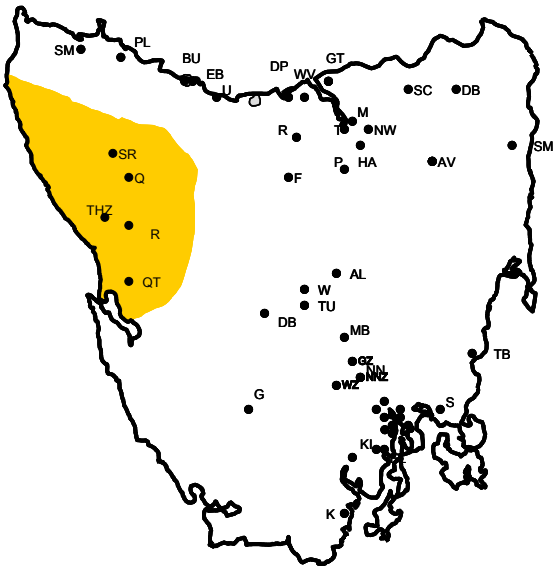
ABN 85 082 464 622



WEST COAST

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 West Coast covers an area from Strahan to Arthur River on the west coast, the Savage River National Park, Rosebery and Queenstown.

The area has a strong mining industry with a number of terminal substations in the area supplying direct connected mining customers. There is a developing tourism industry particularly in the coastal town of Strahan. The load growth in the area is very dependent upon the mining industry and based upon individual requests by direct connected customers.

The network in this area faces a number of challenges including limited access, wild weather, salt pollution and lightning strikes. The townships of Zeehan and Strahan are highly dependent on power for both the tourism and mining industries and these areas are currently supplied by radial 22kV feeders.

The identified or known large constraints are as follows:

-

To address the above constraints the following is being proposed:

-

TABLE OF CONTENTS

2. EXISTING SYSTEM

2.1 Substations

Substations supplying this area are:

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

Transend owned substations

- Queenstown (click here to see the 110/22/11kV single line diagram)
- Rosebery (110/44/22kV)
- Savage River (110/22kV)

Aurora owned substations

Details of drawings including single line diagrams of Aurora zone substations are available in NW-#284367-Aurora Zone and Terminal Sub Drawing Register from QDMS.

- Trial Harbour Zone (44/22kV)

2.2 Supply Network

Distribution within this planning area is predominantly at 22kV, supplied by 110/22kV terminal stations. There are a number of direct connected customers at 44kV and 22kV.

2.3 Network Statistics

West Coast planning area network statistics [1]

22kV:

