INDEPENDENT PLANNING REVIEW

NEW SOUTH WALES AND TASMANIAN TRANSMISSION NETWORKS

Published: **August 2014**

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

IMPORTANT NOTICE

Purpose

The purpose of this publication is to provide information in relation to future development needs for the New South Wales and Tasmanian transmission networks.

AEMO publishes this report in its capacity as National Transmission Planner exercising the functions set out in section 49(2) of the National Electricity Law. This publication is based on information available to AEMO as at 25 July 2014.

Disclaimer

AEMO has made every effort to ensure the quality of the information in this publication but cannot guarantee that information, forecasts and assumptions are accurate, complete or appropriate for your circumstances. This publication does not include all of the information that an investor, participant or potential participant in the national electricity market might require, and does not amount to a recommendation of any investment.

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Acknowledgement

AEMO acknowledges the co-operation and contribution of TransGrid and TasNetworks in providing data and information used in this publication.

EXECUTIVE SUMMARY

The Australian Energy Market Operator (AEMO) has prepared these planning reports to provide an independent view of the transmission network investment needs in New South Wales (NSW) and Tasmania in response to growing pressure on network prices.

AEMO conducted this review in its capacity as the national transmission planner. The planning reports assess the extent to which proposed investments are required to address transmission network needs, and consider whether alternative options could better support the efficient operation of and investment in electricity networks in the long term interests of consumers.

AEMO will submit these planning reports to the Australian Energy Regulator (AER) to consider as part of its regulatory determination process for NSW and Tasmanian transmission network investment.

AEMO's assessment of the projects proposed by the New South Wales and Tasmanian transmission network service providers TransGrid and TasNetworks determines the need, and suggests alternative options in some instances. AEMO's review does not support proposed projects where the analysis does not confirm their need.

An important part of this review was the development of an assessment methodology to apply consistently across both regions. AEMO liaised with TransGrid and TasNetworks, as well as New South Wales distribution businesses and the AER throughout the review.

Results

AEMO's assessment of the investment requirements for the transmission networks in New South Wales and Tasmania is summarised in the table below.

TNSP	TNSP identified investment driver	Projects assessed TNSP revenue proposal 31 May 2014	AEMO assessment of project need July 2014
TransGrid	Capacity	2 planned projects 2 contingent projects	Network need for both planned projects. Network need for both contingent projects subject to trigger events in the next regulatory period.
	Asset condition	18 planned projects	Network need for all projects. Alternatives to like-for-like replacement identified for 5 projects.
TasNetworks	Capacity	3 planned projects	Network need for one planned project. Network need for 2 planned projects subject to trigger events in the next regulatory period.
	Asset condition	3 planned projects	Network need for all projects. Alternatives to like-for-like replacement identified for one project.

It is important to note that AEMO has not assessed the condition of the TNSPs' assets or analysed the cost of proposed projects or alternative network development options.

In addition to this assessment of the investment requirements for transmission networks, AEMO has produced independent forecasts of maximum demand at the transmission connection point level for both New South Wales and Tasmania.

AEMO used these connection point forecasts in this review, and will submit them to the AER as an additional reference in its assessment of TransGrid's and TasNetworks' revenue proposals.

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1 – INTRODUCTION

By providing an independent assessment of emerging transmission network investment requirements in New South Wales and Tasmania over the next seven years, this review supports the efficient, reliable, and secure development of electricity supply infrastructure in the best interests of customers. Providing this support is part of AEMO's charter as national transmission planner (NTP).

On 2 June 2014 the TNSP for New South Wales, TransGrid, and for Tasmania, TasNetworks, submitted their revenue proposals for the next regulatory control period (2014-15 to 2018-19) to the AER for approval. The AER must provide its final revenue determination by 30 April 2015.

The timing of this review allows the AER sufficient opportunity to consider this independent assessment of emerging transmission network investment needs as part of this revenue determination process.

