Issue 1.0, April 2010

FINAL REPORT

PROPOSED NEW LARGE TRANSMISSION NETWORK ASSET

AND

PROPOSED NEW DISTRIBUTION NETWORK ASSETS

DEVELOPMENT OF THE ELECTRICITY SUPPLY NETWORK IN THE LAUNCESTON AREA

FINAL

UNCONTROLLED WHEN PRINTED

CONTACT

Refer to section 6 of this final report.

RESPONSIBILITIES

Compliance

Refer to Appendix B of this final report.

Document Management

This document is the joint responsibility of:

- Transend's Asset Strategy & Planning Group, Transend Networks Pty Ltd, ABN 57 082 586 892

- Aurora's System and Asset Management Group within the Network Division of Aurora Energy Pty Ltd ABN 85 082 464 622.

Disclaimers

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

EXECUTIVE SUMMARY

This final report has been prepared in accordance with Clause 5.6.6(h) of the National Electricity Rules (NER).

Transend Networks Pty Ltd (Transend) as the Tasmanian Transmission Network Service Provider (TNSP), and Aurora Energy Pty Ltd (Aurora) as the Tasmanian Distribution Network Service Provider (DNSP), have obligations under the NER and the *Electricity Supply Industry (Network Performance Requirements) Regulations 2007 (ESI Regulations)*, to ensure that the state's transmission and distribution networks meet the required minimum performance standards.

Transend and Aurora have identified existing and emerging network constraints within the transmission and distribution networks in the Launceston area. In addition, Aurora has submitted a connection application to Transend requesting that a new 110/22 kV connection point be established in the east Launceston area by May 2012.

In accordance with the requirements of Clause 5.6.2(c) of the NER, Transend and Aurora have undertaken joint planning to determine alternative options and establish plans to address the identified network constraints. As part of this process, Transend and Aurora conducted a joint consultation process, and published an application notice in accordance with the requirements of Clause 5.6.2(f) of the NER.

A summary of the application notice was published on Australian Energy Market Operator's (AEMO) website on 21st January 2010. Registered participants and interested parties were invited to make submissions by 10th March 2010. No submissions were received.

The Launceston area studied is the area that extends from Launceston's Central Business District (CBD) east to St Leonards and Waverley, south to Evandale and Longford, west to Westbury, and north to Exeter and Dilston. This area can be predominately characterised as commercial, residential and rural residential, with some modest industrial areas. The Launceston area is currently supplied from Transend's 110 kV network via Hadspen, Mowbray, Norwood and Trevallyn substations. These substations provide supply to Aurora's 22 kV inter-connected distribution network in the Launceston and surrounding areas.

In undertaking joint planning, Transend and Aurora considered a number of development growth scenarios, as well as known significant developments. As part of the demand and energy forecasting process, consideration was also given to the impact of recent global economic events, as well as the potential impact of the proposed Carbon Pollution Reduction Scheme (CPRS) on the different growth scenarios.

Transend and Aurora have conducted studies of the transmission and distribution networks in the Launceston area over a 15 year planning period commencing 2009. These studies identified a number of existing and emerging network constraints. In order to manage the existing constraints in the short term, Transend and Aurora have adopted operational strategies. However these strategies do not provide a suitable long-term solution given the increasing load and emerging supply constraints in the area.

Under the medium winter demand forecast for the Launceston area, the current transmission network supply arrangements do not comply with the requirements of the NER. Additionally, the supply arrangements at Norwood Substation will also be non-compliant with the requirements of the ESI Regulations by winter 2011. Consequently, any transmission network augmentations that arise out of the inability of the current network to meet these requirements are reliability augmentations as defined in the NER.

To address the existing and emerging supply constraints, Transend and Aurora considered a range of alternative options covering both network and non-network solutions. Both Transend and Aurora are of the view that there are currently no practical non-network solutions available to address the supply constraints in the Launceston area. Any genuine proponents of viable non-network solutions to address

the supply constraints were encouraged to submit proposals in response to the application notice.

Five network alternatives were selected as being practical options to address the identified network constraints. These are summarised in Table 0–1.

Table 0–1 Summary of network augmentation options

Option	Transmission Network Augmentation	Distribution Network Augmentation
Option 1 Augment Norwood Substation and establish a 110 kV connection between Mowbray and Norwood substations	• extension of the 110 kV bus bars at Norwood Substation to facilitate the installation of a third 110/22 kV 60 MVA transformer, including associated switchgear and protection and control schemes; • extension of the existing 22 kV switchboard and associated protection and control schemes at Norwood Substation; • establishment of new 110 kV transmission bays at Mowbray and Norwood substations; and • installation of a 110 kV transmission cable between Mowbray and Norwood substations.	• installation/augmentation of ten distribution feeders from Norwood Substation to address load constraints on existing feeders.
Option 2 Establish a new 110/22 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point	• establishment of a new 110/22 kV substation in the east Launceston area, with two 60 MVA 110/22 kV transformers; • establishment of new 110 kV transmission bays at Mowbray and Norwood substations; • establishment of a new 110 kV transmission cable from Mowbray Substation to the new substation; and • establishment of a new 110 kV transmission cable from the new substation to Norwood Substation.	• installation/augmentation of ten distribution feeders from proposed 110/22 kV substation to relieve loading on existing feeders.
Option 3 Establish a new 110/66 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point	• establishment of a new 110/66 kV substation in the east Launceston area, with two 60 MVA 110/66 kV transformers; • installation of new 110 kV transmission bays at Mowbray and Norwood substations; • establishment of a new 110 kV transmission cable from Mowbray Substation to the new substation; and • establishment of a new 110 kV transmission cable from the new substation to Norwood Substation.	• acquisition of zone substation site in the Elphin area to enable the establishment of a 66/22 kV zone substation in that area; • establishment of 66 kV subtransmission feeders from 110/66 kV substation to the Elphin Zone Substation; and • installation of ten distribution feeders from the Elphin Zone Substation to relieve loading on existing feeders.

Option	Transmission Network Augmentation	Distribution Network Augmentation
Option 4 Augment Norwood Substation and augment existing transmission corridors in the Launceston area	• extension of 110 kV and 22 kV bus bars, which will require extension of existing switchyard and control building; • installation of one new 60 MVA 110/22 kV transformer at Norwood Substation, as well as associated switchgear and protection systems; • construction of new 110 kV transmission line from Hadspen Substation to Norwood Substation; • construction of new 110 kV transmission cable between Trevallyn and Mowbray substations; and • separation of Hadspen–Trevallyn transmission circuits onto separate tower lines.	• installation/augmentation of ten distribution feeders from Norwood Substation to address load constraints on existing feeders.
Option 5 Establish a new 110/22 kV substation in the east Launceston area, and augment existing transmission corridors in the Launceston area	• construction of new 110/22 kV substation in the east Launceston area, with firm capacity 60 MVA; • construction of an overhead 110 kV transmission line between Hadspen and Norwood substations; • construction of 110 kV cable between Trevallyn and Mowbray substations; • installation of transmission circuit to supply proposed substation, from Norwood Substation; and • separation of Hadspen–Trevallyn transmission circuits to individual tower lines.	• installation/augmentation of ten distribution feeders from proposed 110/22 kV substation to relieve loading on existing feeders.

It was concluded that for all scenarios considered, Option 2 is the solution that provides the lowest present value cost and that this option satisfied the reliability limb of the regulatory test. Consequently Transend and Aurora have concluded their obligations under clause 5.6.6(b) of the NER and will proceed with implementing Option 2. The estimated capital investment of this option is outlined in Table 0-2.

Table 0–2 Summary of capital expenditure to 2015 in real 2009 dollars

	Expenditure ($ million)	Financial year of commissioning
Transend	51.7	2011–12
Aurora	3.9	2011–12
	2.5	2012–13

Persons wishing to dispute any aspect of this final report, in accordance with clause of the NER are referred to Section 5.

1 INTRODUCTION

Transend Networks Pty Ltd (Transend) is the Tasmanian electricity Transmission Network Service Provider (TNSP), and is responsible for the planning and development of the state's transmission network.

Aurora Energy Pty Ltd (Aurora) is the Tasmanian electricity Distribution Network Service Provider (DNSP), and is responsible for the planning and development of the state's distribution network.

Transend has responsibilities under the National Electricity Rules (NER), and local jurisdictional requirements. These responsibilities include planning to facilitate the economic development of the transmission and distribution networks, and ensuring ongoing compliance with the required system standards[1]. Meeting these obligations is important to address customers' needs, and to facilitate the efficient operation of the National Electricity Market (NEM). Aurora also has responsibilities under the NER.

Transend has identified constraints within the transmission network in the Launceston area. In addition, Aurora has identified emerging constraints within the distribution network in the Launceston area, and has submitted a connection application to Transend requesting that a new 110/22 kV connection point be established in the area to the east of Launceston by May 2012.

In accordance with the requirements of the NER, Transend and Aurora have undertaken joint planning to identify alternative options to address the identified network constraints. Through this joint planning process, Transend and Aurora have established plans to address the identified constraints which are set out in this final report.

1.1 PURPOSE

Transend and Aurora published an application notice in accordance with the requirements of Clause 5.6.2(f) of the NER. A summary of the application notice was published on the Australian Energy Market Operator's (AEMO) website on 21st January 2010.

The application notice recommended the implementation of the new large transmission and new distribution developments as set out in option 2. In accordance with clause 5.6.6(f) of the NER, Registered Participants and interested parties were invited to make submissions in relation to the application notice by 10th March 2010 and no submissions were received.

This final report has been prepared in accordance with the requirements of clause 5.6.6(h) of the NER. This document sets out a detailed analysis of why the investment satisfies the regulatory test.

1.2 KEY REQUIREMENTS OF THE NER AND LOCAL JURISDICTION

Both Transend and Aurora are required under the NER to undertake a consultation process in relation to any proposed new large network investment. This section provides an overview of the key elements of these requirements.

1.2.1 Joint planning

In accordance with Clause 5.6.2(b) of the NER, Transend conducts annual planning reviews with Aurora to consider the demand forecast submitted by Aurora, and to review the adequacy of the existing connection points and the transmission network itself, as well as proposals for future connection points. Through this process, Transend and Aurora have identified constraints within

[1] Network performance must comply with Schedule 5.1 of the NER.

the transmission network in the Launceston area, and the necessity for augmentation or a non-network alternative.

Transend and Aurora have undertaken joint planning to develop plans that can be considered by AEMO, Registered Participants, and interested parties. In addition, Transend's annual planning reports of 2007, 2008 and 2009 and Aurora's annual planning reports of 2008 and 2009 provide descriptions of the existing and emerging constraints in the Launceston area.

1.2.2 NER compliance

Clause 5.6.6 of the NER requires that the applicant proposing to establish a new large transmission network asset must make available to AEMO, Registered Participants and all interested parties, an application notice which sets out certain matters as prescribed in the NER. In addition, Clause 5.6.2 of the NER sets out certain requirements in relation to a DNSP that is proposing the development of new large distribution network assets.

Clause 5.6.6(h) of the NER requires that the applicant prepare a final report (this document) which sets out the matters detailed in the application notice, summarises any submissions received from interested parties and a summary of the response to each submission.

For reference, details of the compliance with clauses 5.6.2 and 5.6.6 of the NER are set out in Appendix B of this final report.

1.2.3 Regulatory test requirements

The regulatory test is an analysis methodology used by transmission and distribution businesses operating in the NEM to assess the cost effectiveness of network investment.

The Australian Energy Regulator (AER) publishes the regulatory test in accordance with Clause 5.6.5A of the NER.

Clause 5.6.5A(b) of the NER states that the purpose of the regulatory test is to identify new network investments or non-network alternative options that:

(a) maximise the net economic benefit to all those who produce, consume and transport electricity in the market; or

(b) in the event the option is necessitated to meet the service standards linked to the technical requirements of Schedule 5.1 of the NER or in applicable regulatory instruments, minimise the present value of the costs of meeting those requirements.

The market benefit limb of the regulatory test relates to point (a), and the reliability limb of the regulatory test relates to point (b).

For transmission, Chapter 10 of the NER defines a reliability augmentation as:

'a transmission network augmentation that is necessitated principally by inability to meet the minimum network performance requirements set out in schedule 5.1 or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction'.

1.2.4 Local jurisdictional requirements

The *Tasmanian Electricity Supply Industry (Network Performance Requirements) Regulations 2007* sets out the minimum performance requirements that a planned power system of a TNSP must meet in order to satisfy the reliability limb of the regulatory test. Transend has obligations under these regulations which form part of its planning criteria. Areas where Transend fails to meet these regulations are discussed in Section 2.4.2 of this final report.

1.3 SCOPE

This final report sets out a proposal for a new large transmission network asset, and new distribution network assets that will jointly address the existing and emerging constraints within the electricity networks in the Launceston area. This final report provides information necessary to satisfy the requirements of clauses 5.6.2 and 5.6.6 of the NER.

The remainder of this final report is divided into four sections as follows:

Section 2: Overview of the Launceston area	This section provides a general description of the Launceston area and its development as background to the development scenarios and the electricity demand forecast. The existing electricity supply arrangements are also presented along with details of the existing and emerging constraints.
Section 3: Alternative options	The identified non-network and network alternative options that were considered are presented in this section. The alternative options are compared and ranked, and a sensitivity analysis is presented.
Section 4: Conclusion and recommendation	This section presents concluding points along with a recommendation to implement the preferred option.
Section 5: Dispute notices	Dispute process and contact details for lodging dispute notices is provided in this section.

1.4 REFERENCES

- Transend Networks Pty Ltd 2007, Transend 2007 Annual Planning Report, Transend Networks Pty Ltd, Tasmania.
- Transend Networks Pty Ltd 2008, Transend 2008 Annual Planning Report, Transend Networks Pty Ltd, Tasmania.
- Transend Networks Pty Ltd 2009, Transend 2009 Annual Planning Report, Transend Networks Pty Ltd, Tasmania.
- Office of the Tasmanian Energy Regulator 2008, Tasmanian Electricity Code.
- Utility Engineering Solutions Pty Ltd 2008, Distribution Network Connection Ten-Year Consumption and Maximum Demand Forecast, Aurora Energy Pty Ltd, Tasmania
- Aurora Energy Pty Ltd 2008, 2008 Annual Planning Report, Aurora Energy Pty Ltd, Tasmania.
- Australian Energy Market Commission 2008, National Electricity Rules (version 29).
- State of Tasmania, *Electricity Supply Industry Act*, Tasmanian Attorney-General's Office.
- Australian Energy Regulator 2007, Final Decision Regulatory Test Version 3 & Application Guidelines, Australian Energy Regulator.
- State of Tasmania 2007, Electricity Supply Industry (Network Performance Requirements) Regulations 2007.

2 OVERVIEW OF THE LAUNCESTON AREA

This section provides an overview of the Launceston area, the anticipated developments within this area, as well as the development scenarios considered. This information serves as background to the presentation of the area demand forecast, which has been used as the basis for studies of the electricity networks. An overview of the existing electricity supply arrangements within the area is also presented, and this section concludes with a discussion of the existing and emerging supply constraints that have been identified.

Broadly, the Launceston area has been defined as that which extends from Launceston CBD east to the suburbs of St Leonards and Waverley, south to the townships of Evandale and Longford, west to the township of Westbury, and north to the townships of Exeter and Dilston. This area is predominately characterised as commercial, residential, and rural-residential, with some modest industrial areas. Figure 2–1 presents a map of the location of the Launceston area.

Figure 2–1 Geographical map of the Launceston area

2.1 ECONOMIC DEVELOPMENTS IN THE LAUNCESTON AREA

Launceston is Tasmania's second largest population centre, comprising approximately 100,000 residents. It is the major centre for, agriculture, education, government, manufacturing and tourism services in northern Tasmania.

Electricity demand in the area continues to increase due to steady population growth, the continuation of a wood heater buy back scheme, and local government focus on commercial developments in specific areas.

In addition to general demand growth, specific planned developments in the area that will impact on the capacity of the networks include:

(a) further development of the industrial/commercial subdivision in the area around Launceston's airport;

(b) an industrial subdivision that is currently being developed at Westbury;

(c) a large hotel/office development at the old Launceston General Hospital site to the south of the CBD;

(d) further development of the University of Tasmania campus in the northern suburbs of Launceston; and

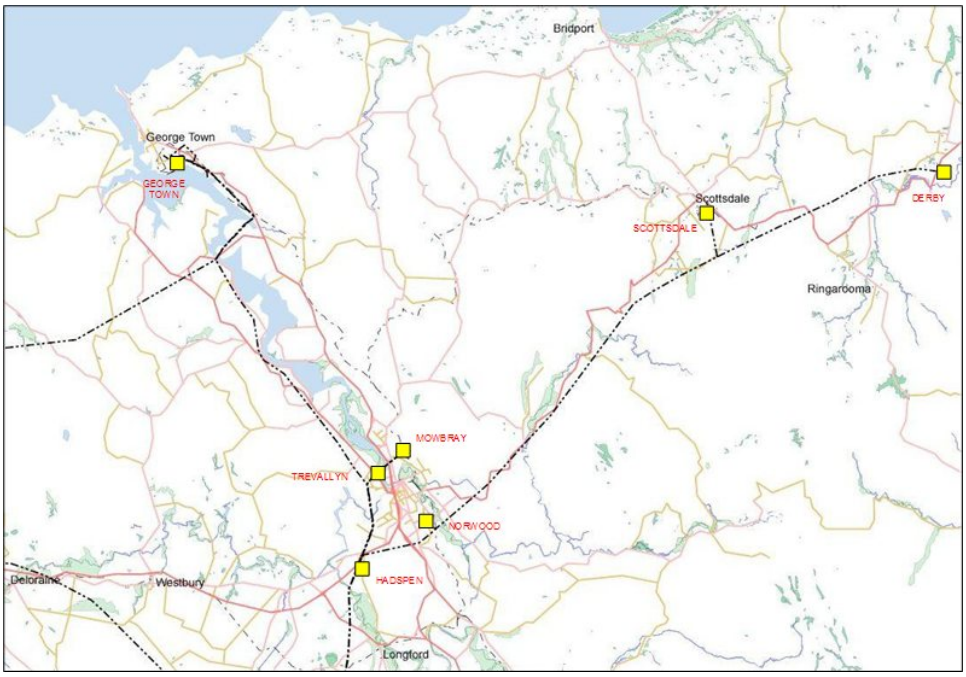
(e) a number of commercial developments in the CBD area.

2.2 EXISTING SUPPLY ARRANGEMENTS

2.2.1 Transmission system supply arrangements

Figure 2–2 presents the geographic arrangement of the transmission network in the Launceston area.

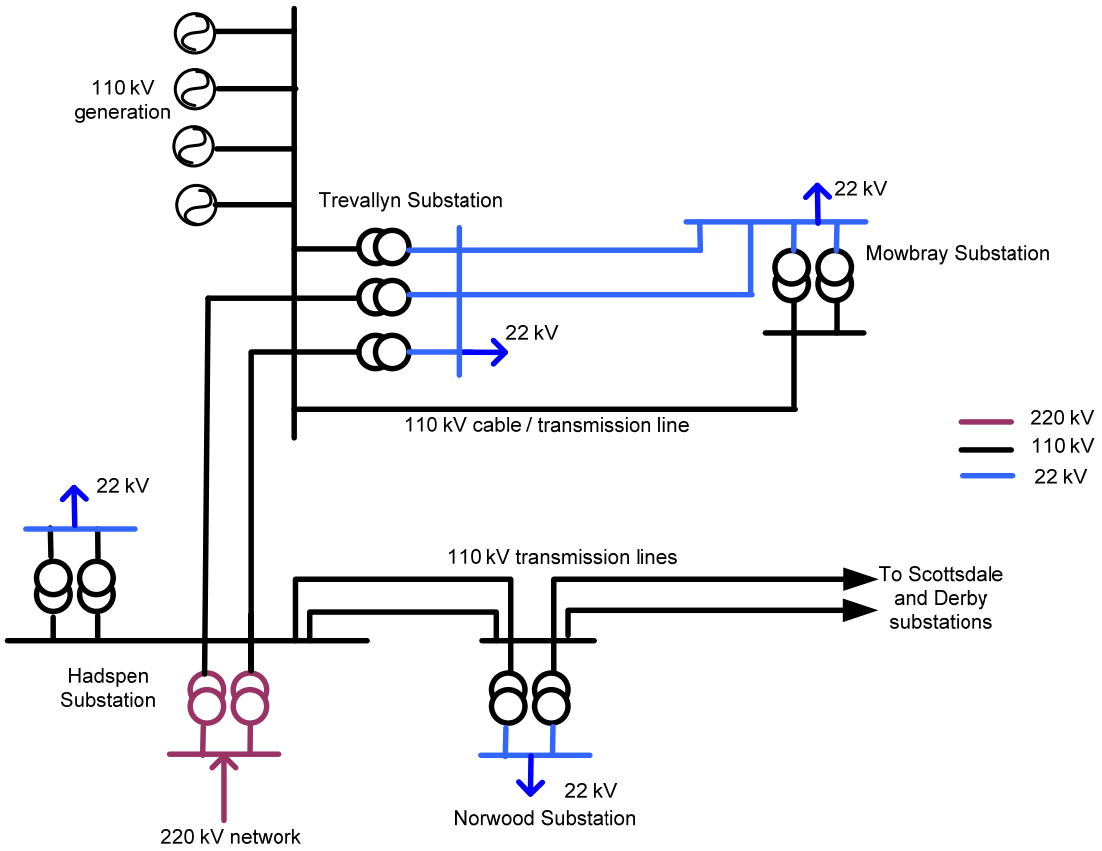
Figure 2–2 Geographic arrangement of the transmission network in the Launceston area



The Launceston area is supplied from the 220 kV network via Hadspen Substation, and from Trevallyn Power Station that is capable of supplying a total of 95 MW to the 110 kV transmission network via Trevallyn Substation. Trevallyn Substation is also supplied from Hadspen Substation via a double circuit 110 kV transmission line. Trevallyn Substation in turn supplies Mowbray Substation via a single 110 kV transmission circuit.

Hadspen Substation supplies Norwood Substation via a double circuit 110 kV transmission line. Norwood Substation in turn supplies Scottsdale Substation via two 110 kV transmission lines, one of which is teed to Derby Substation. A single line diagram of the transmission network in the Launceston area is presented in Figure 2–3.

Figure 2–3 Single line diagram of the transmission network in the Launceston area



Trevallyn Substation, located in the north-west of the Launceston area, has three 110/22 kV, 50 MVA transformers that each have a cyclic rating of 57 MVA. It also has 17 outgoing 22 kV distribution feeders, two of which are 'super feeders' that are used to provide alternative supply to Mowbray Substation in the event that the Trevallyn–Mowbray 110 kV transmission circuit is out of service due to a fault or for maintenance purposes. Trevallyn Substation has a firm rating of 100 MVA, with a cyclic rating of 114 MVA.

Hadspen Substation, located in the south-west of the Launceston area, has two 110/22 kV, 50 MVA transformers that each have a cyclic rating of 60 MVA. It also has eight outgoing 22 kV distribution feeders.