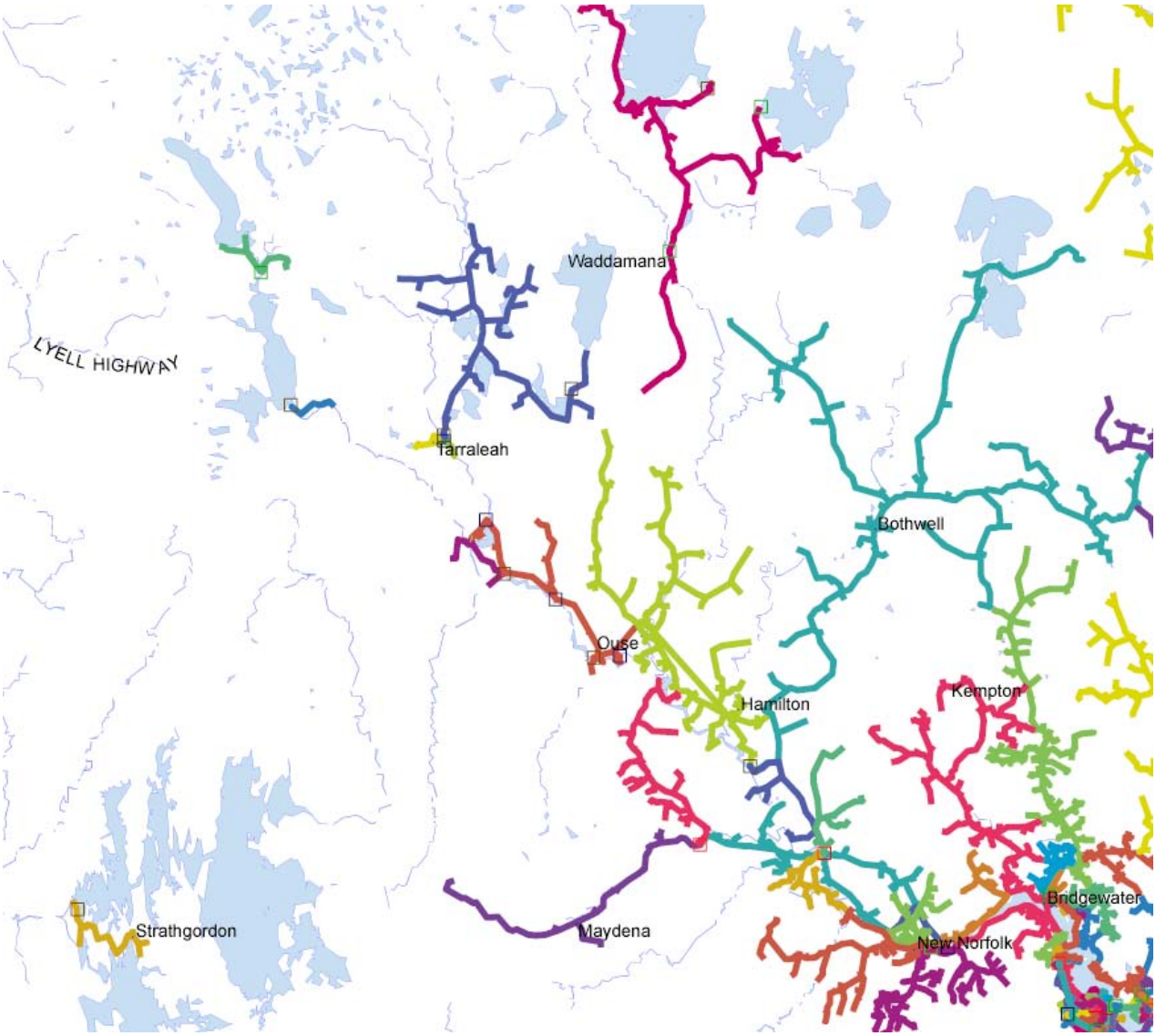
22kV circuit length	345	km
Connected customers	3,971	
Connected transformer capacity	50,473	kVA
Customer density	12	per 22kV circuit km
Transformer capacity density	146	kVA per 22kV circuit km

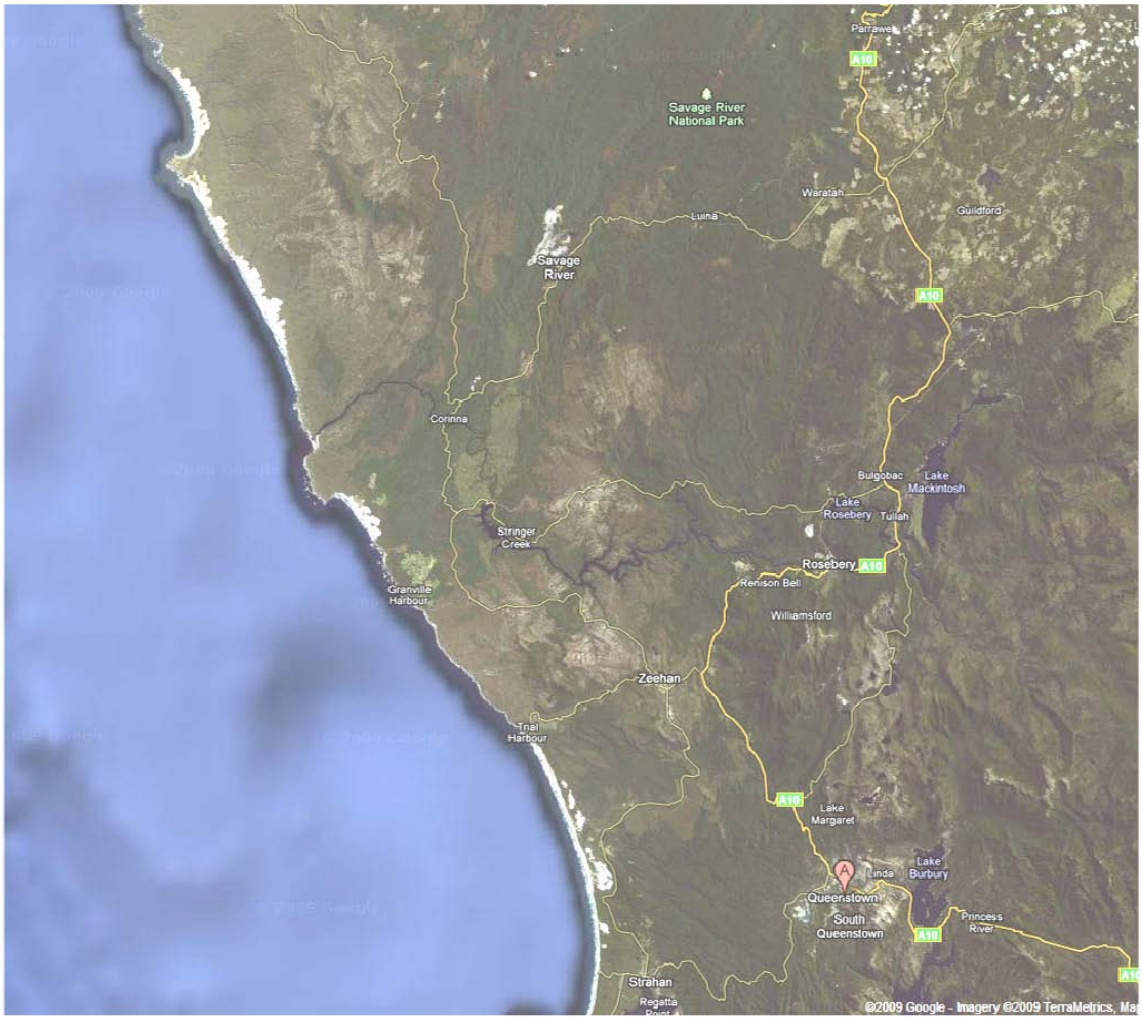
[1] Data sourced from Gtech, query DISTFDR. See NW-#30146137-Feeder Data for Development Plans.