More broadly, this review provides consumers and other National Electricity Market (NEM) stakeholders with an independent, specialist technical appraisal of transmission network investment requirements. Given that customers ultimately bear the cost of transmission network upgrades, it provides a reference to assist them to engage directly with TNSPs as the planning and approval processes for future upgrades commence.

AEMO engaged with both the AER and TNSPs throughout this review process, to develop and apply an impartial, transparent, technically consistent assessment methodology, taking into account all relevant factors.

1.1 AEMO's NTP role

AEMO undertook this review as part of its national transmission planner (NTP) responsibilities under the National Electricity Law (the Law). As part of its NTP function, AEMO must:

- Keep the national transmission grid under review and provide advice on grid development or projects that could affect the grid.[1]
- Provide a national strategic perspective for transmission planning and coordination.[2]
- Have regard to the National Electricity Objective. [3]

The rules governing the AER's capacity to determine network revenues were amended in November 2012.[4] Chapter 6A of the National Electricity Rules (Rules) envisages that AEMO may make submissions during the revenue determination process.

In forming a view on whether to accept a TNSP's revenue proposal, the AER considers factors including "… *any submissions made by AEMO, in accordance with the Rules, on the forecast of the TNSP's required capital expenditure*."[5]

[1] National Electricity Law, s49(2)(c).
[2] National Electricity Law, s49(2)(d).
[3] National Electricity Law, s49(3). The National Electricity Objective is set out in s7 of the National Electricity Law. It is "to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to (a) price, quality, safety, reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system".
[4] AEMC. *Final Rule determination - National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*. 29 Nov 2012.
[5] National Electricity Rules 6A.6.7(e)(11).

1.2 Supporting efficient investment

This report is one part of an integrated package of measures AEMO undertakes to support efficient transmission investment in the NEM. Other measures include:

- The National Transmission Network Development Plan (NTNDP). AEMO develops long-term planning strategies for both current and potential national transmission flow paths[6] and publishes the results in the annual NTNDP.
- A review of projects (published February 2014) proposed by TNSPs under the AER's new network capability incentive scheme[7] designed to improve usage of existing network assets through low-cost projects. TNSPs must consult with AEMO prior to submitting their Network Capability Incentive Parameter Action Plans (NCIPAPs) to the AER.[8] AEMO engaged with TransGrid and TasNetworks as they developed their NCIPAPs in 2013 and had access to transmission network capability data through this engagement.
- Demand forecasting. AEMO prepares independent, consistently derived forecasts of electricity usage patterns for each NEM region and publishes the results in the National Electricity Forecasting Report.[9] In accordance with the 2012 Energy Market reform program endorsed by the Council of Australian Governments (COAG), AEMO has also prepared a set of forecasts at transmission connection point level[10] for the AER's consideration in the New South Wales and Tasmanian transmission network revenue determination processes. AEMO used these connection point forecasts in undertaking this review.
- A national review of the economic value different users place on a reliable supply of electricity.[11] This assists network planners, asset owners, and the AER to align future network investment with how much customers are willing to pay for a secure and reliable electricity supply.

AEMO's specialist transmission planning capability enables it to provide an informed, independent view of transmission network investment requirements.

1.3 TransGrid's and TasNetworks' revenue proposals

To accommodate the introduction of new network regulation rules in November 2012, TransGrid and TasNetworks provided their revenue proposals for the next regulatory control period (2014-15 to 2018-19) in two stages:

- **Transitional proposal (2014-15):** TransGrid and TasNetworks each submitted proposals for 2014-15 to the AER in January 2014.[12] On 28 March 2014, the AER released a "placeholder" determination for each TNSP's maximum allowable revenue for this transitional year.[13]
- **Substantive proposal (2014-15 to 2018-19):** TransGrid and TasNetworks submitted their substantive revenue proposals for the transitional year and the remaining four years of the next regulatory control period on 2 June 2014.[14] The AER is currently undertaking a full determination process (under the new network regulation rules) to calculate revenue allowances for the entire regulatory control period[15] and will publish its final decision by May 2015.

AEMO engaged with both TNSPs as they developed both the transitional and substantive proposals.