Mowbray Substation, located in the north of the Launceston area, has two 50 MVA transformers that each have a cyclic rating of 60 MVA. It also has ten outgoing 22 kV distribution feeders, two of which are 'super feeders' that connect to Trevallyn Substation. The firm rating of Mowbray Substation is limited to 40 MVA, which is the combined capacity of the two 'super feeders'.

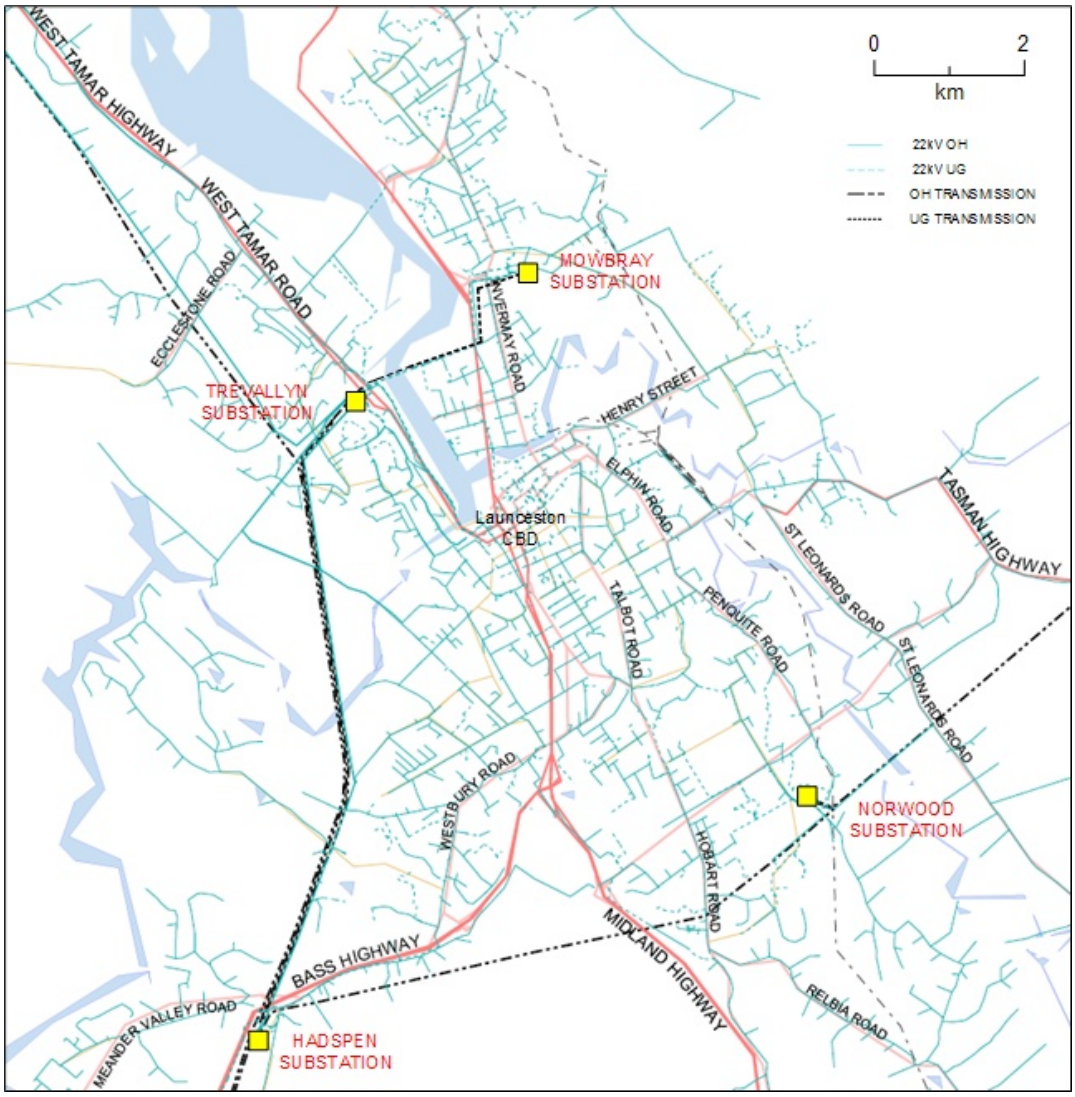
Norwood Substation, located in the south of the Launceston area, has two 110/22 kV, 50 MVA transformers, that each have a cyclic rating of 60 MVA. It also has eight outgoing 22 kV distribution feeders.

Hadspen, Mowbray, Norwood, and Trevallyn substations, as well as all interconnecting 110 kV transmission lines are owned and operated by Transend.

2.2.2 Distribution system supply arrangements

The geographic arrangement of the distribution network in the Launceston area is presented in Figure 2–4.

Figure 2–4 Transmission and distribution network geographic arrangement



The distribution network that supplies the Launceston area comprises a system of 22 kV feeders that emanate from Hadspen, Mowbray, Norwood and Trevallyn substations. Customers in the area take supply either directly from the 22 kV network, in the case of larger commercial and industrial loads, or from the low voltage 400/230V distribution network that is connected to the 22 kV feeder network via step down transformers. Although the 22 kV distribution network is interconnected to some extent, the ability to transfer load between substations using the distribution feeders is limited due to existing loads and topology. The maximum load connected to 22 kV distribution feeders is 10 MVA, with a short time rating of 15 MVA. The capacities of certain 22 kV feeders are subject to further constraints due to specific technical or geographical limitations.

2.3 DEVELOPMENT SCENARIOS AND DEMAND FORECAST

The demand forecast for Hadspen, Mowbray, Norwood and Trevallyn substations is taken from the *'2008 Distribution Network Connection Ten-Year Consumption and Maximum Demand Forecast'* prepared for Aurora by Utility Engineering Solutions (UES demand forecast). Transend and Aurora consider that the medium winter demand forecast is representative of the likely demand for the Launceston area and that it is appropriate for planning purposes.

Three development scenarios were considered in undertaking joint planning for the Launceston area. These scenarios consider high, medium (expected), and low growth possibilities. Under each

of the three scenarios, growth in electricity demand is driven fundamentally by state population growth and growth in the number of households (state-wide). This growth is underpinned by the economic conditions that are taken into account through forecasts of key economic indicators. The medium growth scenario represents the area's expected growth, and as such there is an equal probability (50 per cent probability) that the actual area demand will fall above or below this forecast. The high growth scenario represents an annual growth rate 1.3 per cent greater than the expected, while the low growth scenario represents an annual growth rate 0.7 per cent less than the expected growth rate for the area.

In addition to general underlying growth, significant developments (point loads) have been identified and considered on a case-by-case basis using specific information gathered from potential developers in the area. These developments were added separately to the load forecasts as appropriate.

Aurora produced summer and winter demand forecasts for each development scenario, and for each substation within the Launceston area. Winter demand forecasts are however the most relevant for network planning in this area, due to Tasmania's climatic conditions and the area's largely residential and rural-residential customer base.

The 2008 winter demand forecasts for the medium, high, and low growth scenarios are presented in Table 2–1, Table 2–2 and Table 2–3 respectively. These forecasts have been used as the basis for the network studies in this area.

Load is transferred between substations in the area via the distribution system to optimise the capacity of the distribution and transmission systems by redirecting load to less loaded substations. A detailed analysis of the transfer capability of the distribution network has been undertaken and a works program developed to maximise load transfer capability as far as practical. Load transfer capabilities are discussed further in Section 2.4.

Table 2–1 Medium (expected) growth winter demand forecast (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Hadspen Substation (firm 50 MVA, cyclic 60 MVA)															
Forecast	45	46	56	57	61	62	63	63	64	65	65	66	67	68	68
Transferred	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	4	-	4	-	-	-	-	-	-	-	-	-	-	-
Total	46	55	56	61	61	62	63	63	64	65	65	66	67	68	68
Mowbray Substation (firm 40 MVA, cyclic 40 MVA)															
Forecast	35	37	41	42	43	44	45	45	46	47	48	49	50	51	52
Transferred	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	36	40	41	42	43	44	45	45	46	47	48	49	50	51	52
Norwood Substation (firm 50 MVA, cyclic 60 MVA)															
Forecast	70	67	63	64	66	67	68	69	70	72	73	74	75	77	79
Transferred	-5	-5	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	66	62	63	64	66	67	68	69	70	72	73	74	75	77	79
Trevallyn Substation (firm 100 MVA, cyclic 114 MVA)															
Forecast	102	108	110	112	113	114	116	117	118	120	121	123	124	126	126

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Transferred	5	-2	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	0	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	107	109	110	112	113	114	116	117	118	120	121	123	124	126	126
Launceston area total (firm 240 MVA, cyclic 274 MVA)															
Total	255	266	270	279	283	287	292	294	299	304	307	312	316	320	325
Growth (%)	4.3	4.7	1.5	3.0	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4

Source: UES demand forecast

Table 2–2 High growth winter demand forecast (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Hadspen Substation (firm 50 MVA, cyclic 60 MVA)															
Forecast	45	47	58	59	65	67	68	70	71	73	75	77	78	80	82
Transferred	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	4	-	4	-	-	-	-	-	-	-	-	-	-	-
Total	46	56	58	63	65	67	68	70	71	73	75	77	78	80	82
Mowbray Substation (firm 40 MVA, cyclic 40 MVA)															
Forecast	35	38	43	44	46	47	49	50	52	53	55	57	59	60	62
Transferred	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	36	41	43	44	46	47	49	50	52	53	55	57	59	60	62
Norwood Substation (firm 50 MVA, cyclic 60 MVA)															
Forecast	71	69	66	68	70	72	75	77	79	82	84	87	89	92	96
Transferred	-5	-5	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	67	64	66	68	70	72	75	77	79	82	84	87	89	92	96
Trevallyn Substation (firm 100 MVA, cyclic 114 MVA)															
Forecast	103	111	114	117	120	123	126	130	133	136	139	143	146	150	152
Transferred	5	-2	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	109	111	114	117	120	123	126	130	133	136	139	143	146	150	152
Launceston area total (firm 240 MVA, cyclic 274 MVA)															
Total	258	272	281	292	301	309	318	326	335	344	353	364	372	382	392
Growth (%)	5.6	6	2.8	4.2	2.8	2.8	2.7	2.7	2.7	2.7	2.6	2.7	2.7	2.7	2.6

Source: UES demand forecast

Table 2–3 Low growth winter demand forecast (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Hadspen Substation (firm 50 MVA, cyclic 60 MVA)															
Forecast	44	46	55	55	60	59	60	60	60	61	61	61	61	61	62
Transferred	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	4	-	4	-	-	-	-	-	-	-	-	-	-	-
Total	45	55	55	59	60	59	60	60	60	61	61	61	61	61	62
Mowbray Substation (firm 40 MVA, cyclic 40 MVA)															
Forecast	35	36	40	41	41	42	42	43	44	44	44	45	46	46	47
Transferred	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	36	40	40	41	41	42	42	43	44	44	44	45	46	46	47
Norwood Substation (firm 50 MVA, cyclic 60 MVA)															
Forecast	70	66	62	63	63	64	65	65	66	67	67	68	69	70	71
Transferred	-5	-5	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	66	61	62	63	63	64	65	65	66	67	67	68	69	70	71
Trevallyn Substation (firm 100 MVA, cyclic 114 MVA)															
Forecast	101	107	108	109	109	110	110	111	111	112	112	113	113	114	114
Transferred	5	-2	-	-	-	-	-	-	-	-	-	-	-	-	-
Point loads	0	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	106	108	108	109	109	110	110	111	111	112	112	113	113	114	114
Launceston area total (firm 240 MVA, cyclic 274 MVA)															
Total	252	264	265	272	273	275	277	279	281	284	284	287	289	291	294
Growth (%)	3.6	4.0	0.8	2.3	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7

Source: UES demand forecast

2.4 SUPPLY ISSUES AND PROJECT DRIVERS

Transend and Aurora have conducted studies of the transmission and distribution networks in the Launceston area over a 15 year planning period commencing 2009. These studies have been based on the area development scenarios and demand forecasts presented in Section 2.3, with consideration of the existing supply arrangements presented in Section 2.2.

Transend's transmission network has a number of supply constraints in the Launceston area. Similarly, Aurora's distribution network also has emerging supply constraints. The nature and timing of these supply constraints is different for the transmission and distribution networks, and also varies under the demand forecast scenarios.

This section considers firstly the transmission network supply constraints under the high, medium and low load growth scenarios. The distribution network supply constraints are then considered under each of the scenarios.

2.4.1 NER Compliance

Schedule 5.1, Clause S5.1.2 of the NER states that *"Network Service Providers must plan, design, maintain and operate their transmission networks and distribution networks to allow the transfer of power from generating units to Customers with all facilities or equipment associated with the power system in service and may be required by a Registered Participant under a connection agreement to continue to allow the transfer of power with certain facilities or plant associated with the power system out of service"*.

2.4.2 ESI Regulations

The ESI Regulations are the local jurisdictional regulations under which the Tasmanian transmission system must be planned. These form the basis of Transend's planning criteria. The existing transmission network arrangement in the Launceston area is not sufficient to ensure that requirements under the ESI regulations are met throughout the planning period.

The following issues leave Transend at risk of non-compliance with the ESI Regulations over the forthcoming planning period:

- **Clause 5(1)(a)(iv)–the unserved energy to load that is interrupted consequent on damage to a network element resulting from a credible contingency event is not to be capable of exceeding 300 MWh at any time.**
    - In the winter of 2007 the load at Norwood Substation was such that the potential energy at risk in the event of a transformer failure at Norwood Substation exceeded 300 MWh for an eight day repair period (as specified in Clause (5)(3)(b) of the ESI Regulations). In 2009, the load was again high enough to cause Transend to be in breach of this clause. Load in the Launceston area is forecast to grow at a rate of 1.8 per cent per annum for the next ten years. Transend has implemented operational measures to rectify this issue in the short term until a long term solution can be implemented.
    - The load connected to Trevallyn Substation is forecast to be such that a loss of one 110/22 kV transformer will result in excess of 300 MWh of unserved energy in 2022.
- **Clause 5(1)(a)(v)–the unserved energy to load that is interrupted by a single asset failure is not to be capable of exceeding 3000 MWh at any time:**
    - The Hadspen–Trevallyn Nos. 1 and 2 110 kV transmission circuits share common supporting structures for the last five spans approaching Trevallyn Substation. In the event of a failure of one of these structures, both Hadspen–Trevallyn Nos. 1 and 2 transmission circuits will be out-of-service and supply to Trevallyn and Mowbray substations will be lost. The combined winter load connected to Trevallyn and Mowbray substations in 2009 had the potential to result in over 3000 MWh of unserved energy for a 48 hour repair period (as specified in Clause (5)(3)(a) of the ESI Regulations).
    - The Hadspen–Norwood Nos. 1 and 2 110 kV transmission circuits are strung on common structures for their entire route. The failure of one of these structures will result in loss of supply to Norwood, Scottsdale and Derby substations. The forecast combined winter load on these substations has the potential to result in over 3000 MWh of unserved energy for a 48 hour repair period (as specified in Clause (5)(3)(a) of the ESI regulations) from 2011 onwards.

2.4.3 Transmission system supply issues

Figure 2–5 presents the forecast load from 2009 to 2023, as well as the actual load from 2007 and 2008, in comparison to the capacity of each substation, and the entire Launceston area.

Figure 2–5 Forecast load and capacity of the Launceston area

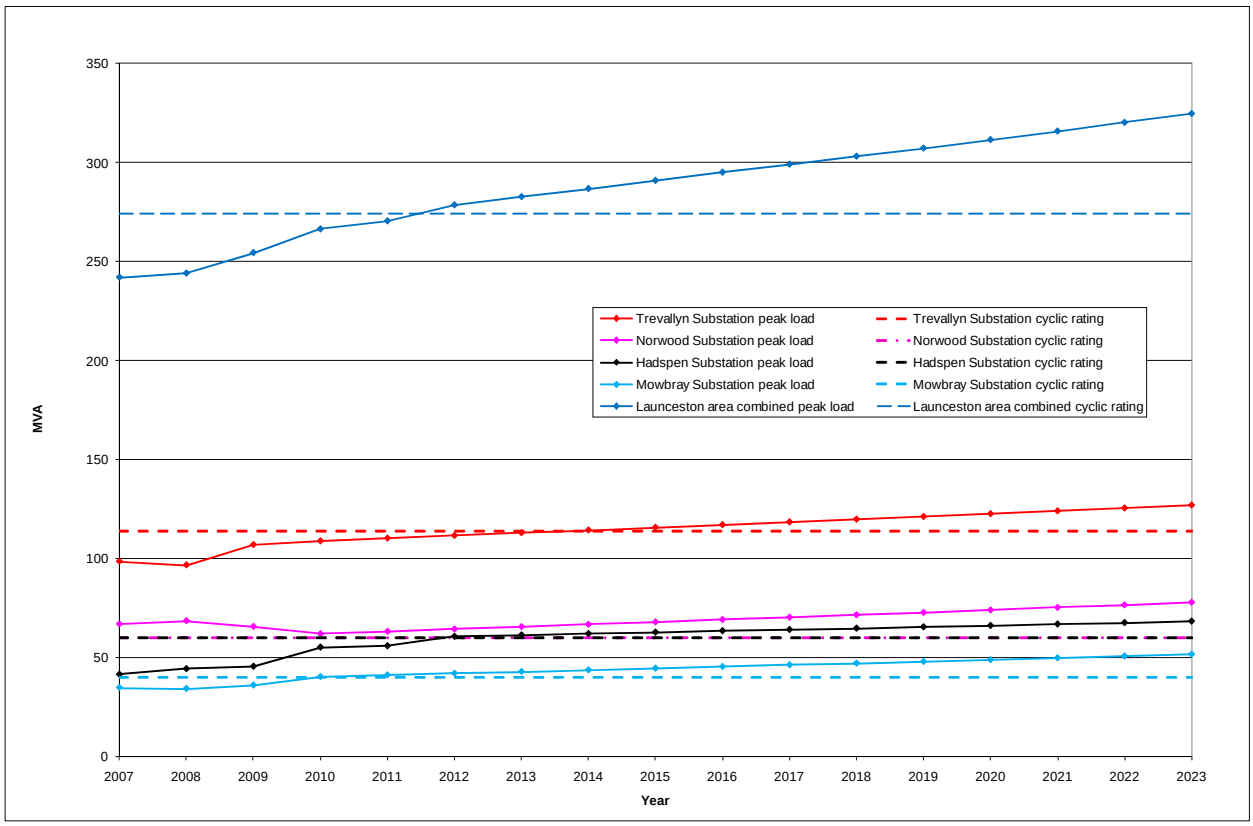


Figure 2–5 shows that in winter 2012 the combined Launceston area load will exceed the combined cyclic rating of the substations in the area.

(a) Substation loads

The following sections outline the potential load at risk given failure of a single transformer at each of the substations.

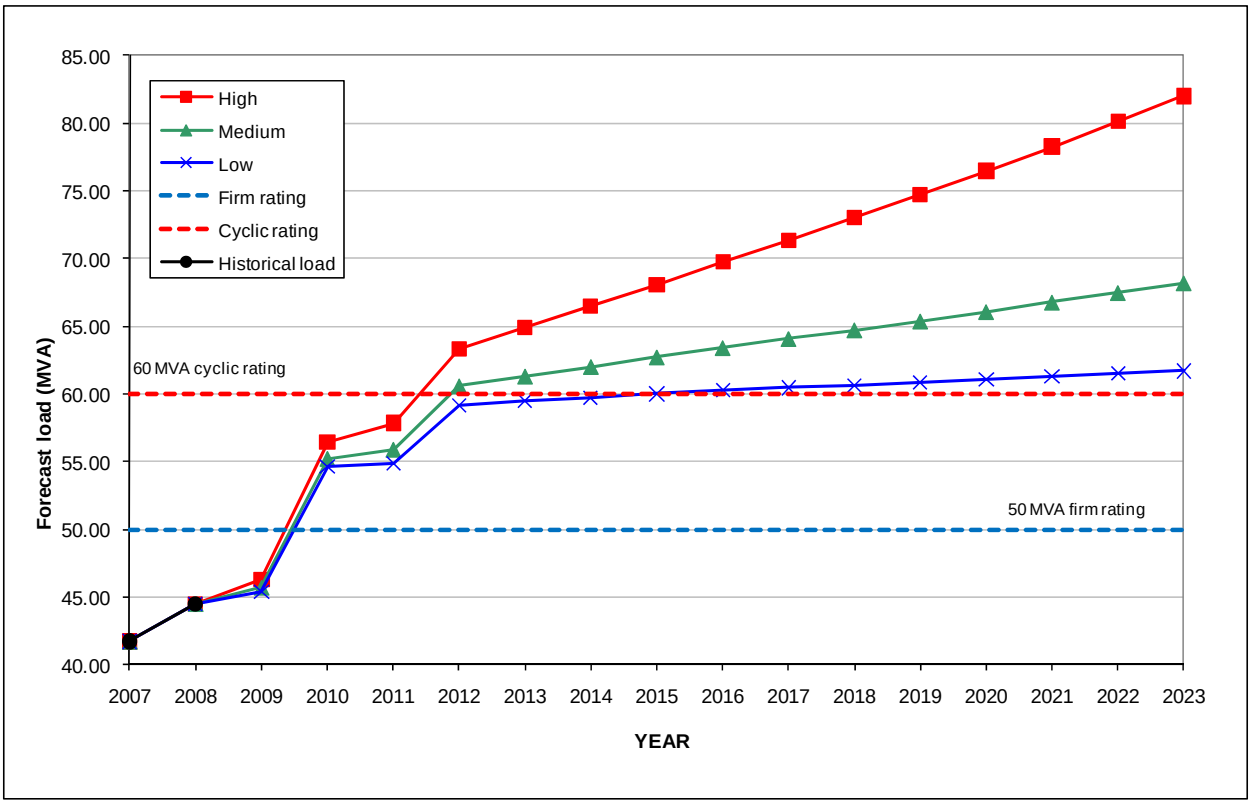
(i) Hadspen Substation

The medium winter demand forecast for Hadspen Substation, the current available capacity, and the resulting load at risk is presented in Table 2–4. Figure 2–6 presents a graph of the historical actual demand, as well as the high, medium and low forecast winter demand against the available capacity at Hadspen Substation. It shows that during the winter of 2010, the forecast load connected to Hadspen Substation is expected to exceed its firm rating, primarily due to the transfer of load from Norwood Substation. In winter 2013, the load is forecast to exceed the cyclic rating.