44kV:

44kV circuit length	47	km
Connected customers	4	
Connected transformer capacity	18,100	kVA

The maps below show the area referred to as West Coast planning area.




Parrawe
A10
Savage River National Park
Waratah
Guildford
Luina
Savage River
A10
Corinna
Bulgobac
Lake Mackintosh
Lake Rosebery
Tullah
Stringer Creek
Rosebery
A10
Granville Harbour
Renison Bell
Williamsford
Zeehan
Trial Harbour
A10
Lake Margaret
Linda
Lake Burbury
Queenstown
South Queenstown
Princess River
A10
Strahan
Regatta
©2009 Google - Imagery ©2009 TerraMetrics, Ma

3. LOCAL PLANNING ISSUES

3.1 Long Term System Strategy

West Coast will continue the development of the 22 kV distribution network. Further extension of the 44kV network will not be encouraged.

The introduction of 66kV subtransmission has been proposed to complement existing distribution at 22 kV, and overcome capacity constraints on the existing Rosebery 44kV network..

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 West Coast planning area:

- West Coast Council.

Other relevant authorities include:

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

3.3 Existing Critical Loads

West Coast planning area has a large 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 West Coast planning area:

Load Type	Description	Substation(s)	Feeder(s)	Asset Connection Point(s) - if applicable
Commercial / Major Retail				

Medical				
Rehabilitation Services				
Industrial				
Sewerage Treatment Plants				
Education				

Table 1 – West Coast Critical Loads

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

3.4 Future Developments and Restrictions

Council planning schemes

The West Coast Council Planning Scheme was released in 2002 and has a number of recent amendments. Part C of the planning scheme discusses the development in urban, commercial, natural resources and environment protection zones. The intents of the zones are as follows:

- Urban –Values are assigned to each of the major towns in the West Coast area. These include promoting heritage form and historical significance, emphasising local attractions and protecting and enhancing residential amenity.
- Commercial – 'provide for commercial use and development within discrete areas and to promote the upgrading and improvement in the environmental quality, attractiveness to visitors and physical amenity of commercial areas'
- Natural resources – allow for sustainable use of resources for tourism, hydroelectricity and forestry without adversely affecting the zone
- Environment Protection – 'provide for the protection and management of areas and resources in areas of high environmental value for reasons of environmental protection, nature conservation, recreation, scenic amenity, maintenance of natural processes, protection of fragile landforms, catchment protection and appropriate public access'.

3.5 Reliability for the area

The West Coast Area includes the following Reliability communities:

- Urban – Queenstown, Rosebery, Strahan
- Low Density Rural - West Coast

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:

- Queenstown

The remaining reliability communities in the West Coast Planning area have shown adequate reliability performance in 2009/10 up to March 2010.