[6] National transmission flow paths are defined in the Rules as any portion of transmission networks used to transport significant amounts of electricity between generation centres and load centres.
[7] The Network Capability Incentive Parameter Action Plan (NCIPAP) is designed to support improved usage of existing network assets through low-cost projects. AEMO has engaged with TransGrid, TasNetworks, AusNet Services (previously known as SP Ausnet) and ElectraNet during the development of their NCIPAP programs over last year.
[8] AER. *Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme.* Version 4. s 5.2, pg 12.Dec 2012.
[9] AEMO. *Forecasting* page: Available at: http://www.aemo.com.au/Electricity/Planning/Forecasting.
[10] Council of Australian Governments. *COAG Energy Market Reform - Implementation Plan.* November 2012, Issue 12.2. Available at: http://www.scer.gov.au/workstreams/energy-market-reform/.
[11] AEMO. *Value of Customer Reliability review* page: Available at: http://www.aemo.com.au/Electricity/Planning/Value-of-Customer-Reliability-review.
[12] TransGrid. *Transitional revenue proposal 2014/15*, 31 January 2014; TasNetworks. *Transitional revenue proposal – Regulatory control period 1 July 2014 – 30 June 2015*, 23 January 2014.
[13] AER. *Transitional transmission determinations - TransGrid and Transend 2014-15*, 28 March 2014.
[14] TransGrid. *Revenue proposal 2014/15 – 2018/19*, 31 May 2014; TasNetworks. *Tasmanian Transmission Revenue Proposal – Regulatory control period 1 July 2014 – 30 June 2019*, 31 May 2014.
[15] The AER will true up any difference between the placeholder revenue allowance for the transitional year and the revenue requirement for the transitional year that is established in the full determination process.

Both TransGrid[16] and TasNetworks[17] identified falling energy consumption and slowing peak demand growth as the reasons for lower capacity-driven network augmentation expenditure in the next regulatory period. This reflects the decline in electricity consumption across the NEM over the past five years, which has resulted in reduced requirements for new generation and transmission infrastructure.

As emphasised in the 2013 NTNDP, efficient utilisation of existing transmission networks is a priority when facing such a decline in demand, and this includes decisions about replacing network assets approaching the end of their useful lives. While network augmentations are subject to a detailed assessment under the Regulatory Investment Test for Transmission (RIT-T), TNSPs are not required to undertake such a transparent process when deciding whether to incur asset replacement expenditure.

TasNetworks' proposed asset-replacement expenditure has reduced, owing to a period of high asset renewal and replacement expenditure in the current and previous regulatory control periods.[18]

TransGrid's proposed asset-replacement expenditure is higher than in the current regulatory control period. TransGrid states this is necessary to maintain the reliability and safety of its transmission network due to many assets built during the 1950's and 1960's reaching the end of their serviceable lives.[19]

The two figures below, sourced from TransGrid and TasNetworks, show the New South Wales and Tasmanian transmission networks.[20]

[16] TransGrid has proposed augmentation expenditure of $77m for the next regulatory control period, compared to $1,061m to be spent in the current period. TransGrid. *Revenue proposal 2014/15 – 2018/19* p. 4.
[17] TasNetworks has proposed augmentation expenditure of $56m for the next regulatory control period, compared to $260m to be spent in the current regulatory control period. TasNetworks. *Tasmanian Transmission Revenue Proposal* p. 78.
[18] TasNetworks has proposed replacement expenditure of $207m for the next regulatory control period, compared to $285m to be spent in the current regulatory control period. TasNetworks. *Tasmanian Transmission Revenue Proposal* p. 55.
[19] TransGrid has proposed replacement expenditure of $1,174m for the next regulatory control period, compared to $703m to be spent in the current period. TransGrid. *Revenue proposal 2014/15 – 2018/19* p. 37.
[20] TasNetworks. *Tasmanian Transmission Revenue Proposal* p. 21; TransGrid. *Transmission Annual Planning Report 2014*, 30 June 2014, p.12-13

