		3	0	0.0	0	0.1

Reference master document #30040697

D.5 Transfer Capacity

- MD transfer capacity with other stations (order of)
-
-
- Brief outline of transmission and subtransmission feeder arrangements, ratings and capabilities

Note it would be useful to include any details of reference documents and schematic diagrams

- HV feeder ratings, current summer and winter loads. MD's
- Provide high and low load forecasts i.e. +/- 10% of base load as above for each HV feeder for the next 10 years
- Indicate anticipated summer and winter load growths for each of the existing HV feeders in the area including ratings of the feeder.
- As above for major zones
- Reference Transend Annual Planning Report.

Appendix E. Planning Criteria and Guidelines

E.1 Transmission Planning Criteria

Transend's planning criteria are fundamentally based on:

- the National Electricity Rules (NER);
- the Electricity Supply Industry (Network Performance Requirements) Regulations 2007; and
- good electricity industry practice

The following criteria are used when planning for the transmission system.

Transmission and transformer loading

- Transmission lines and autotransformer loadings for an intact system or for a contingency (N–1) should not exceed their continuous ratings in planning studies. For supply transformers four-hour emergency ratings can be used to defer augmentations depending on the peak duration of the load duration curve.
- Transmission line loading on circuits covered by NCSPS should not exceed 95 per cent of their rating for an intact system when Basslink is exporting. When Basslink is not in service or importing, standard N–1 criteria applies.

Load interruptions

For an intact system, i.e. where no elements are out of service for maintenance the following should apply as per Network Performance Requirements:

- no credible single contingency event will interrupt more than 25 MW load;
- no single asset failure will interrupt more than 850 MW or, in any event cause a system black;
- the unserved energy to loads interrupted as a result of damage to a network element related to a credible contingency event must not exceed 300 MWh; and
- the unserved energy to loads interrupted as a result of a single asset failure must not exceed 3,000 MWh

Single asset failure that would cause large load interruptions is the loss of a double circuit line, a bus section fault or a bus coupler fault. In calculating unserved energy, the ability to transfer load and the time required for load restoration should be taken into account.

Exposure due to maintenance outage

- Where a network element has been withdrawn from service for maintenance, replacement or repair, the energy exposed to interruption by a credible contingency event must not exceed 18,000 MWh.

In calculating unserved energy, the ability to transfer load should be taken into account.

Maximum repair / replacement time

Minimum Performance Requirements state that for the purpose of calculating unserved energy, any replacements or repairs undertaken, should not exceed the following:

- Transmission line repair – 48 hours
- Transformer replacement – 8 days
- Auto transformer replacement – 18 days

E.2 Distribution Planning Criteria

Key planning standards include: -

System Performance

- Voltage regulation range of + 6% and – 6% of the nominal HV voltage and a LV voltage range of 230/400 V +10% and –2%;
- Power quality standards are recognised in accordance with the TEC, NER and applicable Australian Standards; and
- Tasmanian Reliability Performance Standards

Table Appendix B -1 Tasmanian Reliability Performance Standards

Community category	Frequency standard (Maximum average number of supply interruptions per year)		Duration standard (Maximum total time without electricity in a year measured in minutes)	
	For the category	For each community	For the category	For each community
Critical infrastructure	0.2	0.2	30	30
High density commercial	1	2	60	120
Urban and regional centres	2	4	120	240
Higher density rural	4	6	480	600
Lower density rural	6	8	600	720

Source: Tasmanian Electricity Code

Capacity

Maximum average loading considerations for distribution feeders facilitating HV feeder interconnectivity;

- 22 kV – 10 MVA continuous and 15 MVA (typically one hour) emergency;
- 11 kV - 5 MVA continuous and 7.5 MVA (typically one hour) emergency.

Security of supply

Group firm philosophy or a deterministic planning standard, e.g. “N-1”, dependent on elements of security, load and exposure to risk

Schedule 5.1.2.2 (a) of the NER states:

> *“In the satisfactory operating state, the power system must be capable of providing the highest reasonably expected requirement for power transfer (with appropriate recognition of diversity between individual peak requirements and the necessity to withstand credible contingency events) at any time.”*