Table 2–4 Hadspen Substation medium maximum demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	46	55	56	57	61	62	63	64	65	65
Firm rating	50 MVA (60 MVA cyclic)									
Load at risk (MVA)	0	5	6	7	11	12	13	14	15	15

Figure 2–6 Hadspen Substation – comparison of demand forecast to capacity



(ii) Mowbray Substation

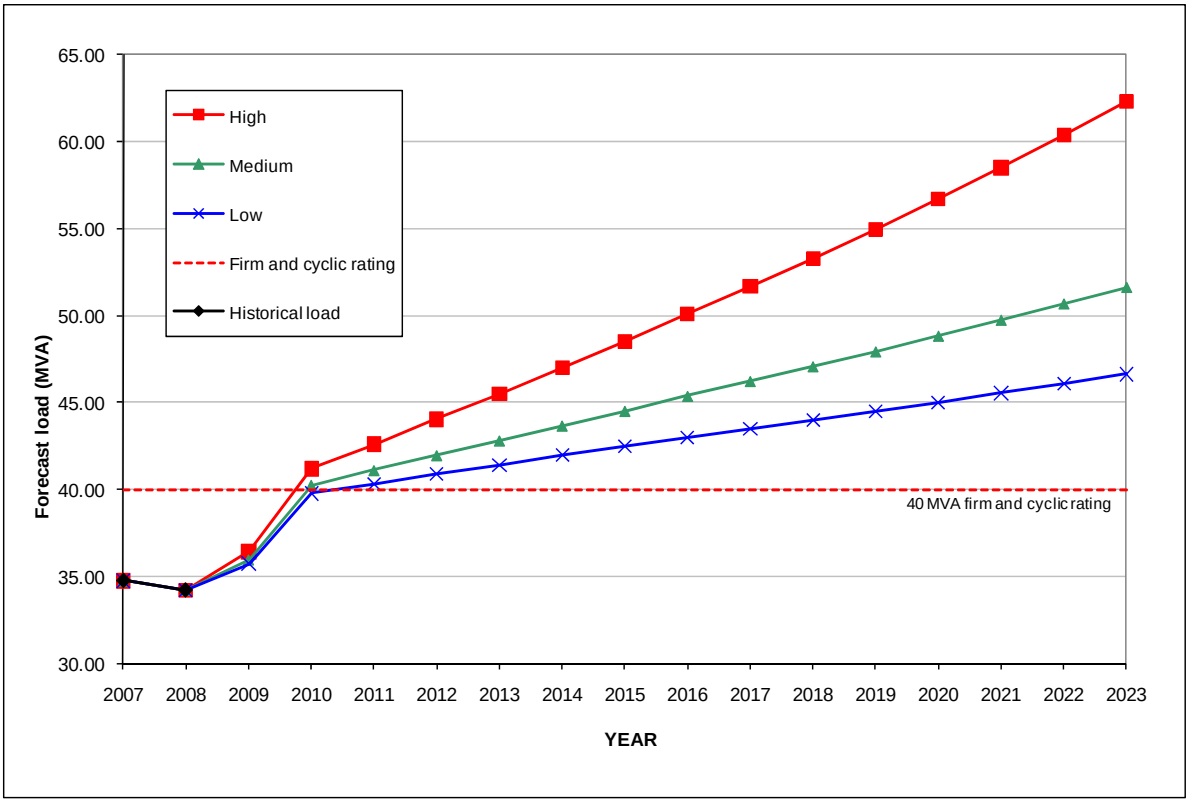
The medium winter demand forecast for Mowbray Substation, the current available capacity, and the resulting load at risk is presented in Table 2–5. Figure 2–7 presents a graph of the historical actual demand, as well as the high, medium and low forecast winter demand against the available capacity at Mowbray.

Figure 2–7 shows that during the winter of 2011, the forecast load at Mowbray Substation will exceed the firm rating of the substation.

Table 2–5 Mowbray Substation medium maximum demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	36	40	41	42	43	44	45	45	46	47
Firm rating	40 MVA (40 MVA cyclic)									
Load at risk (MVA)	0	0	1	2	3	4	5	5	6	7

Figure 2–7 Mowbray Substation – comparison of demand forecast to capacity



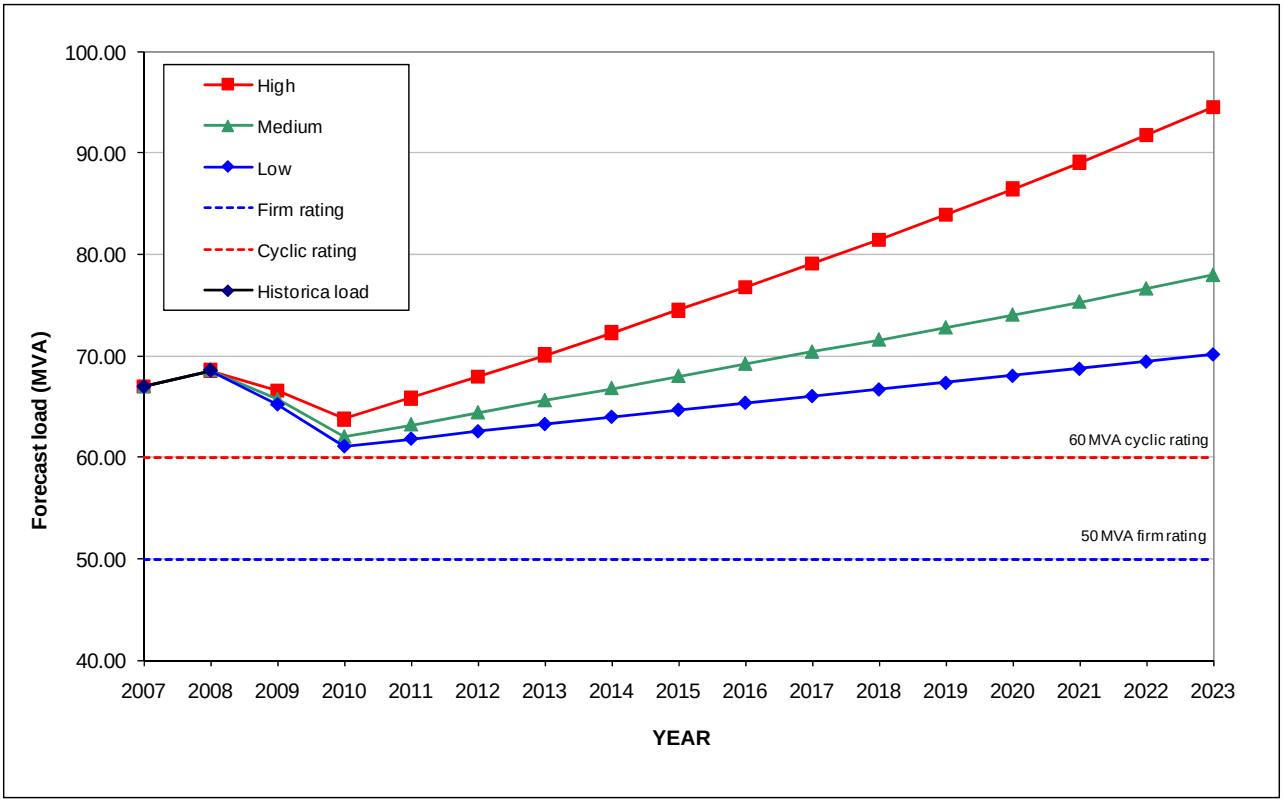
(iii) Norwood Substation

The medium winter demand forecast for Norwood Substation, the current available capacity, and the resulting load at risk is presented in Table 2–6. Figure 2–8 presents a graph of the historical actual demand, as well as the high, medium and low forecast winter demand against the available capacity at Norwood Substation. It shows that during the winters of 2007 and 2008, the historical load connected to Norwood Substation exceeded the cyclic rating of the transformers. Load has been transferred from Norwood Substation to Hadspen Substation in 2009, but this has not entirely alleviated the overloading of Norwood Substation. Load at Norwood Substation is forecast to continue to exceed it's rating well into the future, as the contingent event load transfer capability in the Launceston area becomes more and more limited.

Table 2–6 Norwood Substation medium maximum demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	66	62	63	64	66	67	68	69	70	72
Firm rating	50 MVA (60 MVA cyclic)									
Load at risk (MVA)	16	12	13	14	16	17	18	19	20	22

Figure 2–8 Norwood Substation – comparison of demand forecast to capacity



Under current operational arrangements, in the event of a transformer failure at Norwood Substation during peak winter loads, any load above the firm rating of a single transformer will have to be shed to prevent overloading and subsequent tripping of the remaining transformer. This load can be redistributed between other substations in the area via the distribution network as long as capacity exists at the in–tact substations.

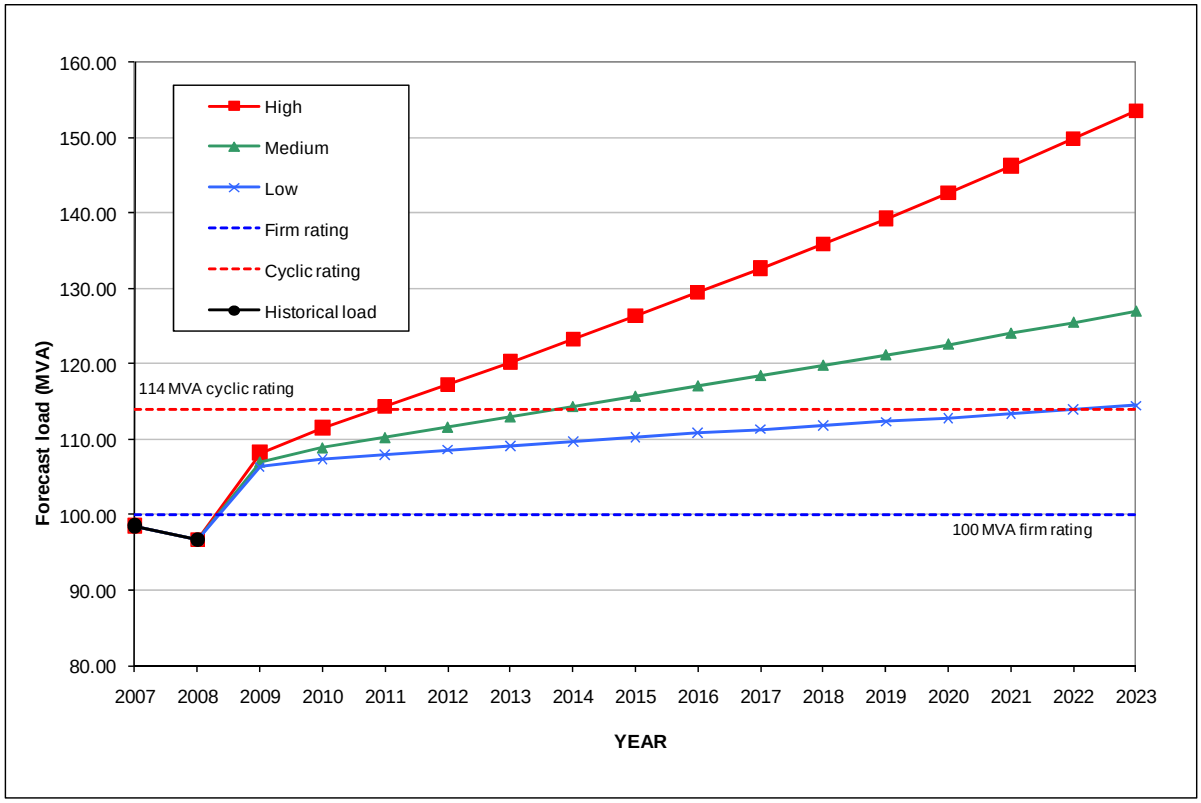
(iv) Trevallyn Substation

The medium winter demand forecast for Trevallyn Substation, the current available capacity, and the resulting load at risk is presented in Table 2–7**.** Figure 2–9 presents a graph of the historical actual demand, as well as the high, medium and low forecast winter demand against the available capacity at Trevallyn Substation. It shows that the load connected to Trevallyn Substation is already above the firm capacity of the substation and will exceed the cyclic rating in 2014.

Table 2–7 Trevallyn Substation medium maximum demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	107	109	110	112	113	114	116	117	118	120
Firm rating	100 MVA (114 MVA cyclic)									
Load at risk (MVA)	7	9	10	12	13	14	16	17	18	20

Figure 2–9 Trevallyn Substation – comparison of demand forecast to capacity



2.4.4 Distribution system supply issues

Constraints on the current distribution system are related to load growth, which is primarily occurring to the south of Norwood and Hadspen substations.

The distribution network is limited in its capability to further transfer load between the Transend substation connection points. Work programs have been developed and are currently in place to augment the distribution feeder network to achieve optimal load transfer between the substations. Once the current works program is complete, the annual cost to effect further load transfers will be greater than the deferral value of implementing the preferred option.

2.4.5 Inter-feeder transfer capability

The capability to transfer load between the 22 kV distribution feeders in the event of loss of an adjacent feeder is constrained as many of the feeders are currently operating at or near their rating during winter peak load.

To address inter-feeder transfer constraints, additional feeders from both Norwood and Trevallyn substations to the CBD area need to be installed. These additional feeders will address inter-feeder transfer constraints up to winter 2012 under a medium load growth scenario. There is limited economic benefit in undertaking further works to address inter-substation transfer capability.

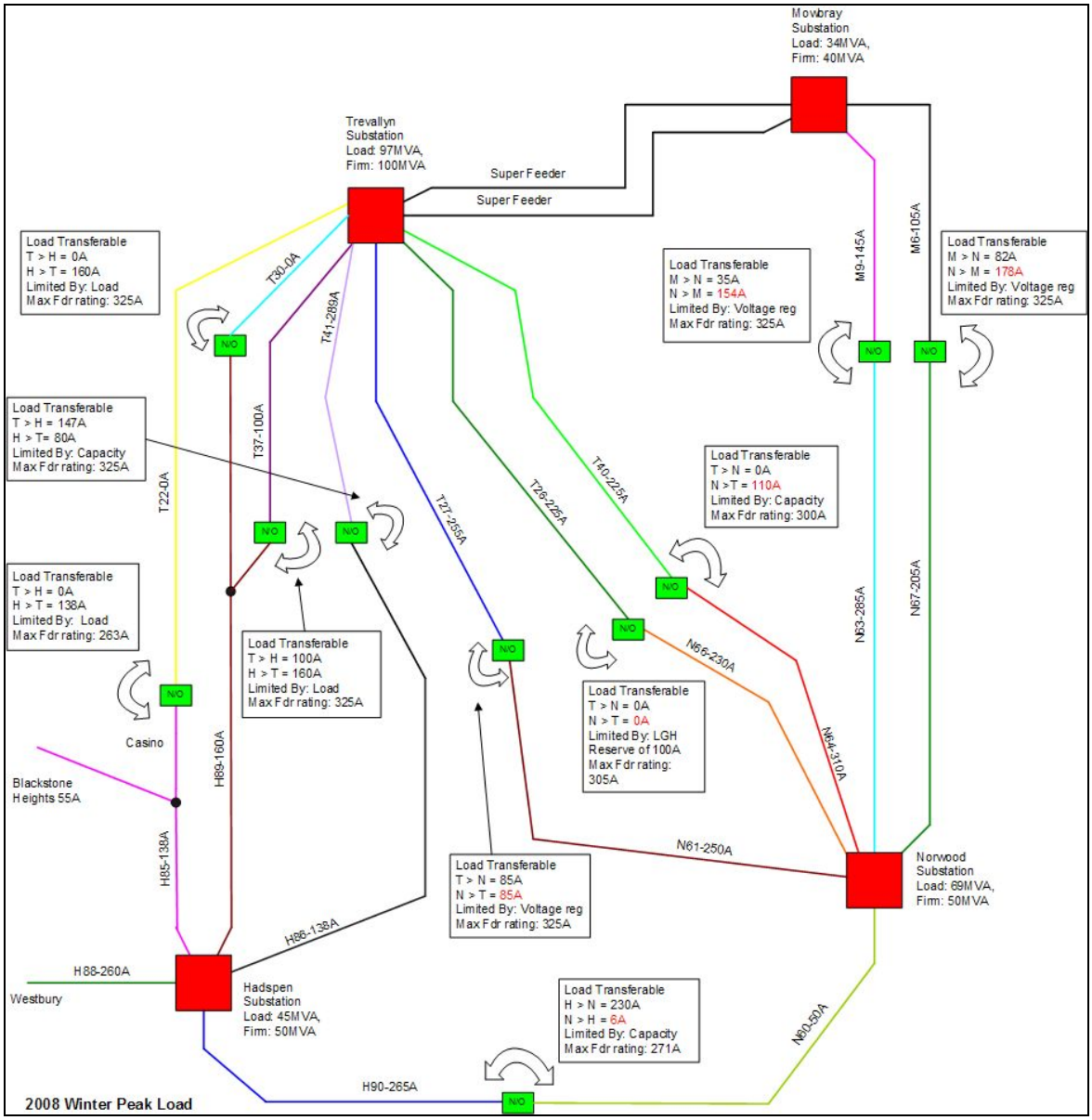
2.4.6 Transfer capability limitations

(a) Existing transfer capability

In the event of the failure of a single transformer at Norwood Substation, the existing 22 kV distribution network had the capability to transfer the 19 MVA (500A) of above firm load to Hadspen, Mowbray and Trevallyn substations (assuming that all distribution feeders and switching elements were fully intact at the time). Figure 2–10 shows the maximum transfer capability of the

individual components of the distribution feeder network. Transfer capability is constrained by the maximum feeder rating, existing feeder load, and voltage regulation. It also shows the peak substation loads during winter 2008, and the capability of the 22 kV distribution network to transfer excess load to adjacent terminal substations.

Figure 2–10 2008 load transfer capability



A detailed analysis of the transfer capability of the distribution network in the Launceston area has been used to develop a comprehensive works program, to be undertaken in 2009–10, to address load transfer constraints that will occur prior to winter 2012 under a medium (expected) demand forecast.

During peak load conditions forecast for winter 2012, a contingent event, such as a transformer failure at Trevallyn Substation, could result in load in the order of 3 MVA being shed. The distribution network will be constrained with respect to reconnecting this load to another substation. Post 2012, even with further distribution network augmentation, the capability to take up transferred load is constrained due to all of the substations operating at various levels above firm capacity.

(i) Hadspen Substation

Hadspen Substation predominantly supplies high-density commercial, urban and rural centres. Under the Tasmanian Reliability Performance Standards, the maximum total time without electricity in a year for high-density commercial areas is 120 minutes, and for urban and regional centres is 240 minutes.

As shown in Table 2–8, the distribution system is constrained to less than 11 MVA of transfer capability beyond 2013, and there is potential for load shedding to be required.

Table 2–8 Hadspen Substation demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	46	55	56	57	61	62	63	64	65	65
Firm rating	50 MVA (60 MVA cyclic)									
Load at risk (MVA)	0	5	6	7	11	12	13	14	15	15
Contingent event transfer capability (MVA)	20	18	12	11	11	10	8	7	6	4
Load at risk that may have to be shed (MVA)	0	0	0	0	0	**2**	**5**	**7**	**9**	**11**

(ii) Mowbray Substation

Mowbray Substation predominantly supplies high-density commercial and urban centres. Under the Tasmanian Reliability Performance Standards, the maximum total time without electricity in a year for a community in a high-density commercial area is 120 minutes, and for urban and regional centres is 240 minutes.

As shown in Table 2–9, the distribution system is constrained to less than 2 MVA of transfer capability beyond 2012, and there is potential for load shedding to be required.

Table 2–9 Mowbray Substation demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	36	40	41	42	43	44	45	45	46	47
Firm rating	40 MVA									
Load at risk (MVA)	0	0	1	2	3	4	5	5	6	7
Contingent event transfer capability (MVA)	2	2	2	2	2	1	1	1	1	0
Load at risk that may have to be shed (MVA)	0	0	0	0	**1**	**3**	**4**	**4**	**5**	**7**

(iii) Norwood Substation

Norwood Substation predominantly supplies high-density commercial, urban and regional centres. Under the Tasmanian Reliability Performance Standards, the maximum total time without electricity in a year for a community in a high-density commercial area is 120 minutes, and for urban and regional centres is 240 minutes.

As shown in Table 2–10, the distribution system is constrained to less than 19 MVA of transfer capability in 2015, and there is potential for load shedding to be required.

Table 2–10 Norwood Substation demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	66	62	63	64	66	67	68	69	70	72
Firm rating	50 MVA (60 MVA cyclic)									
Load at risk (MVA)	16	12	13	14	16	17	18	19	20	22
Contingent event transfer capability (MVA)	17	20	23	23	23	21	19	18	17	15
Load at risk after transfer (MVA)	0	0	0	0	0	0	0	**1**	**3**	**7**

(iv) Trevallyn Substation

Trevallyn Substation predominantly supplies high-density commercial, urban and regional centres. Under the Tasmanian Reliability Performance Standards, the maximum total time without electricity in a year for a community in a high-density commercial area is 120 minutes, and for urban and regional centres is 240 minutes.

As shown in Table 2–11, the distribution system is constrained to less than 11 MVA of transfer capability beyond 2011, and there is potential for load shedding to be required.

Table 2–11 Trevallyn Substation demand forecast and load at risk (MVA)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Maximum demand (MVA)	107	109	110	112	113	114	116	117	118	120
Firm rating	100 MVA (114 MVA cyclic)									
Load at risk (MVA)	7	9	10	12	13	14	16	17	18	20
Contingent event transfer capability (MVA)	11	9	11	9	9	8	7	6	5	3
Load at risk after transfer (MVA)	0	0	0	**3**	**4**	**6**	**9**	**11**	**13**	**17**

3 ALTERNATIVE OPTIONS

This section outlines the alternative options that have been considered as practical solutions to address the existing and emerging supply constraints in the Launceston area as identified in Section 2.4. The feasibility of not undertaking any action (ie the 'do nothing' option) was first considered, then consideration was given to non-network options, and lastly the practical network options were examined.

3.1 DO NOTHING

Currently, the winter demand exceeds the firm rating of Norwood Substation by 16 MVA and Trevallyn Substation by 7 MVA during winter peak periods. The firm ratings of Hadspen and Mowbray substations are forecast to be exceeded in 2010 and 2011 respectively. The failure of a transformer or other critical asset at times when the connected load exceeds the firm capacity of the

substation could result in the shedding of the excess load from the substation in question. Currently, these issues are managed operationally by the transfer of load between substations via Aurora's distribution network. This approach provides an adequate operational solution to the potential exposure to overloading these substations until the connected load exceeds the transfer capability between the substations. Based on the current demand forecast, the transfer capability between the substations will be exceeded in 2012.

In addition, under the medium winter demand forecast for the area, current supply arrangements are already non-compliant with clauses 5(1)(a)(iv) and 5(1)(a)(v) of the ESI regulations (see Section 2.4.2). Therefore, Transend and Aurora must take action under their current obligations, and thus the do nothing option has not been considered further.

The following alternative options have been considered as an application of the reliability limb of the 'regulatory test' under the requirements of the NER.

3.2 NON-NETWORK ALTERNATIVE OPTIONS

This section details a number of non-network alternative options that were considered to reduce demand on the existing networks in the Launceston area as a means to address the identified network constraints.

3.2.1 Demand side management and embedded generation

Demand Side Management (DSM) schemes have been successfully employed both nationally and internationally to reduce network demand. Similarly, embedded generation could offer an alternative to a network solution. However, to be viable in this instance, any DSM or embedded generation scheme would need to provide a reduction of approximately 8.1 MVA off the peak winter demand forecast across the area by winter 2012, 12.25 MVA of peak winter demand by winter 2013, and offset an annual peak demand growth of approximately 2.2 per cent. Such schemes could provide deferral of the lowest cost practical network alternative option, which is valued at approximately $2.3 million per annum[2]. On average, over the first two years of deferral, this is equivalent to approximately $240 per kVA per annum of peak winter demand reduction.