3.6 Asset issues

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

Further information is detailed in the following Asset Management Plans relevant to the West Coast 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

NW30084386 - Management Plan 2010: Zone Substations

3.7 Links

The LAM Area Management Plan relevant to the West Coast planning area is:

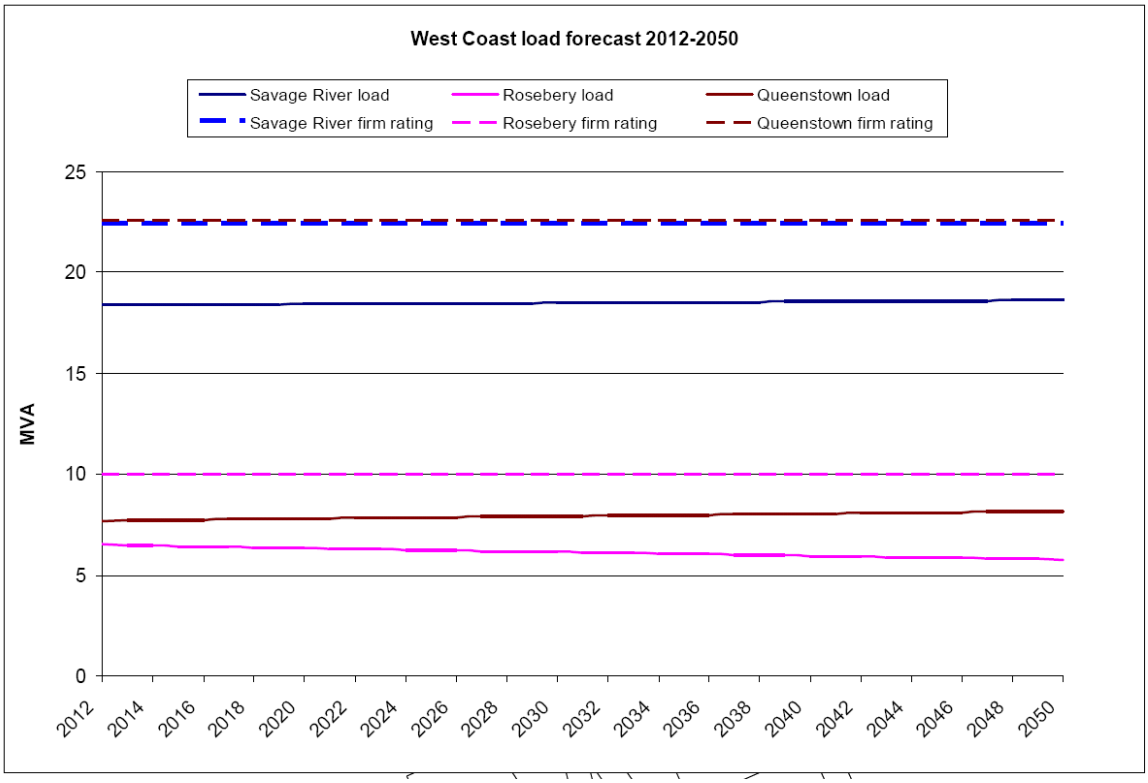
- West Coast NW-#254752-Area Management Plan West Coast.