DSM schemes typically involve the participation of the industrial and commercial sectors. The Launceston area is mostly residential through to medium industrial, and has few significant individual loads that can readily employ a DSM scheme. Consequently, demand aggregation would be necessary to achieve the required demand reduction. Such demand aggregation is likely to require the extensive roll-out of smart metering[3] or load control technology, an appropriate tariff structure, and the active support of retailers to achieve in the required timeframe.

Embedded generation has been implemented at a number of sites within the area, with proposals to implement further units. Whilst embedded generators do offer some peak load relief, none of those installed to date are considered to offer reliability levels adequate to provide network support. Consideration has also been given to the potential uptake of small scale photovoltaic systems; however even with an increase in the trend of uptake of such systems, it is unlikely to be sufficient to overcome the identified network constraints in the Launceston area.

Transend and Aurora are not presently aware of any available DSM options, or embedded generation proposals in the Launceston area that will provide the necessary network support. Proponents of viable DSM or embedded generation schemes were encouraged to submit proposals

[2] Based on the deferral of substation and distribution costs of Option 2, and using the regulatory real WACC as the appropriate discount rate.

[3] The adoption of smart metering is currently under consideration in Tasmania.

in response to the application notice.

3.2.2 Other non-network alternative options

Fuel substitution can be an effective means of reducing electricity demand. This involves encouraging consumers to reduce their electricity demand by using an alternative fuel to (in part) meet their energy needs. In practice this could be achieved by the substitution of electric appliance with gas appliances; and particularly those appliances that drive peak residential demand such as those used in heating and cooking. For a fuel substitution scheme to be practical, it would need to achieve an average annual winter peak demand reduction similar to that discussed in Section 3.2.1.

Transend and Aurora are of the view that a viable fuel substitution scheme is not practical in the Launceston area at this time. Genuine proponents of viable fuel substitution schemes were encouraged to submit proposals in response to the application notice.

3.2.3 Non-network alternative options conclusion

Transend and Aurora have investigated a number of non-network alternative options to address the network constraints discussed in Section 2.4. and given that no submissions were received in response to the application notice, both Transend and Aurora are of the view that there are currently no practical non-network solutions available in the Launceston area.

3.3 NETWORK ALTERNATIVE OPTIONS

Through the joint planning process, Transend and Aurora identified a number of technical and practical alternative network development options to address the network constraints discussed in Section 2.4.

3.3.1 Option 1 – augment Norwood Substation and establish a 110 kV connection between Mowbray and Norwood substations

This option comprised the installation of a third transformer at Norwood Substation and the installation of a 110 kV transmission cable between Mowbray and Norwood substations. Further details of the works that would need to be undertaken by Transend and Aurora, together with the timing and estimated cost are summarised in Table 3–1.

Table 3–1 Option 1 – transmission and distribution network augmentation timing, works and costs

Component	Proposed Works	Financial year	Estimated cost ($ million 08–09)
Transend	• extension of the 110 kV bus bars at Norwood Substation to facilitate the installation of a third 110/22 kV 60 MVA transformer, including associated switchgear and protection and control schemes; • extension of the existing 22 kV switchboard and associated protection and control schemes at Norwood Substation; • establishment of new 110 kV transmission bays at Mowbray and Norwood substations; and • installation of a 110 kV transmission cable between Mowbray and Norwood substations.	2011–12	43.7
	Total transmission estimated capital cost		**43.7**
Aurora	• installation/augmentation of five distribution feeders from Norwood Substation to address load constraints on existing feeders.	2011–12	14.9
	• installation/augmentation of three distribution feeders from Norwood Substation to address load constraints on existing feeders.	2012–13	9.2
	• installation/augmentation of two distribution feeders from Norwood Substation to relieve loading on existing feeders due to incremental growth.	2014–15	3.4
	Total distribution estimated capital cost		**27.5**
	Total estimated capital cost		**71.2**

Figure 4-1 presents a single-line diagram of transmission system in the Launceston area for Option 1 and Figure 4-2 presents the geographic arrangement for the transmission network in the Launceston area for Option 1.

Figure 3–1 Option 1 – single-line diagram

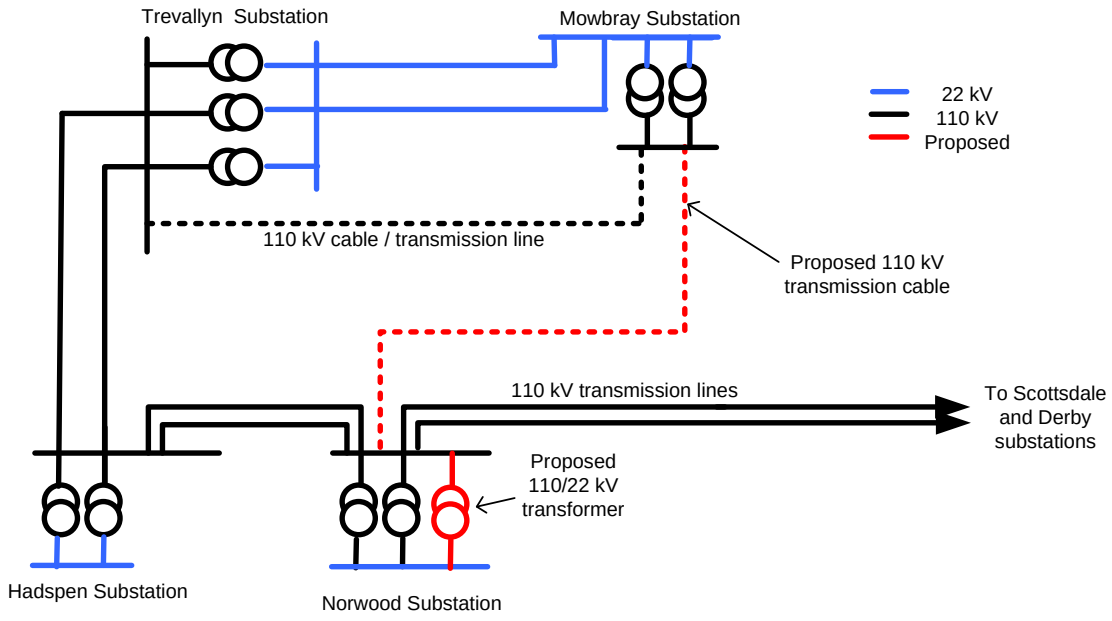


Figure 3–2 Option 1 – transmission network geographic arrangement

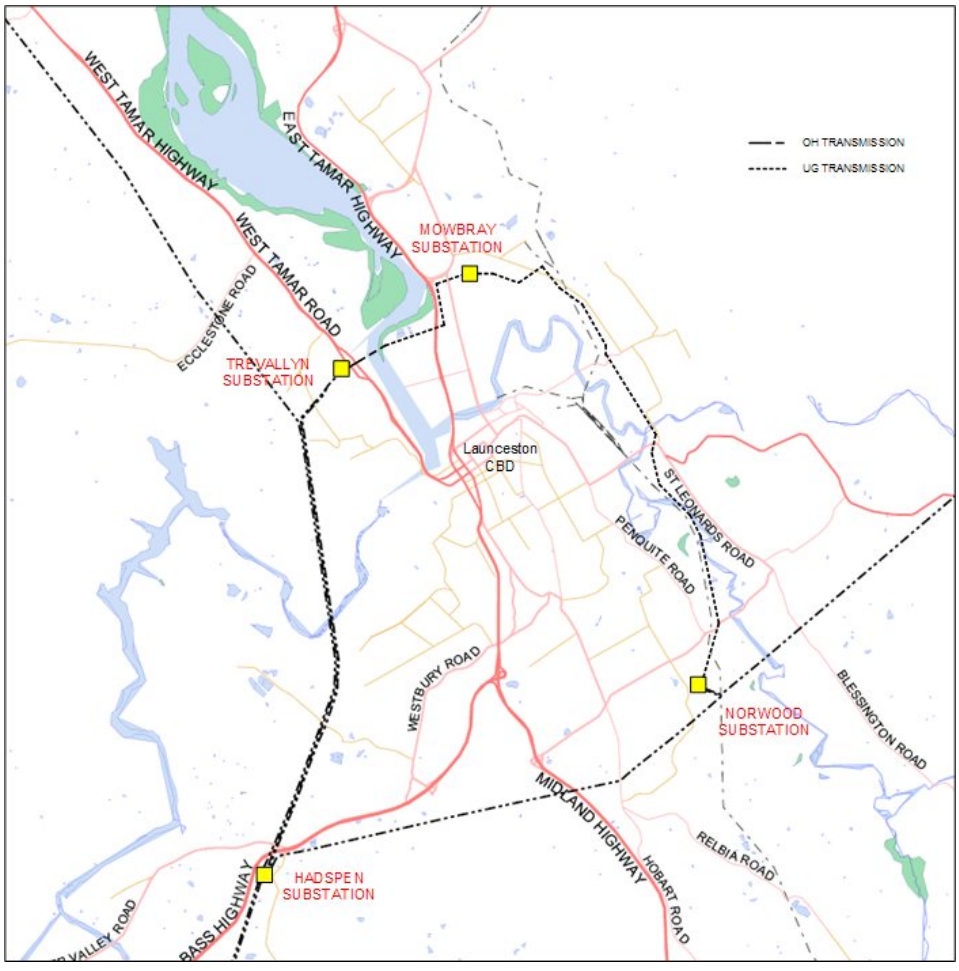
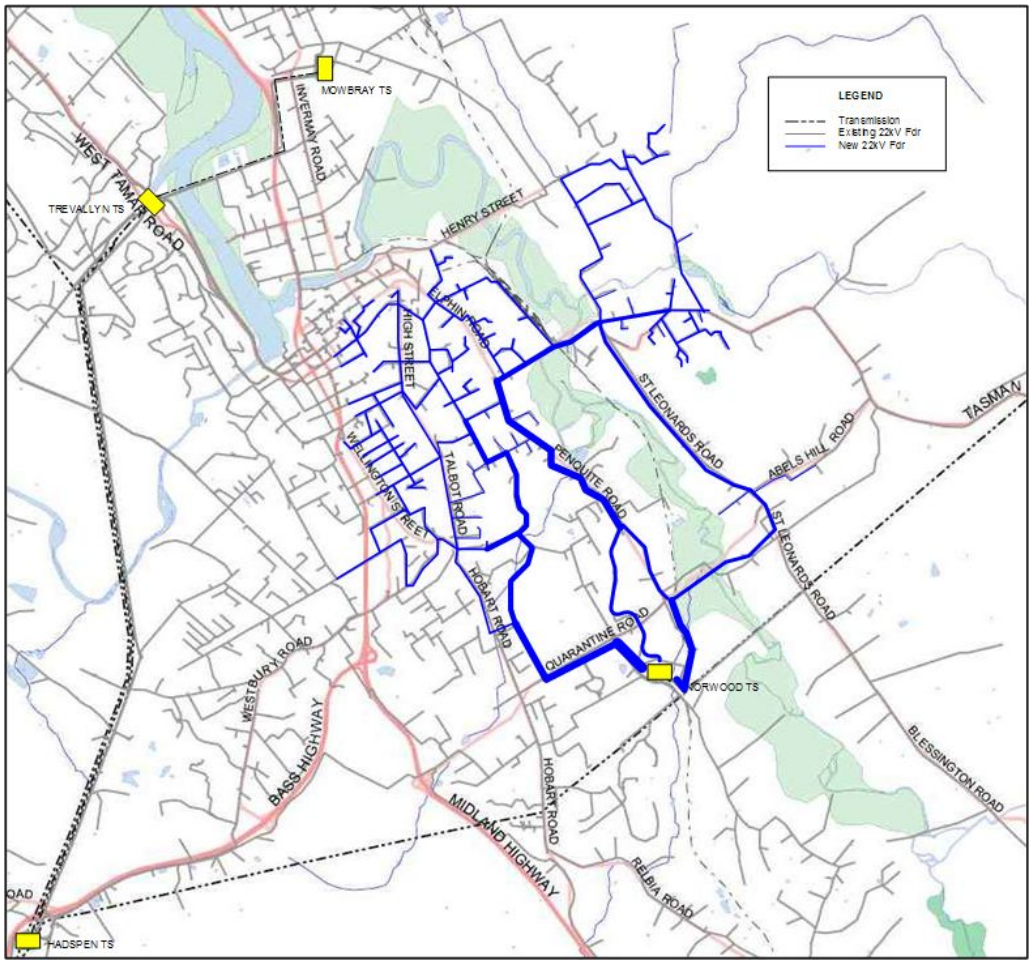


Figure 3–3 presents the distribution arrangement for Option 1.

Figure 3–3 Option 1 –distribution feeder arrangement



(a) Timing

Construction of the works identified for this option would need to commence in 2010, with commissioning of the works by winter 2012.

(b) Key outcomes

The winter demand forecasts for the substations in the Launceston area in comparison with the proposed capacity increases that would result from the implementation of this option are presented in Figure 3–4.

Figure 3–4 Option 1 – medium demand forecast vs proposed transmission capacity

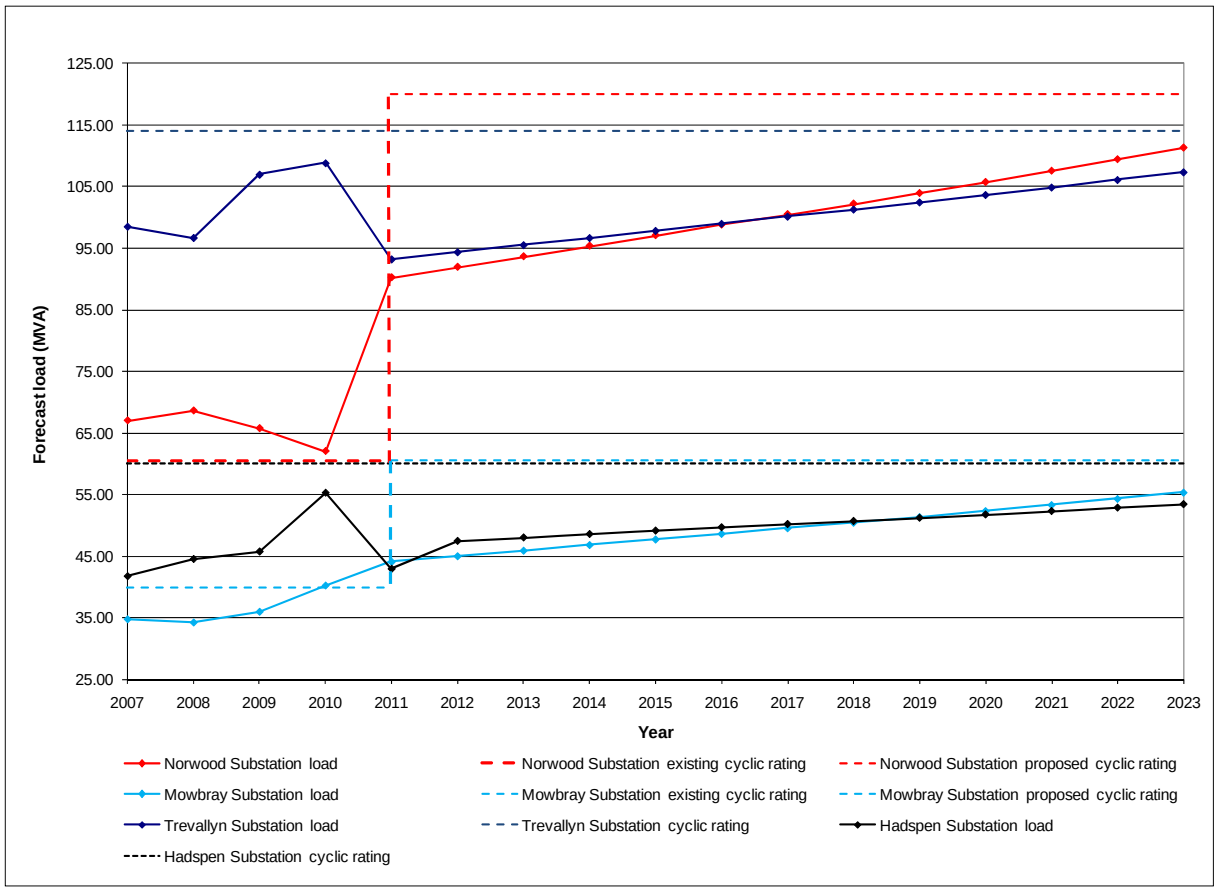


Figure 3–4 shows that under the medium demand forecast for this option, the augmentation of Norwood Substation will address the network constraints at Norwood and Hadspen substations as discussed in Section 2.4. The installation of a third 110/22 kV transformer at Norwood Substation (and associated switchgear and 22 kV feeders) would:

- enable Transend and Aurora to comply with the requirements of the NER;
- enable Transend to comply with the requirements of Clause 5(1)(a)(iv) of the ESI Regulations; and
- enable Aurora to transfer load from existing overloaded feeders.

The establishment of a 110 kV connection between Mowbray and Norwood substations will:

- enable Transend to meet the requirements of Clause 5(1)(a)(v) of the ESI Regulations**;**
- provide 50 MVA firm supply to Mowbray Substation, thereby freeing Aurora's super feeders for use within its distribution network; and
- provide a more secure and reliable electricity supply to customers in the Launceston area.

A number of alternative options and transmission line routes were assessed to identify the most cost-effective way of providing a 110 kV connection between Mowbray and Norwood substations. It was identified that the least cost solution is to install an underground cable in the shortest feasible route between the two substations.

Current forecasts indicate that there will be further constraints in the Launceston area in the year

2023. Due to the continued load growth forecast for the area, Norwood Substation would again be overloaded at this time.

3.3.2 Option 2 – establish a new 110/22 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point

This option comprised the establishment of a new 110/22 kV substation in the east Launceston area as well as a 110 kV transmission circuit connecting the proposed substation to Mowbray and Norwood substations. Further details of the works to be undertaken by Transend and Aurora, together with the timing and estimated cost are summarised in Table 3–2.

Table 3–2 Option 2 – transmission and distribution network augmentation timing, works and costs

Component	Proposed Works	Financial year	Estimated cost ($ million 08/09)
Transend	• establishment of a new 110/22 kV substation in the east Launceston area, with two 60 MVA 110/22 kV transformers; • installation of new 110 kV transmission bays at Mowbray and Norwood substations; • installation of a new 110 kV transmission cable from Mowbray Substation to the new substation; and • installation of a new 110 kV transmission cable from the new substation to Norwood Substation.	2011–12	57.1
	Total transmission estimated capital cost		**57.1**
Aurora	• installation/augmentation of six distribution feeders from the proposed 110/22 kV substation to relieve loading on existing feeders.	2011–12	3.9
	• installation/augmentation of four distribution feeders from the proposed 110/22 kV substation to relieve loading on existing feeders.	2012–13	2.5
	Total estimated distribution capital cost		**6.4**
	Total estimated capital cost		**63.5**

Figure 3–5 presents a single line diagram of the transmission system in the Launceston area for Option 2. Figure 3–6 presents the geographic arrangement for the transmission network in the Launceston area for Option 2.

Figure 3–5 Option 2 – single line diagram

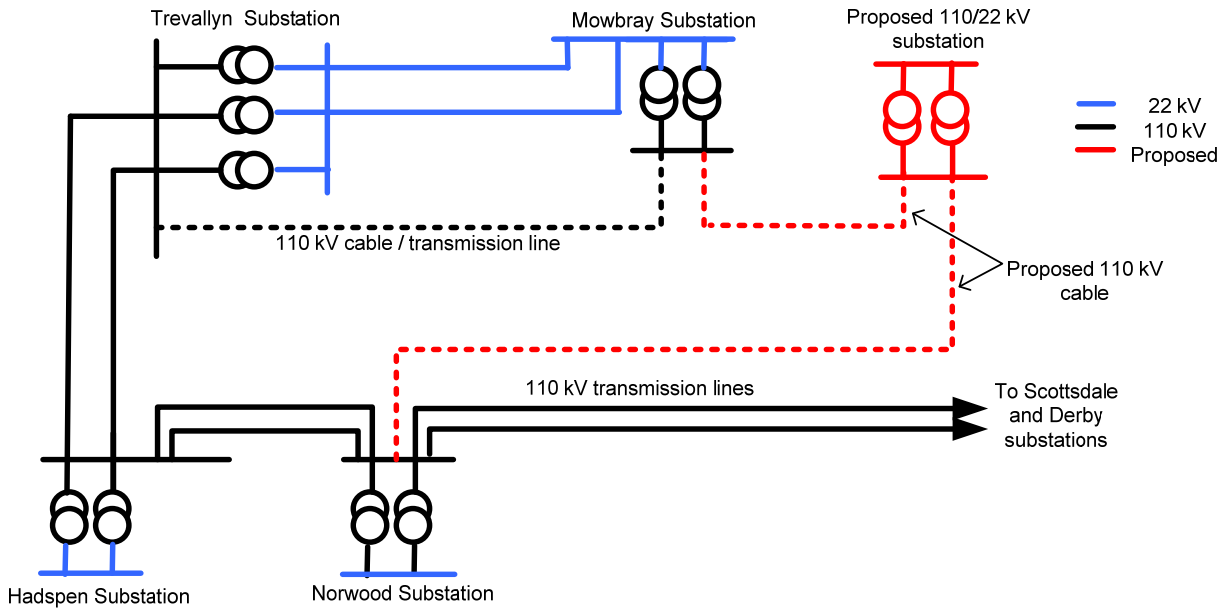


Figure 3–6 Option 2 – transmission network geographic arrangement

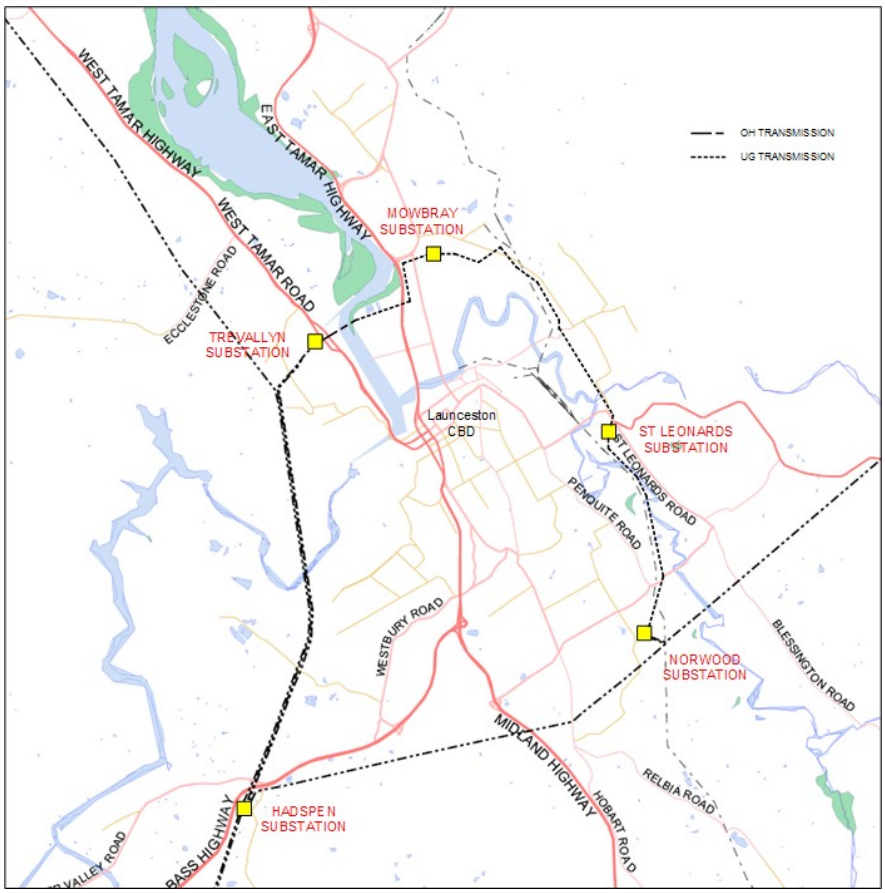
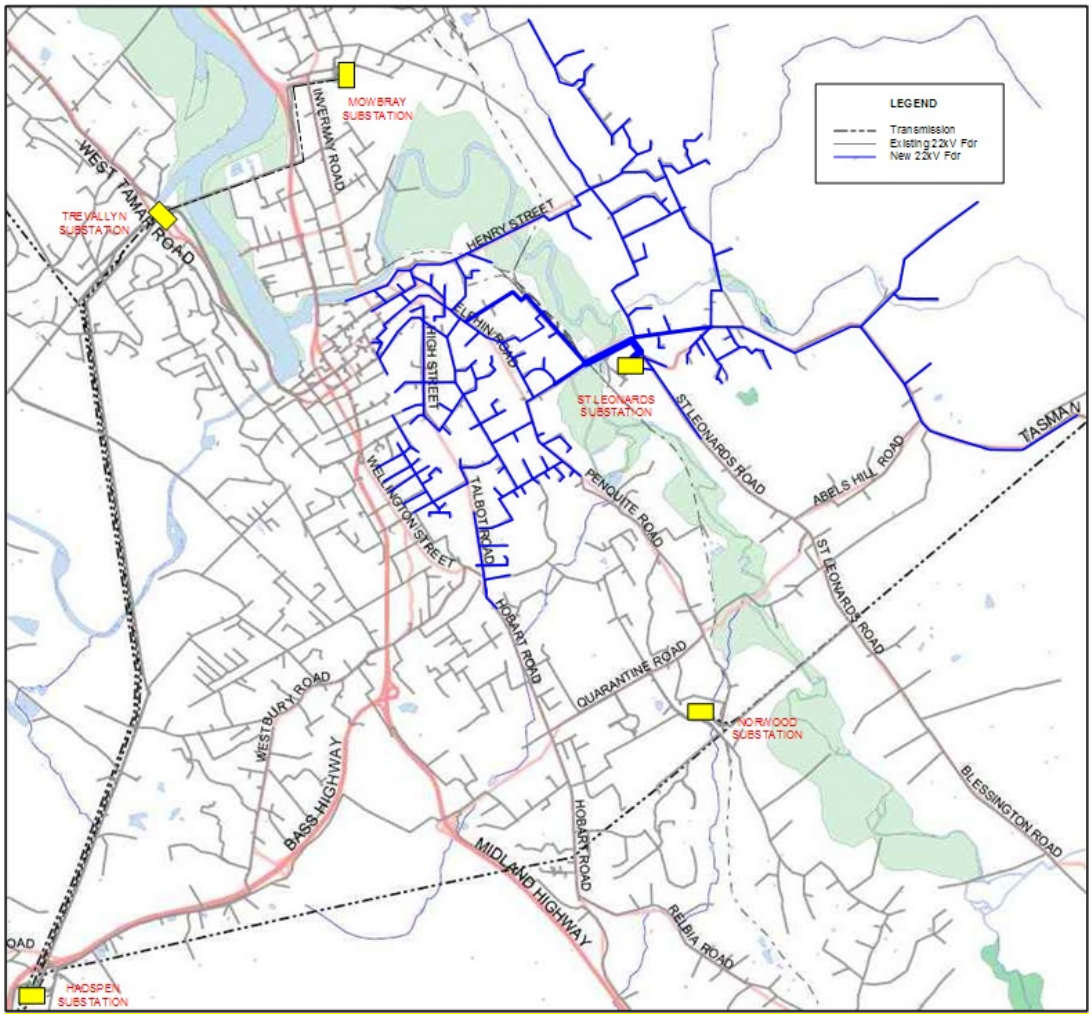


Figure 3–7 presents the distribution network arrangement as a result of implementing this option.

Figure 3–7 Option 2 – distribution network arrangement



(a) Timing

Construction work identified in this option would need to commence in 2010, with commissioning of the works by winter 2012.

(b) Key outcomes

The winter demand forecasts for the substations in the Launceston area in comparison with the proposed capacity increases that would result from the implementation of this option are presented in Figure 3–8.

Figure 3–8 Option 2 – medium demand forecast vs proposed transmission capacity

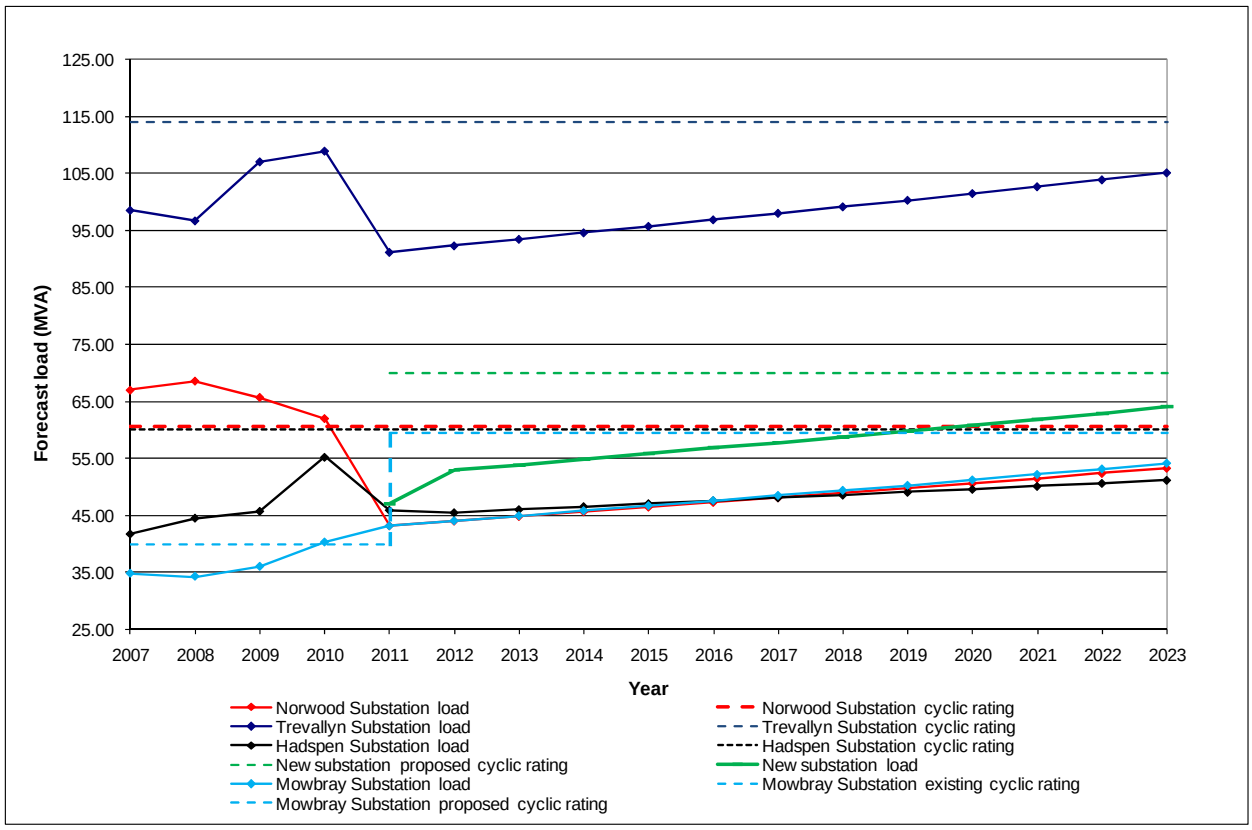


Figure 3–8 shows that under the medium demand forecast for this option, the establishment of a new 110/22 kV connection point in the east Launceston area with the subsequent off-loading of Hadspen, Norwood and Trevallyn substations would address the network constraints as identified in Section 2.4.

The additional 60 MVA firm capacity provided by the proposed substation and additional distribution feeders would:

- enable Transend and Aurora to comply with the requirements of the NER;
- enable Transend to comply with the requirements of Clause 5(1)(a)(iv) of the ESI Regulations;
- enable Aurora to transfer load from existing overloaded feeders; and
- provide greater capacity for inter-substation emergency and planned load-transfers for future peak periods.

An additional connection point in the east Launceston area has the added benefit of allowing load transfer between substations in the north and the south of the area, thereby providing improved operational flexibility.

The establishment of a 110 kV transmission cable between Mowbray and Norwood substations, via the proposed substation in the east Launceston area, would:

- enable Transend to meet the requirements of Clause 5(1)(a)(v) of the ESI Regulations**;**
- provide 50 MVA firm supply to Mowbray Substation, thereby freeing Aurora's super feeders for use within the distribution network; and

- provide a more secure and reliable electricity supply to customers in the Launceston area.

A number of alternative options and transmission line routes were assessed to identify the most cost-effective way of providing a 110 kV connection between Mowbray and Norwood substations and the new substation. It was identified that the least cost solution is to install an underground cable in the shortest feasible route between the two existing substations, via the new substation.

It is forecast that further augmentation to address future constraints in the Launceston area will not be required until 2030 under this option.

3.3.3 Option 3 – establish a new 110/66 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point

This option comprised the establishment of a new 110/66 kV substation in the east Launceston area as well as a number of 22 kV zone substations in the area. A 110 kV transmission circuit would also be established to supply the new substation via Mowbray and Norwood substations. Further details of the works to be undertaken by Transend and Aurora, together with the timing and estimated cost are summarised in Table 3–3.

Table 3–3 Option 3 – transmission and distribution network augmentation timing, works and costs

Component	Proposed Works	Financial year	Estimated cost ($ million 08/09)
Transend	• establishment of a new 110/66 kV substation in the east Launceston area, with two 60 MVA 110/66 kV transformers; • installation of new 110 kV transmission bays at Mowbray and Norwood substations; • installation of a new 110 kV transmission cable from Mowbray Substation to the new substation; and • installation of a new 110 kV transmission cable from the new substation to Norwood Substation.	2011–12	57.1
	Total transmission estimated capital cost		**57.1**
Aurora	• acquisition of zone substation site in Elphin area	2010–11	0.3
	• establishment of a 66/22 kV zone substation in the Elphin area; • establishment of 66 kV subtransmission feeders from 110/66 kV substation to the Elphin Zone Substation; and • installation of six distribution feeders from the Elphin Zone Substation to relieve loading on existing feeders.	2011–12	13.4

Component	Proposed Works	Financial year	Estimated cost ($ million 08/09)
	• installation/augmentation of four distribution feeders from the proposed Elphin Zone Substation to relieve loading on existing feeders.	2012–13	1.3
	Total distribution estimated capital cost		**15.0**
	Total estimated capital cost		**72.1**

Figure 3–9 presents the single line diagram of the proposed arrangement under Option 3, and Figure 3–10 presents the transmission network geographic arrangement resulting from the work proposed under Option 3.

Figure 3–9 Option 3 – single line diagram

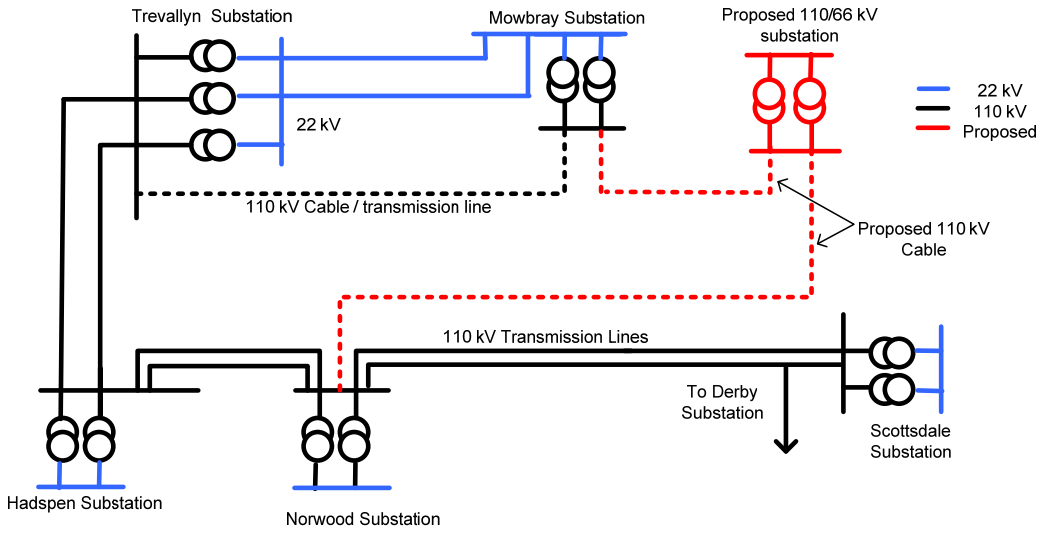


Figure 3–10 Option 3 – transmission network geographic arrangement

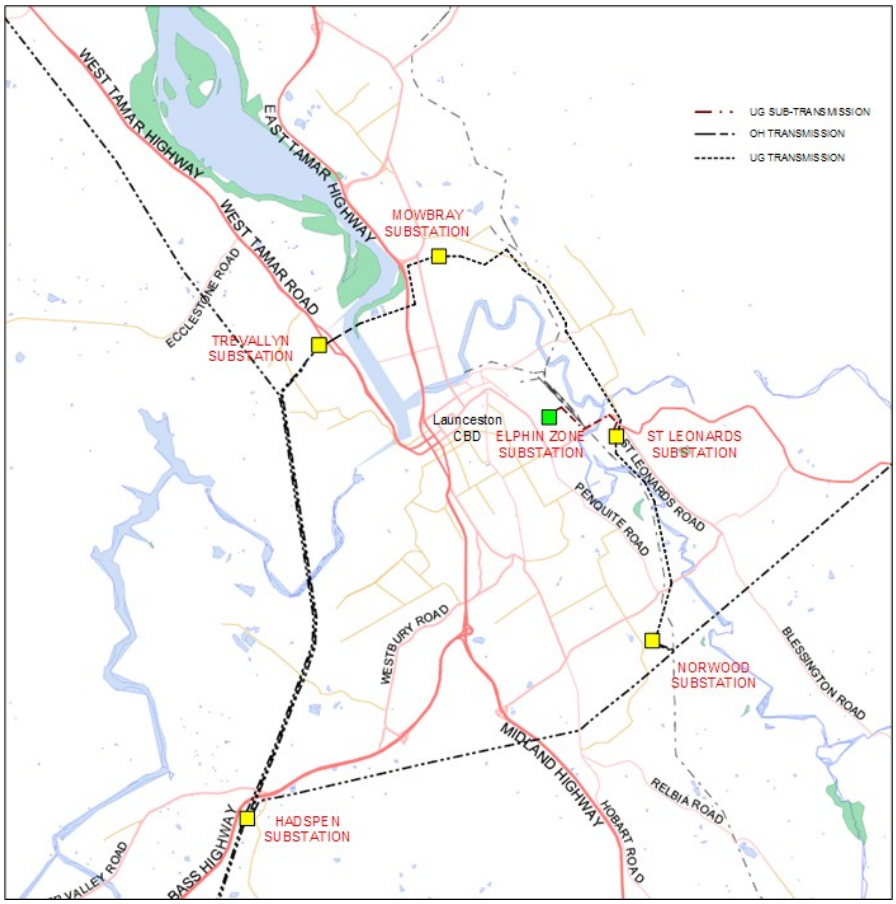


Figure 3–11 and Figure 3–12 show the sub transmission and distribution system arrangements for Option 3.

Figure 3–11 Option 3 – sub-transmission system and 66 kV zone substation

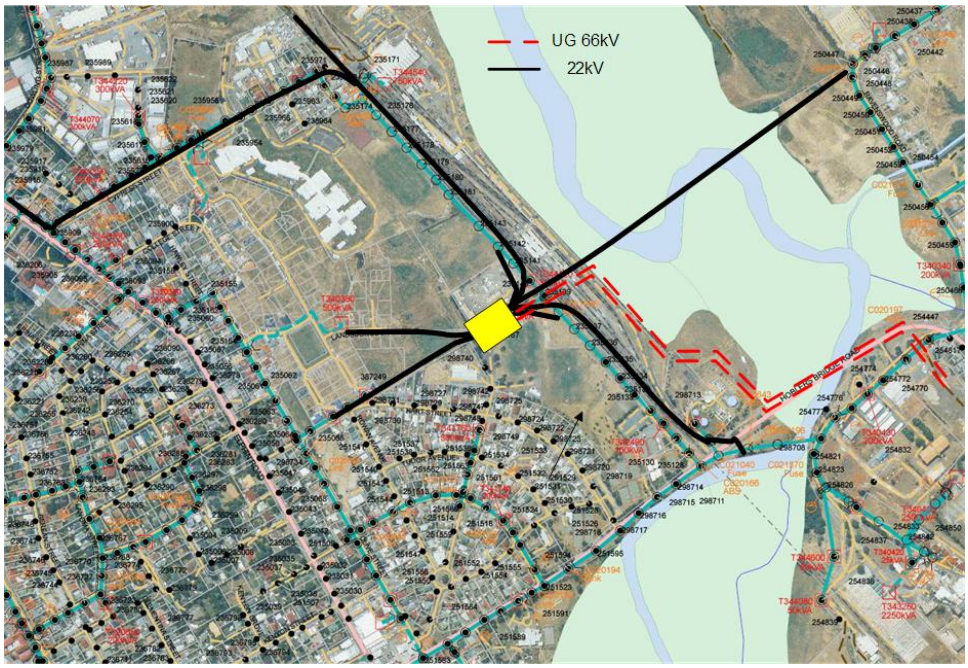
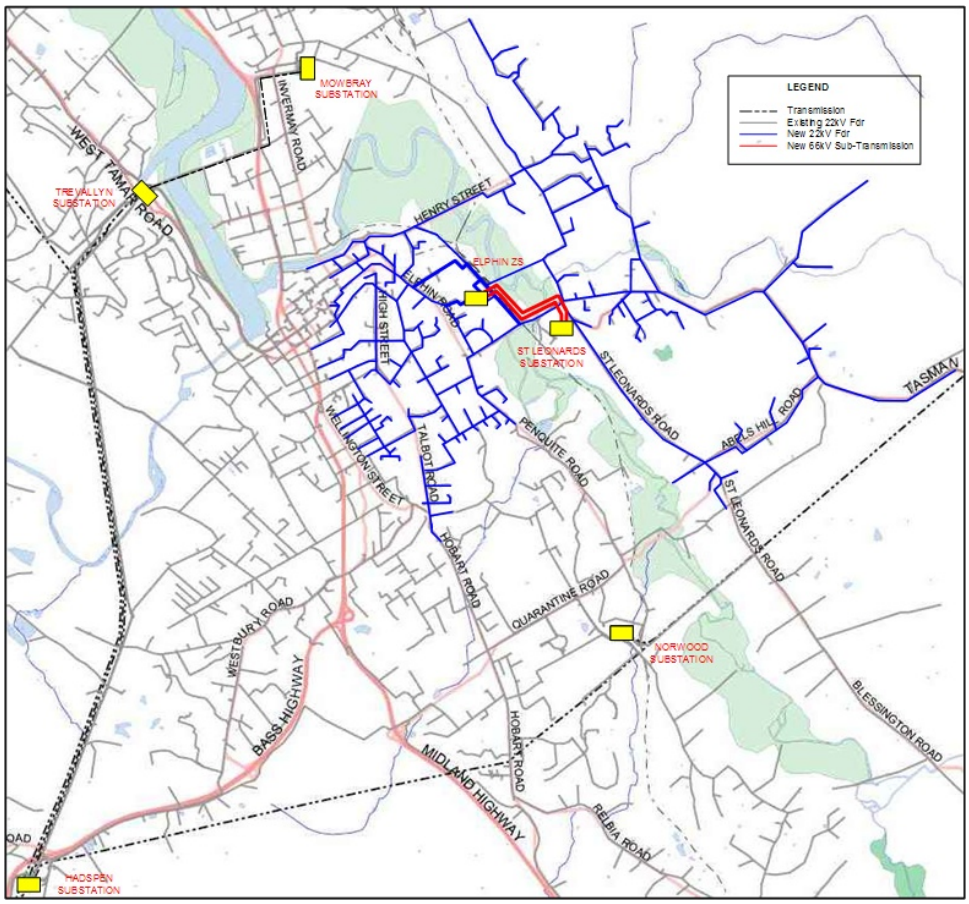


Figure 3–12 Option 3 – distribution network geographic arrangement



(a) Timing

Construction of the works identified for this option would need to commence in 2010, with commissioning of the works by winter 2012.

(b) Key outcomes

The winter demand forecasts for the substations in the Launceston area in comparison to the proposed capacity resulting from the implementation of this option are shown in Figure 3–13.