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

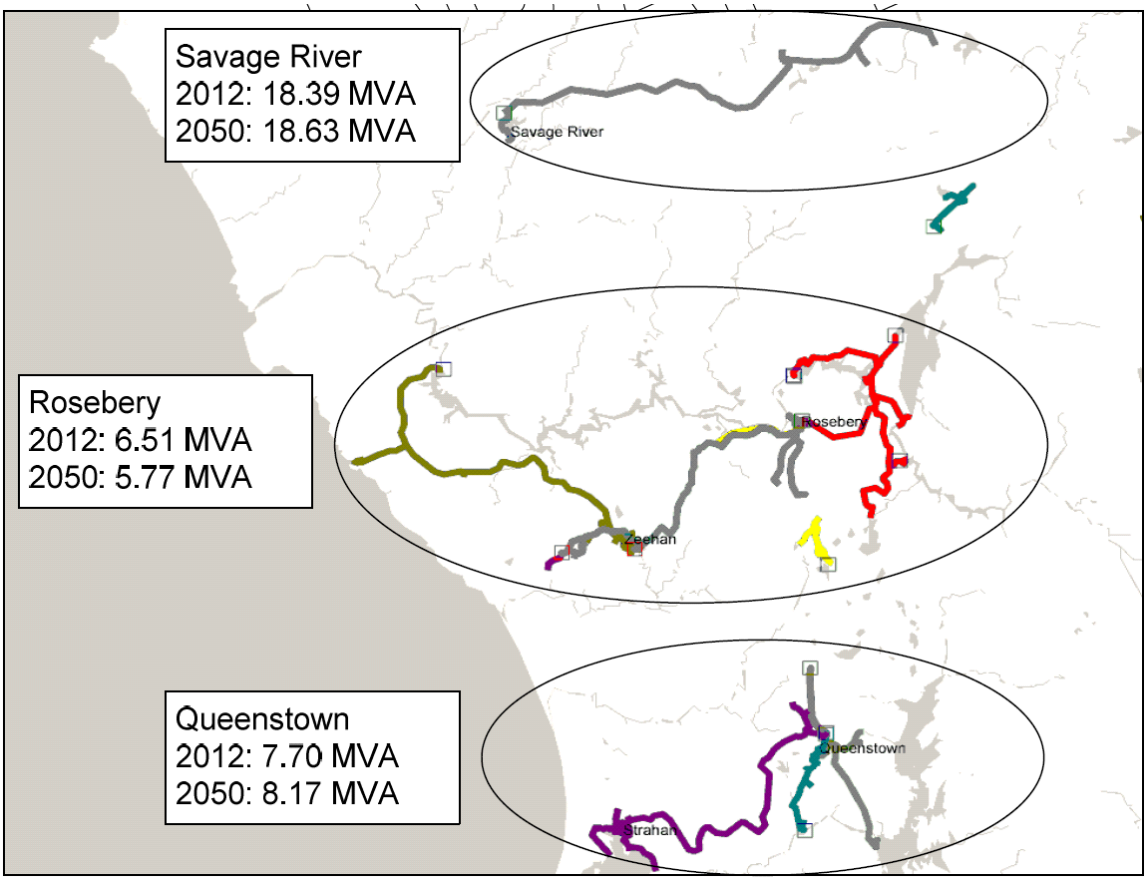
4. LOAD FORECAST

Due to the rural nature of the load in the West Coast, 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 Queenstown, Rosebery and Savage River terminal substations. The load growth in the area is very dependent upon the mining industry and based upon individual requests by direct connected customers.

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



The following figure provides 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. NW-#30083791-(pdf version) Aurora 2009 10year Load forecast - Draft
- Connected kVA (from Web map) customer connections)
- Description

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
	West Coast	Newton	#N/A
	West Coast	Que	#N/A
	West Coast	Queenstown	0.50%
	West Coast	Rosebery	0.50%
	West Coast	Rosebery	0.50%
	West Coast	Savage river	0.50%

As the table above shows, load growth in the West Coast planning area is expected to be modest in the ten year forecast period. However there is always the possibility of large point loads occurring due to mining activity.