Figure 3–13 Option 3 – medium demand forecast vs proposed transmission capacity

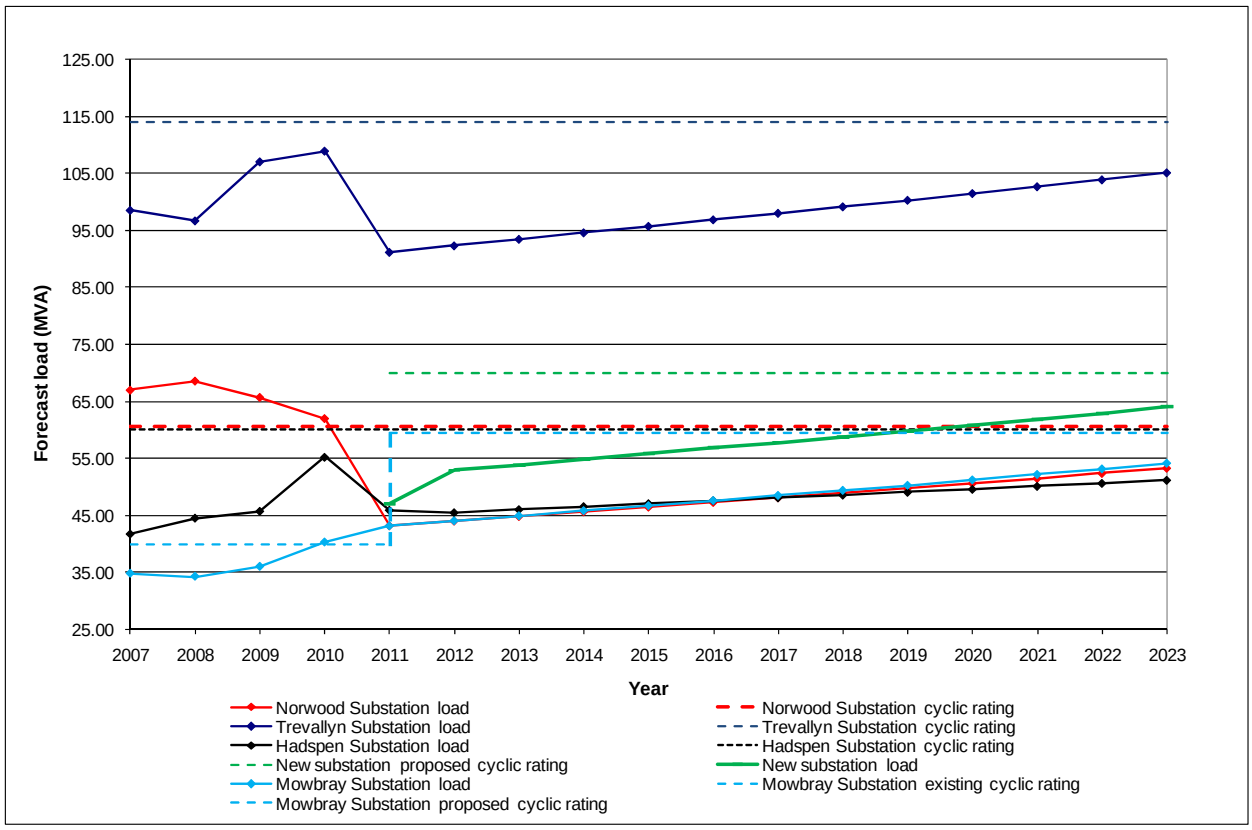


Figure 3–13 shows that under the medium demand forecast for this option, the establishment of a new 110/66 kV connection point in the east Launceston area with the subsequent off-loading of Norwood, Trevallyn and Hadspen substations, would address the network constraints as identified in Section 2.4. The additional 60 MVA firm capacity provided by the proposed substation, and additional distribution network assets would:

- enable Transend and Aurora to comply with the requirements of the NER;
- enable Transend to comply with the requirements of Clause 5(1)(a)(iv) of the ESI Regulations;
- enable Aurora to transfer load from existing overloaded feeders; and
- provide greater capacity for inter-substation emergency and planned load-transfers for future peak periods.

An additional connection point in the east Launceston area has the added benefit of allowing load transfer between substations in the north and the south of the area, thereby providing improved operational flexibility.

The establishment of a 110 kV transmission cable between Mowbray and Norwood substations, via the proposed substation in the east Launceston area, will:

- enable Transend to meet the requirements of Clause 5(1)(a)(v) of the ESI Regulations**;**
- provide 50 MVA firm supply to Mowbray Substation, thereby freeing Aurora's super feeders for use within the distribution network; and
- provide a more secure and reliable electricity supply to customers in the Launceston area.

A number of alternative options and transmission line routes were assessed to identify the most cost-effective way of providing a 110 kV connection between Mowbray and Norwood substations and the new substation. It has been identified that the least cost solution is to install an underground cable in the shortest feasible route between the two existing substations, via the new substation.

It is forecast that further augmentation to address future constraints in the Launceston area will not be required until 2030 under this option.

3.3.4 Option 4 – augment Norwood Substation and augment existing transmission corridors in the Launceston area

This option comprised augmenting Norwood Substation to install a third 110/22 kV 60 MVA transformer, and upgrading existing transmission corridors in the Launceston area. Further details of the works that would need to be undertaken by Transend and Aurora, together with the timing and estimated cost are summarised in Table 3–4.

Table 3–4 Option 4 – transmission and distribution network augmentation timing, works and costs

Component	Proposed Works	Financial year	Estimated cost ($ millions 08/09)
Transend	• extension of 110 kV and 22 kV bus bars at Norwood Substation, which will require extension of existing switchyard and control building; • installation of one new 30/60 MVA 110/22 kV transformer at Norwood Substation, as well as associated switchgear and protection systems; • installation of new 110 kV transmission line from Hadspen Substation to Norwood Substation; • installation of new 110 kV transmission cable between Trevallyn and Mowbray substations; and • separation of Hadspen–Trevallyn transmission circuits onto separate tower lines.	2011–12	44.5
	Total transmission estimated capital cost		**44.5**
Aurora	• installation/augmentation of five distribution feeders from Norwood Substation to address load constraints on existing feeders.	2011–12	14.9
	• installation/augmentation of three distribution feeders from Norwood Substation to address load constraints on existing feeders.	2012–13	9.2

Component	Proposed Works	Financial year	Estimated cost ($ millions 08/09)
	• installation/augmentation of two distribution feeders from Norwood Substation to relieve loading on existing feeders due to incremental growth.	2014–15	3.4
	Total distribution estimated capital cost		**27.5**
	Total estimated capital cost		**72.0**

Figure 3–14 presents a single line diagram of the configuration of the Launceston area transmission system proposed in Option 4 and Figure 3–15 presents the transmission network geographic arrangement resulting from the work proposed under Option 4.

Figure 3–14 Option 4 – single line diagram

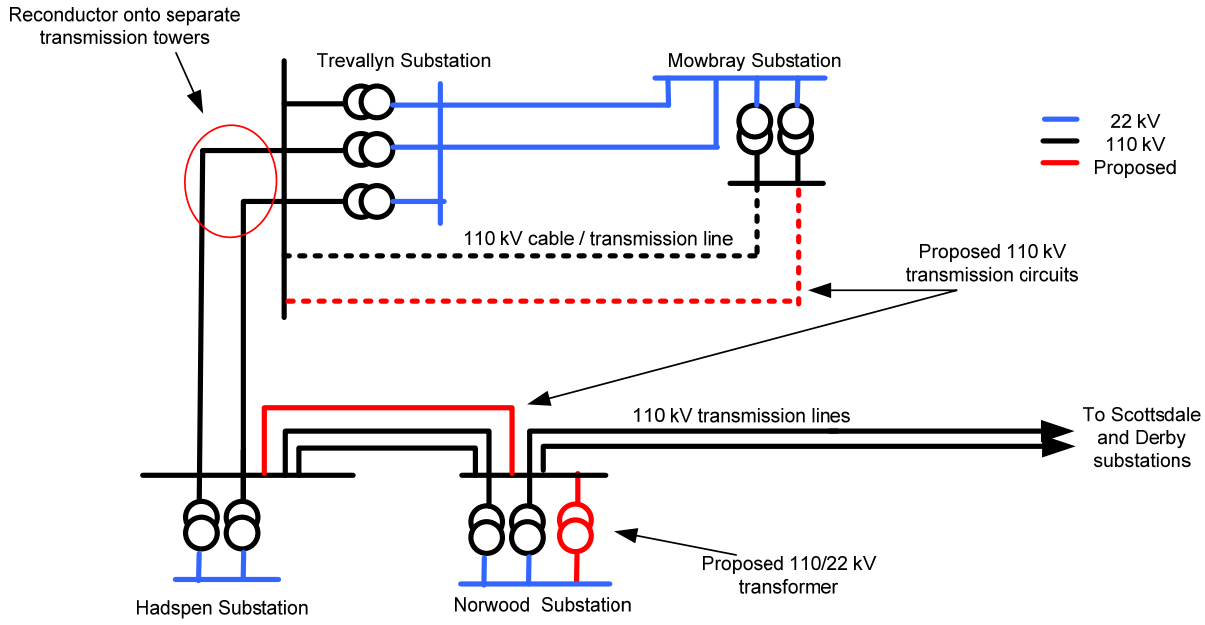


Figure 3–15 Option 4 – transmission network geographic arrangement

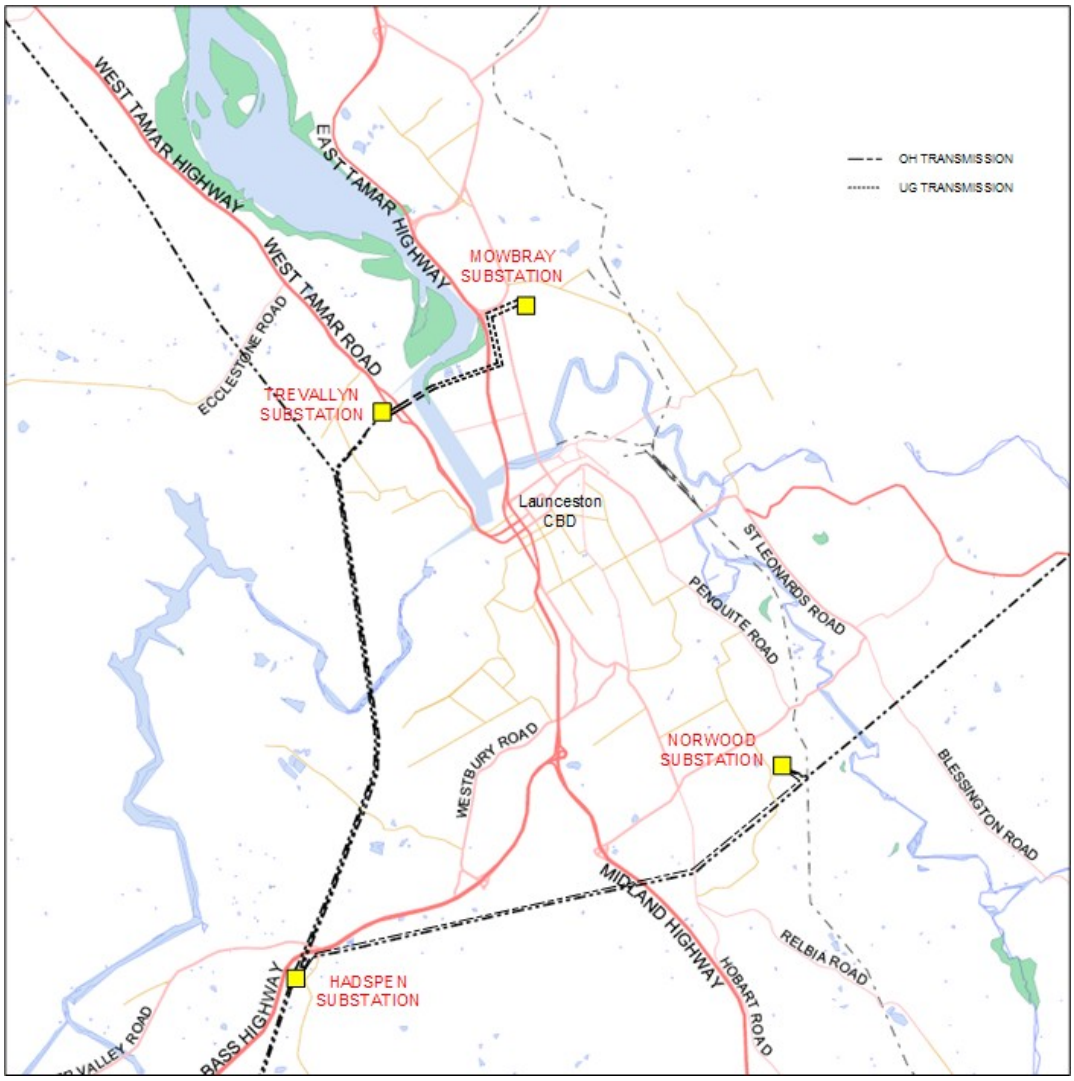
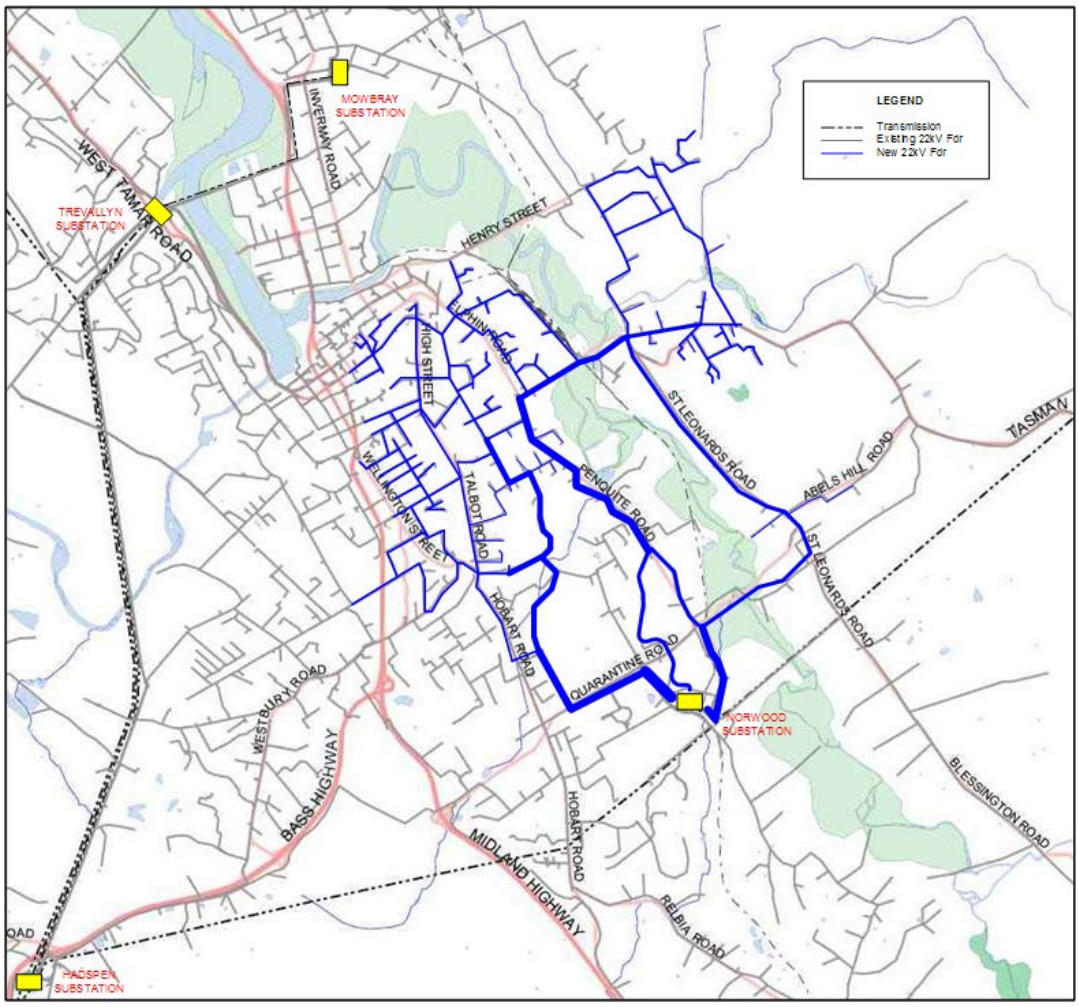


Figure 3–16 presents the distribution arrangement resulting from works under this option.

Figure 3–16 Option 4 – proposed distribution feeder arrangement



(a) Timing

Construction of the works identified for this option would need to commence in 2010, with commissioning of the works by the winter 2012.

(b) Key outcomes

The winter demand forecasts for the Launceston area substations in comparison to the proposed capacity resulting from the implementation of this option are shown in Figure 3–17.

Figure 3–17 Option 4 – medium demand forecast vs proposed transmission capacity

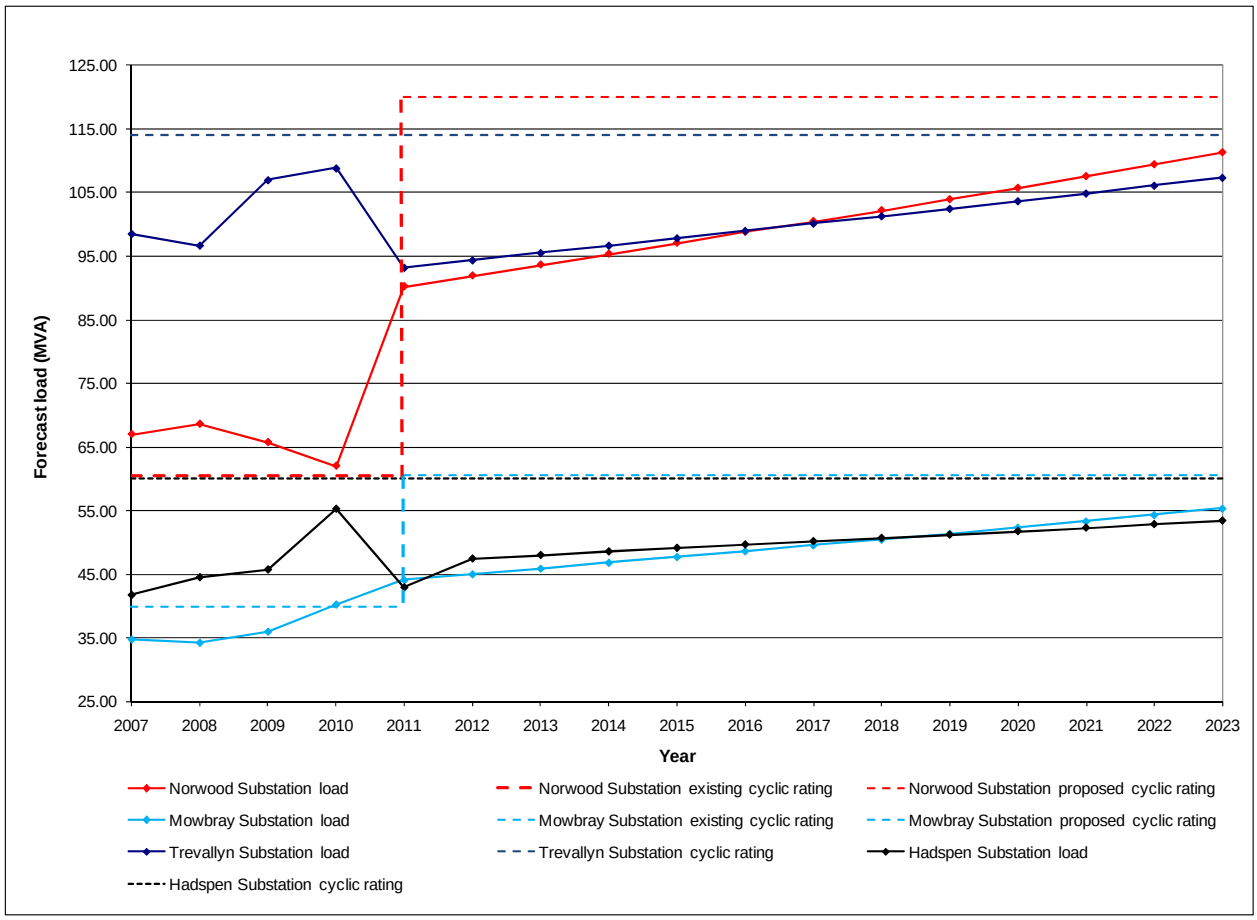


Figure 3–17 shows that under the medium demand forecast for this option, the augmentation of Norwood Substation would address the network constraints at Norwood and Hadspen substations as discussed in Section 2.4. The installation of a third 110/22 kV transformer at Norwood Substation (and associated switchgear and 22 kV feeders) would:

- enable Transend and Aurora to comply with the requirements of the NER;
- enable Transend to comply with the requirements of Clause 5(1)(a)(iv) of the ESI Regulations; and
- enable Aurora to transfer load from existing overloaded feeders.

The various constraints on the transmission system are addressed in Option 4 by augmenting existing transmission corridors as follows:

- the establishment of a third 110 kV transmission line between Hadspen and Norwood substations and the separation of Hadspen–Trevallyn 1 and 2 transmission lines will enable Transend to meet the requirements of Clause 5(1)(a)(v) of the ESI Regulations for a failure of a tower on the Hadspen–Norwood transmission corridor**;** and
- the establishment of a second 110 kV underground transmission cable between Trevallyn and Mowbray substations will enable 50 MVA firm supply to Mowbray Substation.

Current forecasts indicate that there will be further constraints in the Launceston area in the year 2023. Due to the continued load growth forecast for the area, Norwood Substation will again be overloaded at this time.

3.3.5 Option 5 – establish a new 110/22 kV substation in the east Launceston area, and augment existing transmission corridors in the Launceston area

This option comprised the establishment of a new 110/22 kV substation in the east Launceston area and augmentation of existing transmission corridors in the Launceston area. Further details of the works that would need to be undertaken by Transend and Aurora, together with the timing and estimated cost are summarised in Table 3–5.

Table 3–5 Option 5 - transmission and distribution network augmentation timing, works and costs

Component	Proposed Works	Financial year	Estimated cost ($ million 08/09)
Transend	• construction of new 110/22 kV substation in the east Launceston area, with firm capacity 60 MVA; • installation of an overhead 110 kV transmission line between Hadspen and Norwood substations; • installation of a 110 kV cable between Trevallyn and Mowbray substations; • installation of a new transmission circuit to supply the proposed substation from Norwood Substation; and • separation of Hadspen–Trevallyn transmission circuits to individual tower lines.	2011–12	62.8
	Total transmission estimated capital cost		**62.8**
Aurora	• installation/augmentation of six distribution feeders from proposed 110/22 kV substation to relieve loading on existing feeders.	2011–12	3.9
	• installation/augmentation of four distribution feeders from proposed 110/22 kV substation to relieve loading on existing feeders.	2012–13	2.5
	Total distribution estimated capital cost		**6.4**
	Total estimated capital cost		**69.2**

Figure 3–18 presents the single line diagram for Option 5 and Figure 3–19 presents the transmission network geographic arrangement resulting from the work proposed under Option 5.

Figure 3–18 Option 5 – single line diagram

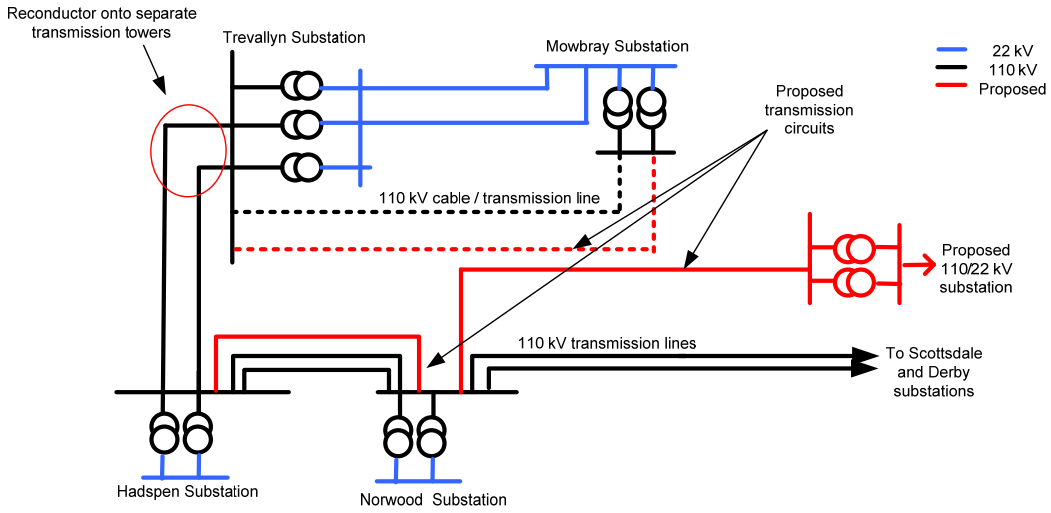


Figure 3–19 Option 5 – transmission network geographic arrangement

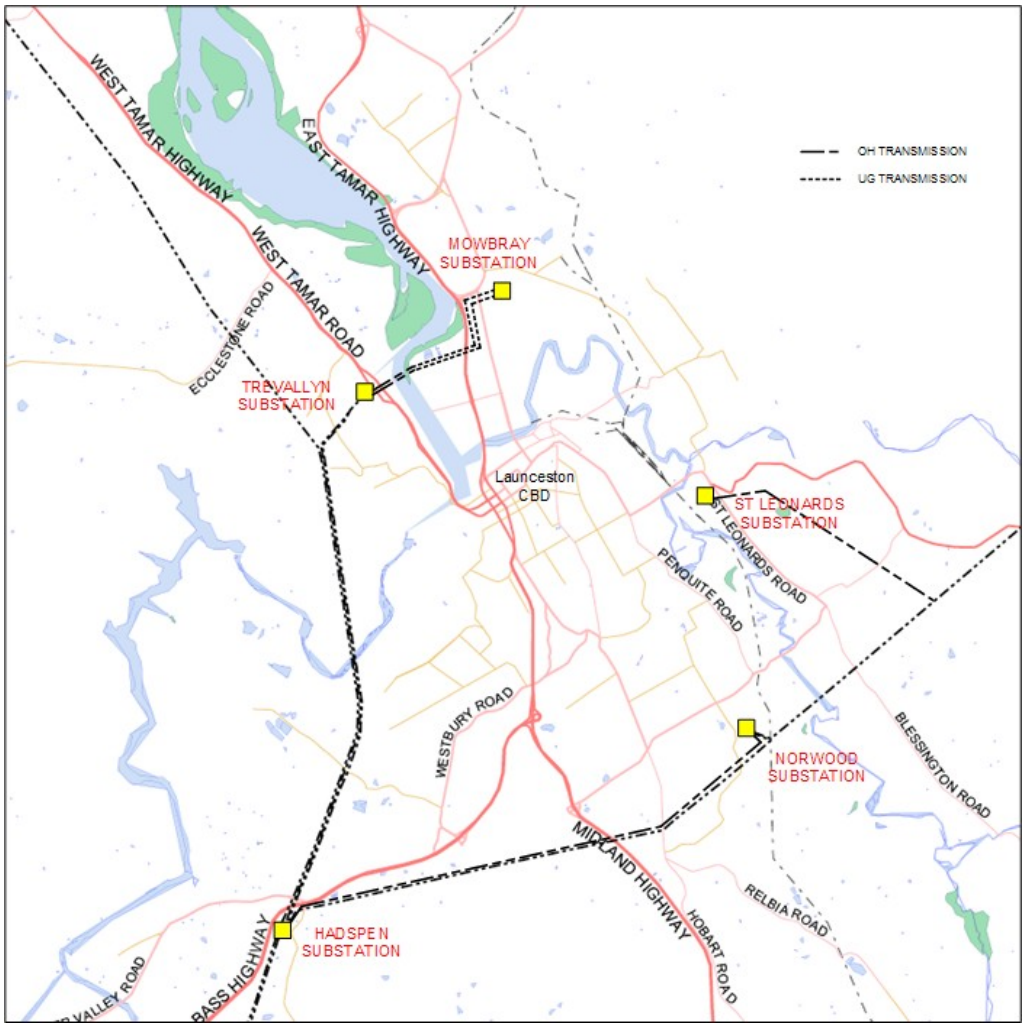
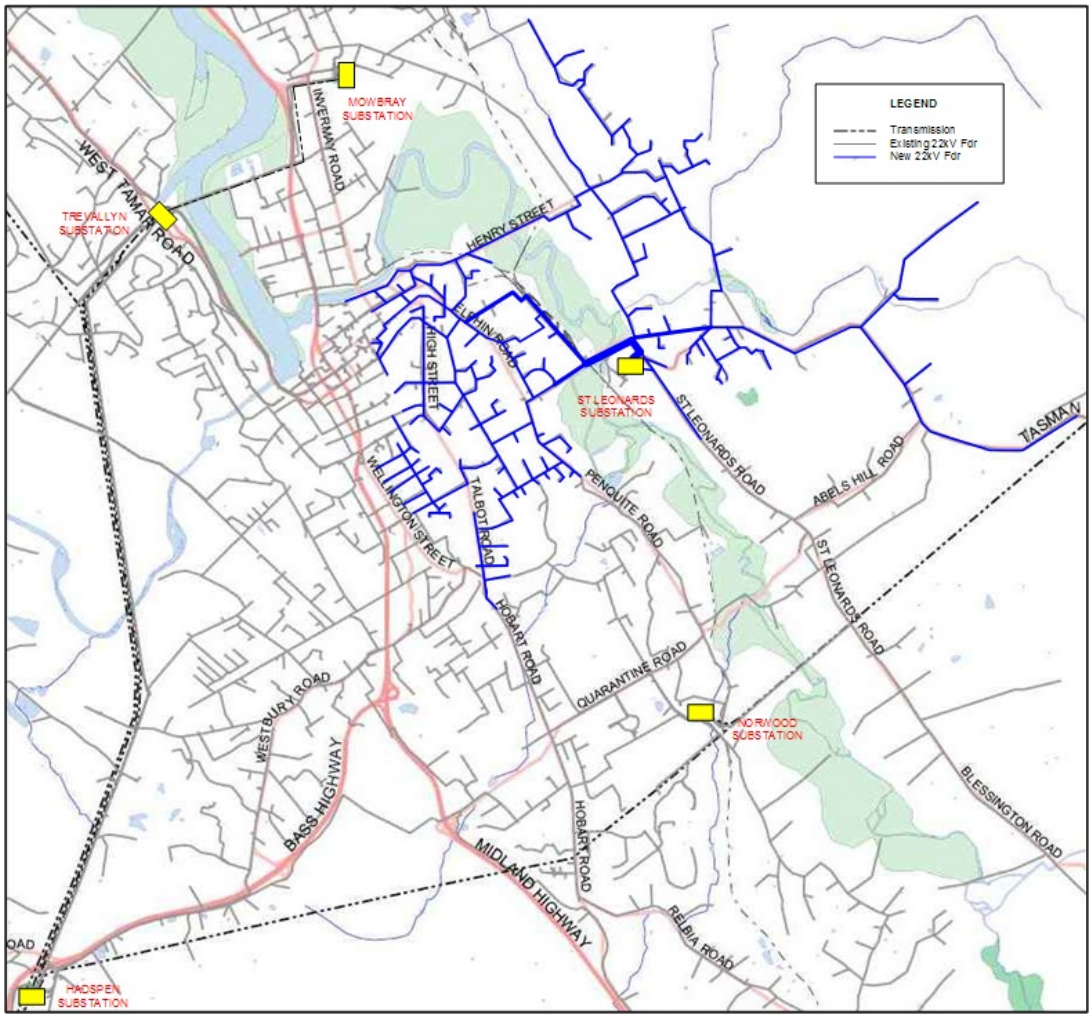


Figure 3–20 shows the distribution network geographic arrangement as a result of implementing this option.

Figure 3–20 Option 5 – proposed distribution network geographic arrangement



(a) Timing

Construction of the works identified for this option would need to commence in 2010, with commissioning of the works by winter of 2012.

(b) Key outcomes

The winter demand forecasts for the Launceston area substations in comparison to the proposed capacity resulting from the implementation of this option are shown in Figure 3–21.

Figure 3–21 Option 5 – medium demand forecast vs proposed transmission capacity

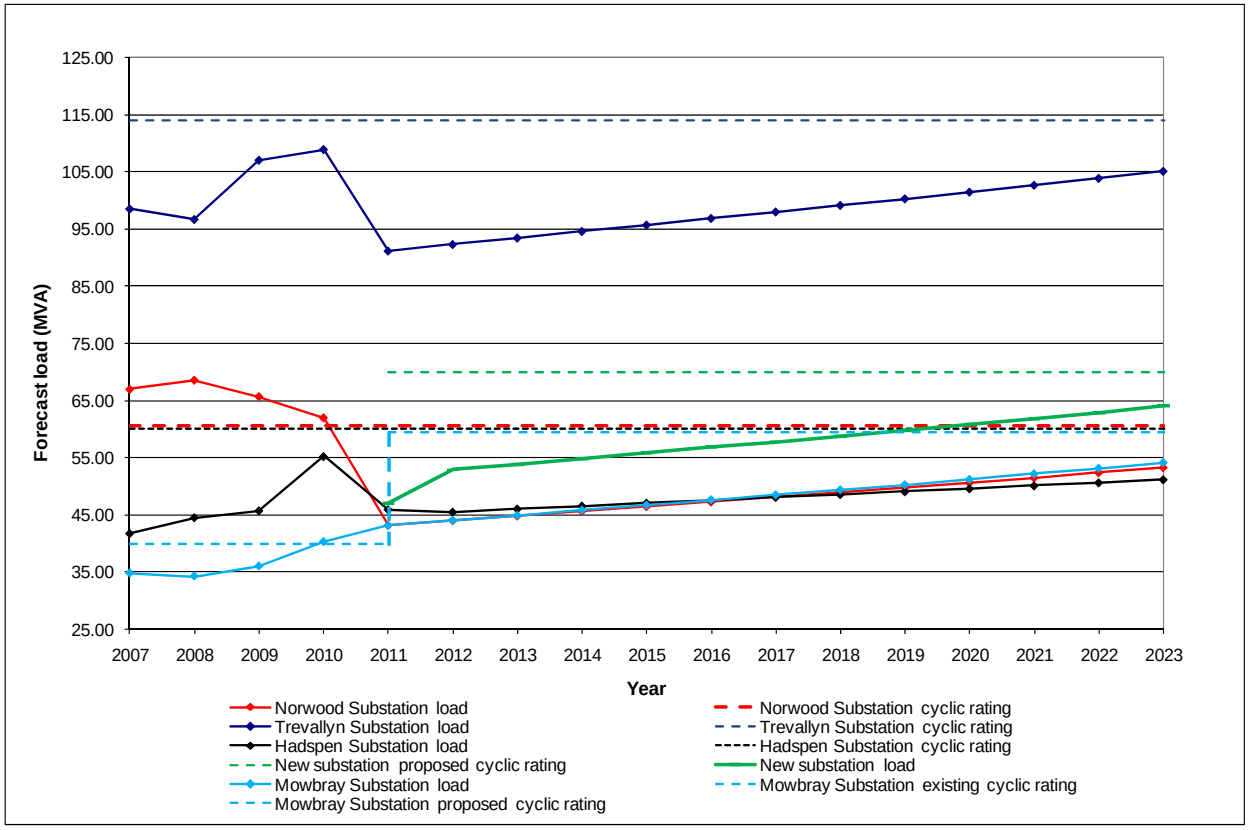


Figure 3–21 shows that under the medium demand forecast for this option, the establishment of a new 110/22 kV connection point in the east Launceston area would allow the off-loading of Hadspen, Norwood and Trevallyn substations and will address the transmission and distribution network constraints identified in Section 2.4. The additional 60 MVA firm capacity provided by the proposed substation would:

- enable Transend and Aurora to comply with the requirements of the NER;
- enable Transend to comply with the requirements of Clause 5(1)(a)(iv) of the ESI Regulations;
- enable Aurora to transfer load from existing overloaded feeders; and
- provide greater capacity for inter-substation emergency and planned load-transfers for future peak periods.

The various constraints on the transmission system are addressed in Option 5 by upgrading existing transmission corridors as follows:

- the establishment of a third 110 kV transmission line between Hadspen and Norwood substations and the separation of Hadspen–Trevallyn 1 and 2 transmission lines will enable Transend to meet the requirements of Clause 5(1)(a)(v) of the ESI Regulations for a failure of a Hadspen–Norwood transmission tower**;** and
- the establishment of a second 110 kV underground transmission cable between Trevallyn and Mowbray substation will enable 50 MVA firm supply to Mowbray Substation.

It is forecast that further augmentation to address constraints outlined in Section 2.4 will not be required until 2030.

3.4 TRANSMISSION NETWORK IMPACTS

Transend has assessed whether the proposed new large transmission network asset could reasonably have a material impact on any interconnected transmission networks and has concluded that no adverse impacts are likely to occur under any of the network alternative options considered in the application notice.

3.5 FINANCIAL ANALYSIS

3.5.1 Present Value Analysis

All cost estimates were prepared on the same basis in order to ensure a fully equivalent assessment of the alternative options. These cost estimates were prepared in accordance with the cost estimating policies and procedures of Transend and Aurora. All direct costs as defined by the regulatory test have been included. Transend cost estimates are based on its standard estimating procedure and have a nominal accuracy of ±30 per cent. While Aurora's cost estimates have a nominal accuracy of ±25 per cent. The impact of the accuracy of the cost estimates on the selection of the preferred option is examined in the sensitivity analysis presented in Section 3.5.2.

The discount rates used in undertaking the present value analysis were 7.93 per cent pre-tax real for Transend, and 6.64 per cent pre-tax real for Aurora. These are the values set in the regulatory determinations for the current regulatory period for Transend and Aurora respectively.

Table 3–6 summarises the results of the cost-benefit analysis for the development options considered. The analysis utilised the present value (PV) of Transend and Aurora's capital and operational costs.

Table 3–6 Cost summary

Option	Aurora capital cost ($ million)	Aurora cost (PV) ($ million)	Transend capital cost ($ million)	Transend cost (PV) ($ million)	Total cost (PV) ($ million)	Ranking
1	27.5	20.4	43.7	32.3	52.7	3
2	6.4	4.8	57.1	42.1	47.0	1
3	15.1	11.7	57.1	42.1	53.9	5
4	27.5	20.4	44.5	33.3	53.7	4
5	6.4	4.8	62.8	47.1	51.9	2

3.5.2 Sensitivity analysis

The options considered were subjected to sensitivity analysis to determine if changing any of the underlying assumptions had an effect on the cost ranking of the options. Table 3–7 shows the results of this sensitivity analysis on the options' costs, and ranks the options in terms of lowest present value cost under the various scenarios.

Table 3–7 Sensitivity analysis results and option ranking ($ million)

Scenario	Range	Option 1	Option 2	Option 3	Option 4	Option 5
Medium load growth	Base case	52.7	47.0	53.9	53.7	51.9
Rank		**3**	**1**	**5**	**4**	**2**
Low load growth	0.7% of base case	52.1	47.0	53.8	53.2	51.9
Rank		**3**	**1**	**5**	**4**	**2**
High load growth	1.3% of base case	57.3	50.8	58.1	58.4	56.2
Rank		**3**	**1**	**4**	**5**	**2**
Capex overspend	25% over spend	65.8	58.7	67.3	67.0	64.7
Rank		**3**	**1**	**5**	**4**	**2**
Capex under spend	25% under spend	39.6	35.3	40.4	40.4	39.1
Rank		**3**	**1**	**4**	**4**	**2**
Opex over budget	50% over spend	52.8	47.1	54.0	54.0	52.3
Rank		**3**	**1**	**4**	**4**	**2**
Opex under budget	50% under spend	52.6	46.9	53.8	53.4	51.5
Rank		**3**	**1**	**5**	**4**	**2**

The underlying assumptions that have been tested in the sensitivity analysis are:

- load growth;
- capital costs; and
- operational costs.

For variances in each of these assumptions, the ranking of options did not change significantly, and options 2, 5, and 1 were ranked 1, 2 and 3 respectively for all scenarios. On the basis of the sensitivity analysis that has been undertaken, Option 2 was considered a robust solution to addressing the identified network issues in the Launceston area.

3.6 CONCLUSION

Under the medium (expected) winter demand forecast, Option 2 – Establish a new 110/22 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point is the preferred option, as it has the lowest present value cost of the practical alternative options. That is, it is the least cost network option to overcome the identified network supply constraints as discussed in Section 2.4, in the Launceston

area. Sensitivity analysis has also shown that under the majority of reasonable scenarios, Option 2 is the lowest present value cost solution. Consequently, Option 2 meets the requirements to pass the reliability limb of the regulatory test.

Transend and Aurora, the 'Applicants' believe that the Option 2 asset satisfies the regulatory test because it is the least cost option to establish new transmission and distribution assets which are necessitated by the inability to otherwise meet ESI Regulations as set out in Schedule 5.1 of the NER and under local jurisdictional requirements. Having identified and examined all reasonable alternatives, Option 2 represents the least cost reliability augmentation.

4 RECOMMENDATION

Based on the analysis undertaken by Transend and Aurora, and given that no submissions were received in relation to the application notice, it is concluded that Option 2 is the lowest present value cost option under a majority of reasonable scenarios that fully addresses the identified network constraints in the Launceston area. It is also concluded that Option 2 passes the regulatory test under the reliability limb.

Based on this conclusion, it is recommended that Transend and Aurora take appropriate action to implement the new large transmission and new distribution developments as set out in Option 2 of this final report in order to address the identified network constraints in the Launceston area.

5 DISPUTE NOTICES

Persons wishing to dispute the contents, findings, assumptions or recommendation of this final report are referred to clause 5.6.6(j) of the NER.

Disputing parties must lodge a notice of the dispute in writing to the AER and provide a copy of the notice to Transend and Aurora within 30 business days of the publication of the summary of this final report on AEMO's website.

Copies of dispute notices should be forwarded to:

Mr Brent Dalton
Aurora Energy Pty Ltd
Level 1, 177 Main Road
Moonah, TAS 7008
Email: Brent.Dalton@auroraenergy.com.au

Appendix A

Options Financial Analysis

APPENDIX 1A - MEDIUM LOAD GROWTH SCENARIO																	
	WACC																
Transend	7.93%																
Aurora	6.64%																
OPTION 1 - Augment Norwood Substation and establish a 110 kV connection between Mowbray and Norwood substations																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					43680000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						1000	1000	1000	1000	1000	9000	1000	1000	1000	1000	1000	
OH transmission line						0	0	0	0	0	0	0	0	0	0	0	
Cable						0	30000	0	30000	0	30000	0	30000	0	30000	0	
BusZone Protection						0	0	0	0	0	0	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	4900	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	4400	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$43,680,000	$1,000	$31,000	$1,000	$31,000	$1,000	$48,300	$1,000	$31,000	$1,000	$31,000	$1,000	
Transend NPC	**$32,274,392**																
Aurora Capital costs																	
Substation																	
Subtransmission																	
Feeder					14846000	9235000		3384000									
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3758	3758	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Undergound Line O&M						6188	6188	12083	12083	12083	12083	12083	12083	12083	12083	12083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$14,846,000	$9,244,946	$9,946	$3,400,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	
Aurora NPC	**$20,420,444**																
Total NPC	**$52,694,836**																
OPTION 2 -Establish a new 110/22 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					57060000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	9000	2000	2000	2000	2000	2000	
OH transmission line						0	0	0	0	0	0	0	0	0	0	0	
Cable						0	30000	0	30000	0	30000	0	30000	0	30000	0	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$57,060,000	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	$2,000	$32,000	$2,000	$32,000	$2,000	
Transend NPC	**$42,149,023**																
Aurora Capital costs																	
Substation																	
Subtransmission																	
Feeder					3887000	2485000											
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3622	4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	
Undergound Line O&M						1733	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$3,887,000	$2,490,354	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	
Aurora NPC	**$4,849,285**																
Total NPC	**$46,998,308**																
OPTION 3 -Establish a new 110/66 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					57060000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	9000	2000	2000	2000	2000	2000	
OH transmission line						0	0	0	0	0	0	0	0	0	0	0	
Cable						0	30000	0	30000	0	30000	0	30000	0	30000	0	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$57,060,000	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	$2,000	$32,000	$2,000	$32,000	$2,000	
Transend NPC	**$42,149,023**																
Aurora Capital costs																	
Substation				300000	9000000												
Subtransmission					1596000												
Feeder					2840000	1321000											
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						2392	3963	3963	3963	3963	3963	3963	3963	3963	3963	3963	
Undergound Line O&M						1260	1913	1913	1913	1913	1913	1913	1913	1913	1913	1913	
Substation O&M						13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	
Aurora Total Costs		$0	$0	$300,000	$13,436,000	$1,338,585	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	
Aurora NPC	**$11,709,948**																
Total NPC	**$53,858,971**																

APPENDIX 1A - MEDIUM LOAD GROWTH SCENARIO																	
	WACC																
Transend	7.93%																
Aurora	6.64%																
OPTION 4 - Augment Norwood Substation and augment existing transmission corridors in the Launceston area																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					44520000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						1000	1000	1000	1000	1000	9000	1000	1000	1000	1000	1000	
OH transmission line						68431	101431	68431	101431	68431	117931	68431	101431	68431	101431	68431	
Cable						0	6000	0	6000	0	6000	0	6000	0	6000	0	
BusZone Protection						0	0	0	0	0	0	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	4900	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	
Transend Total Costs		0	0	0	$44,520,000	$69,431	$108,431	$69,431	$108,431	$69,431	$146,631	$69,431	$108,431	$69,431	$108,431	$69,431	
Transend NPC	**$33,285,875**																
Aurora Capital costs																	
Substation																	
Subtransmission																	
Feeder					14846000	9235000		3384000									
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3758	3758	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Undergound Line O&M						6188	6188	12083	12083	12083	12083	12083	12083	12083	12083	12083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$14,846,000	$9,244,946	$9,946	$3,400,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	
Aurora NPC	**$20,420,444**																
Total NPC	**$53,706,319**																
OPTION 5 - Establish a new 110/22 kV substation in the east Launceston area, and augment existing transmission corridors in the Launceston area																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					62810000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	18000	2000	2000	2000	2000	2000	
OH transmission line						111978	165978	111978	165978	111978	192978	111978	165978	111978	165978	111978	
Cable						0	6000	0	6000	0	6000	0	6000	0	6000	0	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	13200	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$62,810,000	$113,978	$173,978	$113,978	$173,978	$113,978	$251,228	$113,978	$173,978	$113,978	$173,978	$113,978	
Transend NPC	**$47,067,945**																
Aurora Capital costs																	
Substation																	
Subtransmission																	
Feeder					3887000	2485000											
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3622	4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	
Undergound Line O&M						1733	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$3,887,000	$2,490,354	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	
Aurora NPC	**$4,849,285**																
Total NPC	**$51,917,230**																