Copy of load profile

4.1 Future committed point loads (> 1 MVA)

- None identified

4.2 Possible point loads (> 1 MVA)

- New mine

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

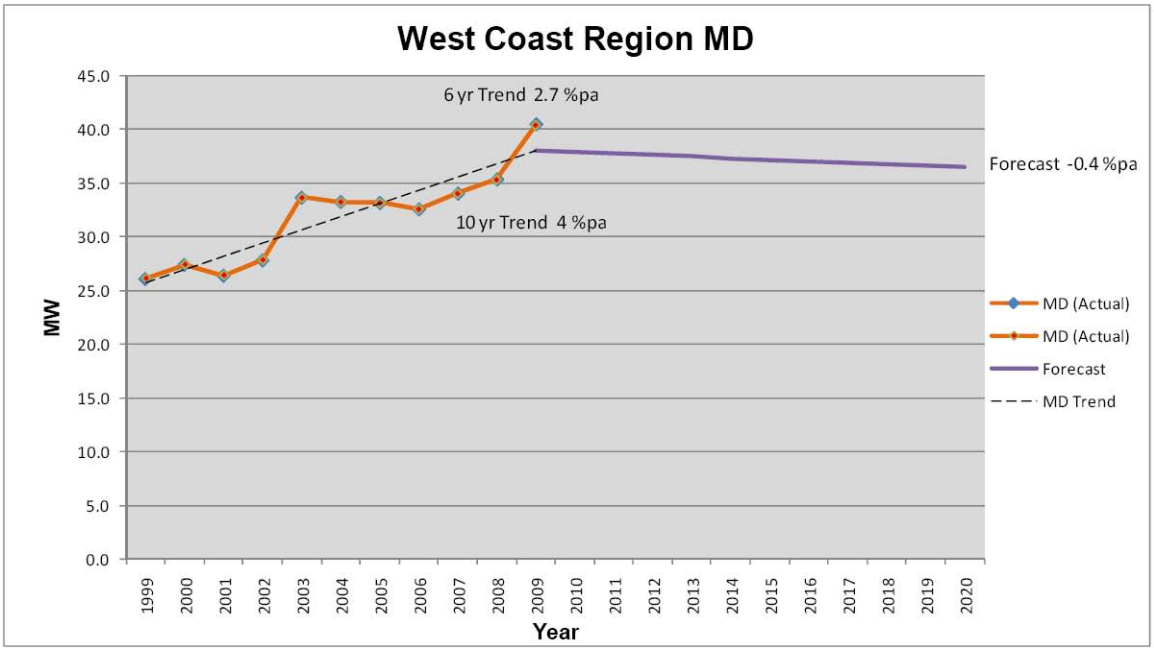
- None identified

4.4 Possible future embedded generation (> 1 MVA)

- Wind farms

4.5 Analysis of Load Forecast

- Load model hyperlink / reference NW-#30072253-West Coast area load model (2009)
- Copy of load forecast graph NW-#30083791-(pdf version) Aurora 2009 10year Load forecast - Draft



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 E on page 35.

6. CONSTRAINTS (LIMITATIONS)

Constraints in the West Coast 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 NW-#30141356-Distribution Network Planning Manual DRAFT 2010 for State wide management plans for the Distribution Substation and LV System planning levels

6.1 Summary of Constraints

6.1.1 Zone Substation Constraints

Capacity / Aged Asset Constraints				
Substation	**Firm Capacity (MVA)**	**Current Load (MVA)**	**Forecast to exceed (year)**	**Comments**
Rosebery 44kV			Already exceeded	Firm capacity currently exceeded. Transformers recommended for replacement in 2044.
Rosebery 22kV				Aged Asset: Transformers recommended for replacement in 2033 and 2035.
Savage River				Aged Asset : Transformers recommended for replacement in 2017.

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

6.1.2 Subtransmission Constraints

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

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

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

6.1.3 Distribution Feeder Constraints

Capacity Constraints				
Substation	**Feeder**	**Capacity constraint type**	**Forecast to exceed (year)**	**Comments**
		Feeder Section	Already Exceeding	
		Feeder Section	Already Exceeding	

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

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.

6.3 Transfer and Operational Capability

The table below shows the rating, peak load and transfer capacity. 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**	**Transfer Substation**
Queenstown				0	Trial Harbour
Trial Harbour				0	Queenstown

The table shows that no transfer capacity exists between any of the West Coast substations.

Details of the analysis carried out on load transfers in the HE area are available in NW-#30073003-West Coast area load transfer (2009).

-

6.4 Power Factor

6.5 LV issues

There are no locations in the West Coast 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[2]	
Tx size	**Count**	**Customer Count**	**Count**	**Customer Count**
< 50 kVA	65	151	4	50
>= 50 kVA	180	3,795	2	50

7. SHORT TERM PLAN (<5YR)

The West Coast Area Strategic Plan provides the background to much of the planning information in this document. It can be found at: NW-#30103852-West Coast strategic area plan Rev_3.

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

A joint Aurora-Transend study is ongoing to determine configuration and voltage for the existing Rosebery 44kV network.

Year	Proposed Project	Proposed Outcomes
Ongoing	Rosebery 44 kV network augmentation	Address firm capacity and voltage issues on the Rosebery 44 kV network

Details of the constraints, options and possible solutions analysed to arrive at these proposed projects are included in Appendix A on page 25.

8. MEDIUM TERM PLAN (5 TO 10YR)

The West Coast Area Strategic Plan provides the background to much of the planning information in this document. It can be found at: NW-#30103852-West Coast strategic area plan Rev_3.

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

Year	Proposed Project	Proposed Outcomes
2017	Savage River transformer upgrade	Addresses age limitation on the existing transformers at Savage River

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

Details of the constraints, options and possible solutions analysed to arrive at these proposed projects are included in Appendix B on page 31.

9. LONG TERM PLAN (10YR+)

The West Coast Area Strategic Plan provides the background to much of the planning information in this document. It can be found at: NW-#30103852-West Coast strategic area plan Rev_3.

The West Coast area is characterised by numerous large point loads that are currently supplied at 110 kV and 44 kV. The 22 kV distribution load in the area is fairly small and well supported by the existing 110/22 kV substations.

The 44kV subtransmission voltage is non-standard and a conversion to 66 kV is planned for the West Coast area with the conversion to be staged. The 66 kV network will provide additional capacity in the subtransmission network and is cheaper to install than new 110 kV network.

Network extensions for new large customers (including wind farms) will need to be determined based on the size of the load and the proximity to the 66 kV, 110 kV and 220 kV networks in the West Coast area.

There are no specific projects in the long term for the West Coast area.

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

Since all the 22kV networks in the West Coast planning area are isolated from one another, there is no opportunity for 22kV switching in the event of transformer outages contingencies.