APPENDIX 1B - HIGH LOAD GROWTH SCENARIO																	
	WACC			MIN NPV	$50,816,534												
Transend	7.93%																
Aurora	6.64%																
OPTION 1 - Augment Norwood Substation and establish a 110 kV connection between Mowbray and Norwood substations																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs				43680000													
Transend O&M costs																	
Transformer 110/22 kV 60 MVA					1000	1000	1000	1000	1000	9000	1000	1000	1000	1000	1000	9000	
OH transmission line					0	0	0	0	0	0	0	0	0	0	0	0	
Cable					0	30000	0	30000	0	30000	0	30000	0	30000	0	30000	
BusZone Protection					0	0	0	0	0	0	0	0	0	0	0	0	
Transformer Protection					0	0	0	0	0	4900	0	0	0	0	0	4900	
Transmission Line Protection					0	0	0	0	0	4400	0	0	0	0	0	4400	
Transend Total Costs		$0	$0	$43,680,000	$1,000	$31,000	$1,000	$31,000	$1,000	$48,300	$1,000	$31,000	$1,000	$31,000	$1,000	$48,300	
Transend NPC	**$34,849,126**																
Aurora Capital costs																	
Substation			0	0													
Subtransmission				0													
Feeder				24081000		3384000											
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M					4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Undergound Line O&M					10395	10395	12083	12083	12083	12083	12083	12083	12083	12083	12083	12083	
Substation O&M					0	0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$24,081,000	$14,495	$3,398,495	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	
Aurora NPC	**$22,416,290**																
Total NPC	**$57,265,417**																
OPTION 2 -Establish a new 110/22 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs				57060000												0	
Transend O&M costs																	
Transformer 110/22 kV 60 MVA					2000	2000	2000	2000	2000	9000	2000	2000	2000	2000	2000	9000	
OH transmission line					0	0	0	0	0	0	0	0	0	0	0	0	
Cable					0	30000	0	30000	0	30000	0	30000	0	30000	0	30000	
BusZone Protection					0	0	0	0	0	11250	0	0	0	0	0	11250	
Transformer Protection					0	0	0	0	0	9800	0	0	0	0	0	9800	
Transmission Line Protection					0	0	0	0	0	8800	0	0	0	0	0	8800	
Transend Total Costs		$0	$0	$57,060,000	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	
Transend NPC	**$45,513,358**																
Aurora Capital costs																	
Substation			0	0													
Subtransmission				0													
Feeder				6372000													
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M					4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	
Undergound Line O&M					3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	
Substation O&M					0	0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$6,372,000	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	
Aurora NPC	**$5,303,176**																
Total NPC	**$50,816,534**																
OPTION 3 -Establish a new 110/66 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs				57060000													
Transend O&M costs																	
Transformer 110/22 kV 60 MVA					2000	2000	2000	2000	2000	9000	2000	2000	2000	2000	2000	9000	
OH transmission line					0	0	0	0	0	0	0	0	0	0	0	0	
Cable					0	30000	0	30000	0	30000	0	30000	0	30000	0	30000	
BusZone Protection					0	0	0	0	0	11250	0	0	0	0	0	11250	
Transformer Protection					0	0	0	0	0	9800	0	0	0	0	0	9800	
Transmission Line Protection					0	0	0	0	0	8800	0	0	0	0	0	8800	
Transend Total Costs		$0	$0	$57,060,000	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	
Transend NPC	**$45,513,358**																
Aurora Capital costs																	
Substation			300000	9000000													
Subtransmission				1596000													
Feeder				4161000													
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M					3963	3963	3963	3963	3963	3963	3963	3963	3963	3963	3963	3963	
Undergound Line O&M					1913	1913	1913	1913	1913	1913	1913	1913	1913	1913	1913	1913	
Substation O&M					13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	
Aurora Total Costs		$0	$300,000	$14,757,000	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	
Aurora NPC	**$12,564,585**																
Total NPC	**$58,077,942**																

APPENDIX 1B - HIGH LOAD GROWTH SCENARIO																		
	WACC				MIN NPV	**$56,183,581**												
Transend	7.93%																	
Aurora	6.64%																	
OPTION 4 - Augment Norwood Substation and augment existing transmission corridors in the Launceston area																		
Year (ending 30 June)			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					44520000													
Transend O&M costs																		
Transformer 110/22 kV 60 MVA						1000	1000	1000	1000	1000	9000	1000	1000	1000	1000	1000	9000	
OH transmission line						68431	101431	68431	101431	68431	117931	68431	101431	68431	101431	68431	117931	
Cable						0	6000	0	6000	0	6000	0	6000	0	6000	0	6000	
BusZone Protection						0	0	0	0	0	0	0	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	4900	0	0	0	0	0	4900	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	8800	
Transend Total Costs			0	0	$44,520,000	$69,431	$108,431	$69,431	$108,431	$69,431	$146,631	$69,431	$108,431	$69,431	$108,431	$69,431	$146,631	
Transend NPC	**$35,972,121**																	
Aurora Capital costs																		
Substation																		
Subtransmission																		
Feeder					24081000		3384000											
Pole replacement																		
Aurora O&M costs																		
Overhead Line O&M						4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Undergound Line O&M						10395	10395	12083	12083	12083	12083	12083	12083	12083	12083	12083	12083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs			$0	$0	$24,081,000	$14,495	$3,398,495	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	
Aurora NPC	**$22,416,290**																	
Total NPC	**$58,388,411**																	
OPTION 5 - Establish a new 110/22 kV substation in the east Launceston area, and augment existing transmission corridors in the Launceston area																		
Year (ending 30 June)			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					62810000												0	
Transend O&M costs																		
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	18000	2000	2000	2000	2000	2000	18000	
OH transmission line						111978	165978	111978	165978	111978	192978	111978	165978	111978	165978	111978	192978	
Cable						0	6000	0	6000	0	6000	0	6000	0	6000	0	6000	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	11250	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	9800	
Transmission Line Protection						0	0	0	0	0	13200	0	0	0	0	0	13200	
Transend Total Costs			$0	$0	$62,810,000	$113,978	$173,978	$113,978	$173,978	$113,978	$251,228	$113,978	$173,978	$113,978	$173,978	$113,978	$251,228	
Transend NPC	**$50,880,405**																	
Aurora Capital costs																		
Substation																		
Subtransmission																		
Feeder					6372000													
Pole replacement																		
Aurora O&M costs																		
Overhead Line O&M						4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	4237	
Undergound Line O&M						3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs			$0	$0	$6,372,000	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	
Aurora NPC	**$5,303,176**																	
Total NPC	**$56,183,581**																	

APPENDIX 1C - LOW LOAD GROWTH SCENARIO																	
	WACC																
Transend	7.93%																
Aurora	6.64%																
OPTION 1 - Augment Norwood Substation and establish a 110 kV connection between Mowbray and Norwood substations																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					43680000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						1000	1000	1000	1000	1000	9000	1000	1000	1000	1000	1000	
OH transmission line						0	0	0	0	0	0	0	0	0	0	0	
Cable						0	30000	0	30000	0	30000	0	30000	0	30000	0	
BusZone Protection						0	0	0	0	0	0	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	4900	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	4400	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$43,680,000	$1,000	$31,000	$1,000	$31,000	$1,000	$48,300	$1,000	$31,000	$1,000	$31,000	$1,000	
Transend NPC	**$32,274,392**																
Aurora Capital costs																	
Substation				0	0												
Subtransmission					0												
Feeder					14846000		9235000		3384000								
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3758	3758	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Undergound Line O&M						6188	6188	10395	10395	12083	12083	12083	12083	12083	12083	12083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$14,846,000	$9,946	$9,244,946	$14,495	$3,398,495	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	
Aurora NPC	**$19,867,059**																
Total NPC	**$52,141,451**																
OPTION 2 -Establish a new 110/22 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					57060000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	9000	2000	2000	2000	2000	2000	
OH transmission line						0	0	0	0	0	0	0	0	0	0	0	
Cable						0	30000	0	30000	0	30000	0	30000	0	30000	0	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$57,060,000	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	$2,000	$32,000	$2,000	$32,000	$2,000	
Transend NPC	**$42,149,023**																
Aurora Capital costs																	
Substation				0	0												
Subtransmission					0												
Feeder					3887000	1595000	890000										
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3963	3963	4237	4237	4237	4237	4237	4237	4237	4237	4237	
Undergound Line O&M						2543	2543	3083	3083	3083	3083	3083	3083	3083	3083	3083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$3,887,000	$1,601,506	$896,506	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	
Aurora NPC	**$4,809,384**																
Total NPC	**$46,958,408**																
OPTION 3 -Establish a new 110/66 kV connection point in the east Launceston area and establish a 110 kV connection between Mowbray and Norwood substations and the new connection point																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					57060000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	9000	2000	2000	2000	2000	2000	
OH transmission line						0	0	0	0	0	0	0	0	0	0	0	
Cable						0	30000	0	30000	0	30000	0	30000	0	30000	0	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$57,060,000	$2,000	$32,000	$2,000	$32,000	$2,000	$68,850	$2,000	$32,000	$2,000	$32,000	$2,000	
Transend NPC	**$42,149,023**																
Aurora Capital costs																	
Substation				300000	9000000												
Subtransmission					1596000												
Feeder					2840000		1321000										
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						2392	2392	3963	3963	3963	3963	3963	3963	3963	3963	3963	
Undergound Line O&M						1260	1260	1913	1913	1913	1913	1913	1913	1913	1913	1913	
Substation O&M						13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	13933	
Aurora Total Costs		$0	$0	$300,000	$13,436,000	$17,585	$1,338,585	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	$19,809	
Aurora NPC	**$11,648,794**																
Total NPC	**$53,797,817**																

APPENDIX 1C - LOW LOAD GROWTH SCENARIO																	
	WACC			MIN NPV	**$51,877,330**												
	7.93%																
Aurora	6.64%																
OPTION 4 - Augment Norwood Substation and augment existing transmission corridors in the Launceston area																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					44520000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						1000	1000	1000	1000	1000	9000	1000	1000	1000	1000	1000	
OH transmission line						68431	101431	68431	101431	68431	117931	68431	101431	68431	101431	68431	
Cable						0	6000	0	6000	0	6000	0	6000	0	6000	0	
BusZone Protection						0	0	0	0	0	0	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	4900	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	8800	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$44,520,000	$69,431	$108,431	$69,431	$108,431	$69,431	$146,631	$69,431	$108,431	$69,431	$108,431	$69,431	
Transend NPC	**$33,285,875**																
Aurora Capital costs																	
Substation																	
Subtransmission																	
Feeder					14846000		9235000		3384000								
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3758	3758	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Undergound Line O&M						6188	6188	10395	10395	12083	12083	12083	12083	12083	12083	12083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$14,846,000	$9,946	$9,244,946	$14,495	$3,398,495	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	$16,183	
Aurora NPC	**$19,867,059**																
Total NPC	**$53,152,934**																
OPTION 5 - Establish a new 110/22 kV substation in the east Launceston area, and augment existing transmission corridors in the Launceston area																	
Year (ending 30 June)		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Transend Capital costs					62810000												
Transend O&M costs																	
Transformer 110/22 kV 60 MVA						2000	2000	2000	2000	2000	18000	2000	2000	2000	2000	2000	
OH transmission line						111978	165978	111978	165978	111978	192978	111978	165978	111978	165978	111978	
Cable						0	6000	0	6000	0	6000	0	6000	0	6000	0	
BusZone Protection						0	0	0	0	0	11250	0	0	0	0	0	
Transformer Protection						0	0	0	0	0	9800	0	0	0	0	0	
Transmission Line Protection						0	0	0	0	0	13200	0	0	0	0	0	
Transend Total Costs		$0	$0	$0	$62,810,000	$113,978	$173,978	$113,978	$173,978	$113,978	$251,228	$113,978	$173,978	$113,978	$173,978	$113,978	
Transend NPC	**$47,067,945**																
Aurora Capital costs																	
Substation																	
Subtransmission																	
Feeder					3887000	1595000	890000										
Pole replacement																	
Aurora O&M costs																	
Overhead Line O&M						3963	3963	4237	4237	4237	4237	4237	4237	4237	4237	4237	
Undergound Line O&M						2543	2543	3083	3083	3083	3083	3083	3083	3083	3083	3083	
Substation O&M						0	0	0	0	0	0	0	0	0	0	0	
Aurora Total Costs		$0	$0	$0	$3,887,000	$1,601,506	$896,506	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	$7,319	
Aurora NPC	**$4,809,384**																
Total NPC	**$51,877,330**																

Appendix B

Compliance with Clauses 5.6.2 and 5.6.6 of the NER

This section sets out a compliance checklist which demonstrates the compliance of this application notice with the requirements of clauses 5.6.2 and 5.6.6 of the NER version 29.

Note: The Australian Energy Market Operator (AEMO) is referred to as the National Electricity Market Management Company (NEMMCO) in Version 29 of the NER.

NER clause	Summary of requirements	Comments/evidence of compliance
5.6.2 (a1)	The terms Network Service Provider, Transmission Network Service Provider and Distribution Network Service Provider when used in this Clause 5.6.2 are not intended to refer to, and are not to be read or construed as referring to, any Network Service Provider in its capacity as a Market Network Service Provider.	
5.6.2 (a)	Each Transmission Network Service Provider and Distribution Network Service Provider must analyse the expected future operation of its transmission networks or distribution networks over an appropriate planning period, taking into account the relevant forecast loads, any future generation, market network service, demand side and transmission developments and any other relevant data.	Refer to Section 2 of this application notice Transend has provided its analysis in the published annual planning reports
5.6.2 (b)	Each Transmission Network Service Provider must conduct an annual planning review with each Distribution Network Service Provider connected to its transmission network within each region. The annual planning review must incorporate the forecast loads submitted by the Distribution Network Service Provider in accordance with Clause 5.6.1 or as modified in accordance with Clause 5.6.1(d) and must include a review of the adequacy of existing connection points and relevant parts of the transmission system and planning proposals for future connection points.	Refer to Section 2 of this application notice Transend has documented its planning review in the published annual planning reports.
5.6.2 (c)	Where the necessity for augmentation or a non-network alternative is identified by the annual planning review conducted under Clause 5.6.2(b), the relevant Network Service Providers must undertake joint planning in order to determine plans that can be considered by relevant Registered Participants, NEMMCO and interested parties.	Refer to Section 1.2.1 of this final report Transend and Aurora have undertaken a joint planning process to develop the options and to identify the least cost solution as presented in the final report.

5.6.2 (d)	The minimum planning period for the purposes of the annual planning review is 5 years for distribution networks and 10 years for transmission networks.	Refer to Transend's 2009 Annual Planning Report and Aurora's Distribution System Planning Report 2009. Transend's and Aurora's planning horizons comply with this requirement.
5.6.2 (e)	Each Network Service Provider must extrapolate the forecasts provided to it by Registered Participants for the purpose of planning and, where this analysis indicates that any relevant technical limits of the transmission or distribution systems will be exceeded, either in normal conditions or following the contingencies specified in Schedule 5.1, the Network Service Provider must notify any affected Registered Participants and NEMMCO of these constraints and advise those Registered Participants and NEMMCO of the expected time required to allow the appropriate corrective network augmentation or non-network alternatives, or modifications to connection facilities to be undertaken.	Refer to Transend's 2009 Annual Planning Report and Aurora's Distribution System Planning Report 2009 and this final report for identified network constraints. This final report forms the final stage in the required consultation process.
5.6.2 (f)	Within the time for corrective action notified in Clause 5.6.2(e) the relevant Distribution Network Service Provider must consult with affected Registered Participants, NEMMCO and interested parties on the possible options, including but not limited to demand side options, generation options and market network service options to address the projected constraints of the relevant distribution system except that a Distribution Network Service Provider does not need to consult on a network option which would be a new small distribution network asset.	Refer to Section 3 of this final report This final report forms the final stage in the DNSP consultation process required by this clause.
5.6.2 (g)	Each Distribution Network Service Provider must carry out an economic cost effectiveness analysis of possible options to identify options that satisfy the regulatory test, while meeting the technical requirements of schedule 5.1, and where the Network Service Provider is required by Clause 5.6.2(f) to consult on the option this analysis and allocation must form part of the consultation on that option.	Refer to Section 3.5 of this final report The options analysis is presented in Section 3.

5.6.2 (h)	Following conclusion of the process outlined in clauses 5.6.2(f) and (g), the Distribution Network Service Provider must prepare a report that is to be made available to affected Registered Participants, NEMMCO and interested parties which: (1) includes assessment of all identified options; (2) includes details of the Distribution Network Service Provider's preferred proposal and details of: (A) its economic cost effectiveness analysis in accordance with Clause 5.6.2(g); and (B) its consultations conducted for the purposes of Clause 5.6.2(g); (3) summarises the submissions from the consultations; and 4) recommends the action to be taken.	This final report forms the final stage in the DNSP consultation process. Aurora and Transend have prepared a final report (this document) in accordance with Transend's obligations under Clause 5.6.6 (h). This document addresses Aurora's obligations under Clause 5.6.2 (h).
5.6.2 (i) to (j)	These clauses contain provisions relating to the processes applying where a Registered Participant disputes certain matters in relation to the final report	Refer to Section 5 of this final report.
5.6.2 (k)	Following: (1) completion of the 40 business day period referred to in Clause 5.6.2(i) or on resolution of any dispute in accordance with rule 8.2, in relation to proposals to which Clause 5.6.2(j) applies; or (2) completion of the report referred to in Clause 5.6.2(h), in relation to any other network option recommended by the report, the relevant Distribution Network Service Provider must arrange for the network options (if any) recommended by its report made in accordance with Clause 5.6.2(h) to be available for service by the agreed time.	Clause 5.6.2(k)(1) is not applicable to the preparation of this final report (only applicable if the required DNSP capitalised expenditure is in excess of $10m).
5.6.2 (k)	The Distribution Network Service Provider must include the cost of the relevant assets of the network options referred to in Clause 5.6.2(k) in the calculation of distribution service prices determined in accordance with Chapter 6.	These provisions are not applicable to the preparation of this final report.
5.6.2 (l)	If a use of system service or the provision of a service at a connection point is directly affected by a transmission network or distribution network augmentation, appropriate amendments to relevant connection agreements must be negotiated in good faith between the parties to them.	These provisions are not applicable to the preparation of this final report.

5.6.2 (m)	Where the relevant Transmission Network Service Provider or Distribution Network Service Provider decides to implement a generation option as an alternative to network augmentation, the Network Service Provider must: (1) register the generating unit with NEMMCO and specify that the generating unit may be periodically used to provide a network support function and will not be eligible to set spot prices when constrained on in accordance with Clause 3.9.7; and (2) include the cost of this network support service in the calculation of transmission service and distribution service prices determined in accordance with Chapter 6 or Chapter 6A, as the case may be.	These provisions are not applicable to the preparation of this final report.
5.6.2 (n)	NEMMCO must provide to the Inter-Regional Planning Committee, and to other Network Service Providers on request, a copy of any report provided to NEMMCO by a Network Service Provider under Clause 5.2.3(d)(12). If a Registered Participant reasonably considers that it is or may be adversely affected by a development or change in another region, the Registered Participant may request the preparation of a report by the relevant Network Service Provider as to the technical impacts of the development or change. If so requested, the Network Service Provider must prepare such a report and provide a copy of it to NEMMCO, the Registered Participant requesting the report and, on request, any other Registered Participant.	These provisions are not applicable to the preparation of this final report.
5.6.6 (a)	In addition to the procedures to establish a connection to a network in Clause 5.3 [establishing and modifying a connection], applications to establish a new large transmission network asset must comply with the access arrangements and procedures set out in this Clause 5.6.6.	Transend proposes to comply with this provision by adhering to the processes detailed in Clause 5.3 regarding establishing connection points, and meeting the requirements set out in the whole of Clause 5.6.6. See below for further details.
5.6.6 (b)	A person who proposes to establish a new large transmission network asset (the applicant) must consult all Registered Participants, NEMMCO and interested parties about the proposed new large transmission network asset in accordance with this Clause 5.6.6.	Transend proposes to comply with this provision by adhering to the processes, and meeting the requirements set out in the whole of Clause 5.6.6. See below for further details.
5.6.6 (c)	The applicant must make available to all Registered Participants and NEMMCO a notice (the application notice) which sets out, in relation to a proposed new large transmission network asset: (1) a detailed description of: (i) the proposed asset;	Aurora and Transend have complied with this provision by publishing an application notice on AEMO's website, and on their respective websites.

(ii) the reasons for proposing to establish the asset (including, where applicable, the actual or potential constraint or inability to meet the network performance requirements set out in schedule 5.1 or relevant legislation or regulations of a participating jurisdiction, including load forecasts and all assumptions used); and

(iii) all other reasonable network and non-network alternatives to address the identified constraint or inability to meet the network performance requirements identified in Clause 5.6.6(c)(1)(ii). These alternatives include, but are not limited to, interconnectors, generation options, demand side options, market network service options and options involving other transmission and distribution networks

(2) all relevant technical details concerning the proposed asset;

(3) the construction timetable and commissioning date for the asset;

(4) an analysis of the ranking of the proposed asset and all reasonable alternatives as referred to in Clause 5.6.6(c)(1)(iii). This ranking must be undertaken by the applicant in accordance with the principles contained in the regulatory test;

(5) an augmentation technical report prepared by the Inter-regional Planning Committee in accordance with Clause 5.6.3(j) but only if:

(i) the asset is reasonably likely to have a material inter-network impact; and

(ii) the applicant has not received consent to proceed with such construction from all Transmission Network Service Providers whose transmission networks are materially affected by the asset; and

(6) a detailed analysis of why the applicant considers that the asset satisfies the regulatory test and, where the applicant considers that the asset satisfies the regulatory test as a reliability augmentation, analysis of why the applicant considers that the asset is a reliability augmentation.

5.6.6 (d)	In assessing whether a new large transmission network asset: (1) is reasonably likely to have a material inter-network impact for the purposes of Clause 5.6.6(c)(5); or (2) is a reliability augmentation for the purposes of Clause 5.6.6(c)(6), an applicant must have regard to the objective set of criteria published by the Inter-regional Planning Committee in accordance with Clause 5.6.3(i) or Clause 5.6.3(l) (whichever is relevant), but only if any such criteria have been published	The recommendation in this report has no material inter-network impact.
5.6.6 (e)	The applicant must provide a summary of the application notice to NEMMCO. Within 3 business days of receipt of the summary, NEMMCO must publish the summary on its website. The applicant must, upon request by an interested party, provide a copy of the application notice to that person within 3 business days of the request.	A separate copy of the executive summary of this application notice was been provided to AEMO for the purpose of this provision.
5.6.6 (f)	Within 30 business days of publication of the summary of the application notice on NEMMCO's website, interested parties may make written submissions to the applicant on any matter in the application notice, and may request a meeting.	No submissions were received.
5.6.6 (g)	The applicant must consider all submissions received in accordance with the requirements of Clause 5.6.6(f) within a further 30 business days. The applicant must use its best endeavours to hold a meeting with interested parties who have requested such meeting, within a further 21 business days if: (1) after having considered all submissions received in accordance with the requirements of Clause 5.6.6(f), the applicant considers that it is necessary or desirable to hold a meetings; or (2) a meeting is requested by 2 or more interested parties.	No submissions were received.
5.6.6 (h)	The applicant must prepare a final report (final report) to be made available to all Registered Participants, NEMMCO and interested parties who responded to the application notice. The final report must set out the matters detailed in Clause 5.6.6(c) and summarise the submissions received from interested parties and the applicant's response to each such submission.	Aurora and Transend have complied with this provision by preparation of this document.
5.6.6 (i)	The applicant must provide to NEMMCO a summary of the final report, and NEMMCO must publish the summary on its website within 3 business days of its receipt.	A separate copy of the executive summary of this application notice has been provided to AEMO for the purpose of this provision.

5.6.6 (j) to (s)	These clauses contain provisions relating to the processes applying where: • an interested party disputes certain matters in relation to the final report; and • the AER's determination of whether the proposed augmentation satisfies the Regulatory Test.	Refer to Section 5 of this final report.