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 Rosebery 44kV Network

A.1.1. Constraints

Rosebery terminal substation has two 30 MVA 110/44 kV transformers and two 44/22 kV transformers. The combined load on the 44 kV feeders and 44/22 kV transformers exceeds the firm capacity of the 110/44 kV transformers during peak times with all mines in operation.

The first 44kV feeder, 97011, runs to the Rosebery mine and is privately owned and managed by Transend. The second 44kV feeder, F97013, runs for 33.5 km to Trial Harbour zone substation. The third 44kV feeder, F97014, runs to Bluestone Mine. The load on the 44kV feeders to the three mines is forecast to grow significantly as outlined in the following table.

Feeder	Customer	Load (2009)	Conductor type	Rating	Aurora forecast load
97011	Rosebery Mine (Transend)	14.8 MVA	Private feeder	685 A / 52 MVA	25 MVA
97013	Supplies Zeehan and Trial Harbour Zone	9.6 MVA	19/3.25 AA	239 A / 18.2 MVA	14 MVA
97014	Bluestone Mine (Aurora)	11.2 MVA	26/.1236-7/.0961	236 A / 18MVA	17.5 MVA

Another main driver for this project is the removal of the 44 kV voltage level from the sub transmission network. This is due to the presence of a non standard voltage and also capacity limitations based on forecast load growth on the existing 44 kV feeders.

A.1.2. Options considered

1. Installation of a 110/66 kV terminal substation and an 66/22 kV zone substation
2. Installation of a 110/66 kV terminal substation, 110/22 kV transformers and 110/6.6 kV transformers

3. Installation of a 110/66 kV terminal substation and an 66/22 kV zone substation with 22 kV feeders to supply the Rosebery mine
4. Non-network option
5. Do nothing option

Option 1 – Installation of a 110/66 kV terminal substation and an 66/22 kV zone substation

The first option involves the upgrade of the existing transformers to 110/66 kV transformers, new 66 kV switchgear and the installation of a zone substation with two new 66/22 kV transformers. This will be done in stages and the initial configuration will include a 110/66/44 kV transformer and two 66/44/22 kV transformers to allow the continued operation of the 44 kV network. The three 44 kV feeders will be upgraded to 66 kV in stages and the mining customer transformers will also be replaced.

Option 2 – Installation of a 110/66 kV terminal substation, 110/22 kV transformers and 110/6.6 kV transformers

The second option involves the upgrade of the existing transformers to 110/66 kV transformers, new 66 kV switchgear, two new 110/22 kV transformers and two new 110/6.6 kV transformers. This will be done in stages and the initial configuration will include a 110/66/44 kV transformer and two 110/22 kV transformers to allow the continued operation of the 44 kV network.

The two 44 kV feeders to Bluestone mine and Trial Harbour zone will be upgraded to 66 kV in stages and the mining customer transformers will also be replaced at Bluestone. New 6.6 kV cables will be required to the Rosebery mine when the 110/6.6 kV transformers are installed and the 44 kV feeder will be scrapped.

Option 3 – Installation of a 110/66 kV terminal substation and an 66/22 kV zone substation with 22 kV feeders to supply the Rosebery mine

The third option involves the upgrade of the existing transformers to 110/66 kV transformers, new 66 kV switchgear and the installation of a zone substation with two new 66/22 kV transformers. This will be done in stages and the initial configuration will include a 110/66/44 kV transformer and two 66/44/22 kV transformers to allow the continued operation of the 44 kV network. Larger 66/44/22 kV transformers will be required to support the Rosebery mine load at 22 kV.

The two 44 kV feeders to Bluestone mine and Trial Harbour zone will be upgraded to 66 kV in stages and the mining customer transformers will also be replaced at Bluestone. New 22 kV feeders will be required to the Rosebery mine when the 110/6.6 kV transformers are installed and the 44 kV feeder will be scrapped.

Option 4 – Non-network option

No non-network alternatives have been considered.

Option 5 – Do nothing option

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

Technical comparison

Option	Description	Advantages	Disadvantages
1	Installation of a 110/66 kV terminal substation and an 66/22 kV zone substation	• Address firm capacity limitations at Rosebery • Utilises existing 44 kV feeders where upgrade is possible • Additional 22 kV and 6.6 kV feeders not required • Requires less 110 kV circuit breakers • Uses 66/44/22 kV transformers that can be used as a spare at Trial Harbour • Can be easily staged to incorporate 44 kV network	•

Option	Description	Advantages	Disadvantages
2	Installation of a 110/66 kV terminal substation, 110/22 kV transformers and 110/6.6 kV transformers	• Address firm capacity limitations at Rosebery	• Requires four additional 110 kV circuit breakers • Will still ultimately require a third 110/66 kV transformer (assuming load increases at existing mines and the Mt.Lindsey load becoming operational) • 110/22 kV transformers required in the first stage of the project • New 6.6 kV cables required to supply 25 MVA – 6x300mm2 Cu XLPE spaced 450mm • Existing 44 kV feeder to Rosebery mine will be scrapped
3	Installation of a 110/66 kV terminal substation and an 66/22 kV zone substation with 22 kV feeders to supply the Rosebery mine	• Address firm capacity limitations at Rosebery • Requires less 110 kV circuit breakers	• Larger 66/44/22 kV transformers required, different to those installed at Trial Harbour • New high capacity 22 kV cables required to supply 25 MVA at Rosebery mine • Existing 44 kV feeder to Rosebery mine will be scrapped

Cost comparison

Option	Initial Capital Cost ($M)	Total Capital Cost ($M)	Net Present Value ($M)
1	17.0	37.0	26.3
2	22.0	56.3	40.5
3	18.0	38.1	27.1

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-#30103852-West Coast strategic area 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:

Transend:

Stage 1

- Install a new 110/66/44 kV 60 MVA transformer and 110 kV circuit breaker
- Install new 66 kV switchgear with twelve breakers (3 transformers CBs)

Ongoing

- Upgrade 44 kV F97011 (150 m) to Rosebery mine to 66 kV
- Replace customer transformers at Rosebery mine (66/6.6kV)
- Replace existing 110/44 kV transformers with 110/66 kV 60 MVA transformers
- Changeover to 66 kV windings at Rosebery

Aurora:

Stage 1

- Install two new 66/44/22 kV zone substation adjacent to the existing terminal substation (two new transformers, 66 kV connection to Rosebery, 22 kV switchgear and cutovers)

Ongoing

- Upgrade the 44 kV 35 km section of F97013 from Rosebery to Zeehan with 66 kV
- Construct a new 66 kV feeder to replace F97014 (10 km) to Bluestone mine
- Convert the old 44 kV feeder F97014 and 44/0.415 kV customers to 22 kV
- Replace customer transformers at Bluestone mine
- Changeover to 66 kV windings at Trial Harbour

Refer to the five year plan in Section 8.3.2 of NW-#30103852-West Coast strategic area plan Rev_3 for information on the staging for the 44kV conversion. The remaining changeover work including customer transformer replacements and the installation of a new 110/66 kV 60 MVA transformer can be completed just before the changeover is to occur (assuming there are no age limitations on the customer transformers).

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

B.1 Savage River transformer upgrade

B.1.1. Constraints

The transformers at Savage River 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 direct connected customer, Goldamere, had an average load of 17 MVA in 2009. An expansion at Goldamere would cause the substation load to approach the firm rating of the transformers. 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. This timing can be refined further by completing regular testing on the transformer as it approaches the 50 year mark.

B.1.2. Options considered

1. Replace the ageing transformer at Savage River substation
2. Non-network option
3. Do nothing option

Option 1 – Replace the ageing transformers at Savage River substation

The first option is to replace the two existing 110/22 kV 22.5 MVA transformers with two new 110/22 kV 25 MVA transformers. 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 Savage River 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 that the existing transformers at Savage River substation be replaced in 2017. This timing can be refined further by completing regular testing on the transformer as it approaches the 50 year mark.

The estimated cost of this project is $6 million.

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

There are no specific projects in the long term for the West Coast area.

Appendix D. Technical Data

D.1 Substation loading

Trial Harbour Rd			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	20	45	45	22.5	22.5			14.6	0	30	7.5
Subtransmission Feeder xx013			0	0	0	0			14.6	0	0	0

Reference master document # 30006462

D.2 Aurora Zone Substation data sheet

Planning Area	Zone Substation	Type	Primary Voltage (kV)	Secondary Voltage	No of Feeders In Service
West Coast	Trial Harbour	Rural - major	44	22	3

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
West Coast	Newton	Transend Networks	22	1	Distribution
West Coast	Que	Transend Networks	22	1	Distribution
West Coast	Queenstown	Transend Networks	22	3	Distribution
West Coast	Rosebery	Transend Networks	44	3	Distribution & subtransmission
West Coast	Rosebery	Transend Networks	22	3	Distribution
West Coast	Savage River	Transend Networks	22	1	Distribution

Reference master document #30040697

D.4 High Voltage feeder loading

2008/09

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 E -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.”*