Figure 1: New South Wales transmission network

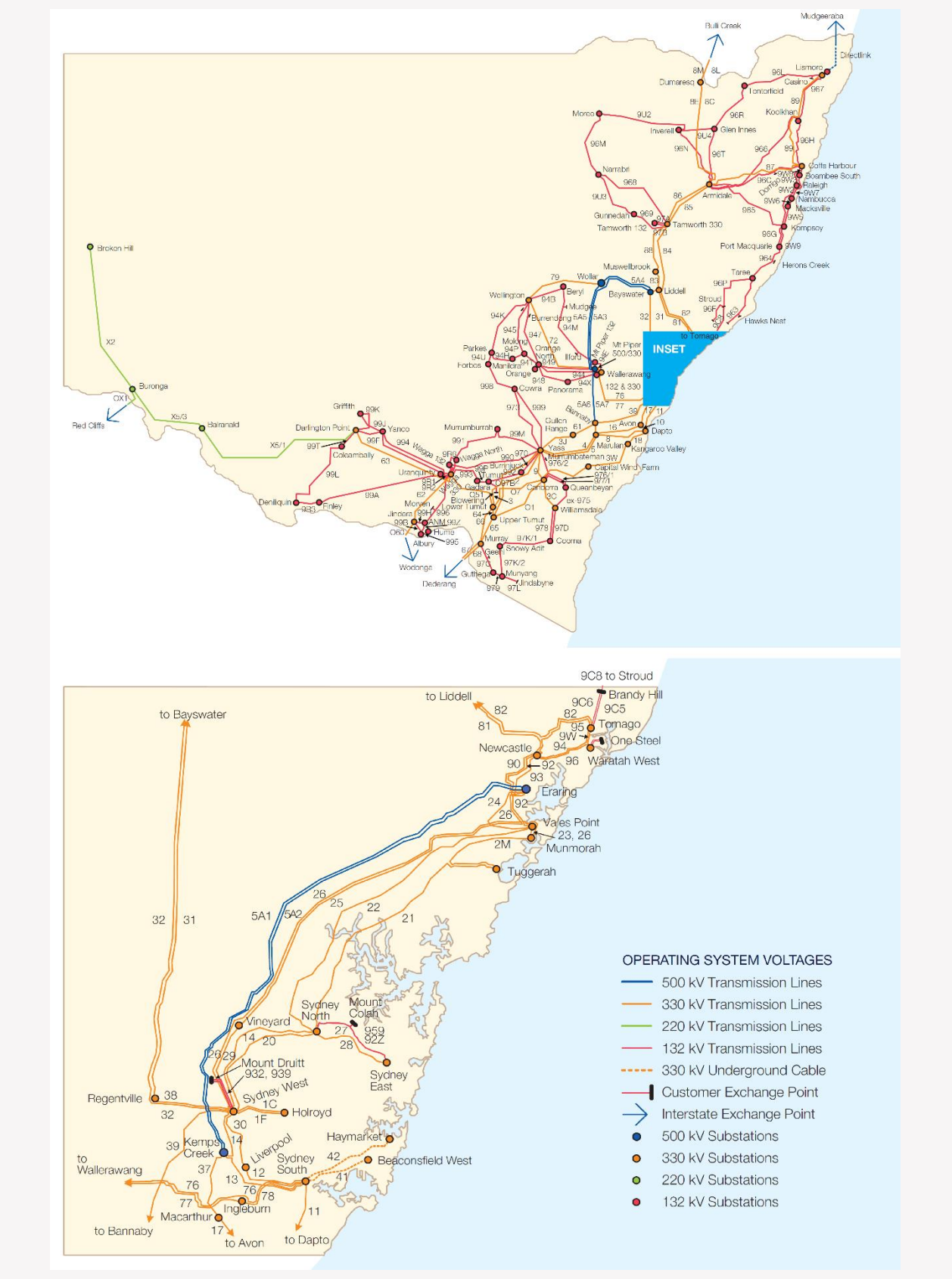
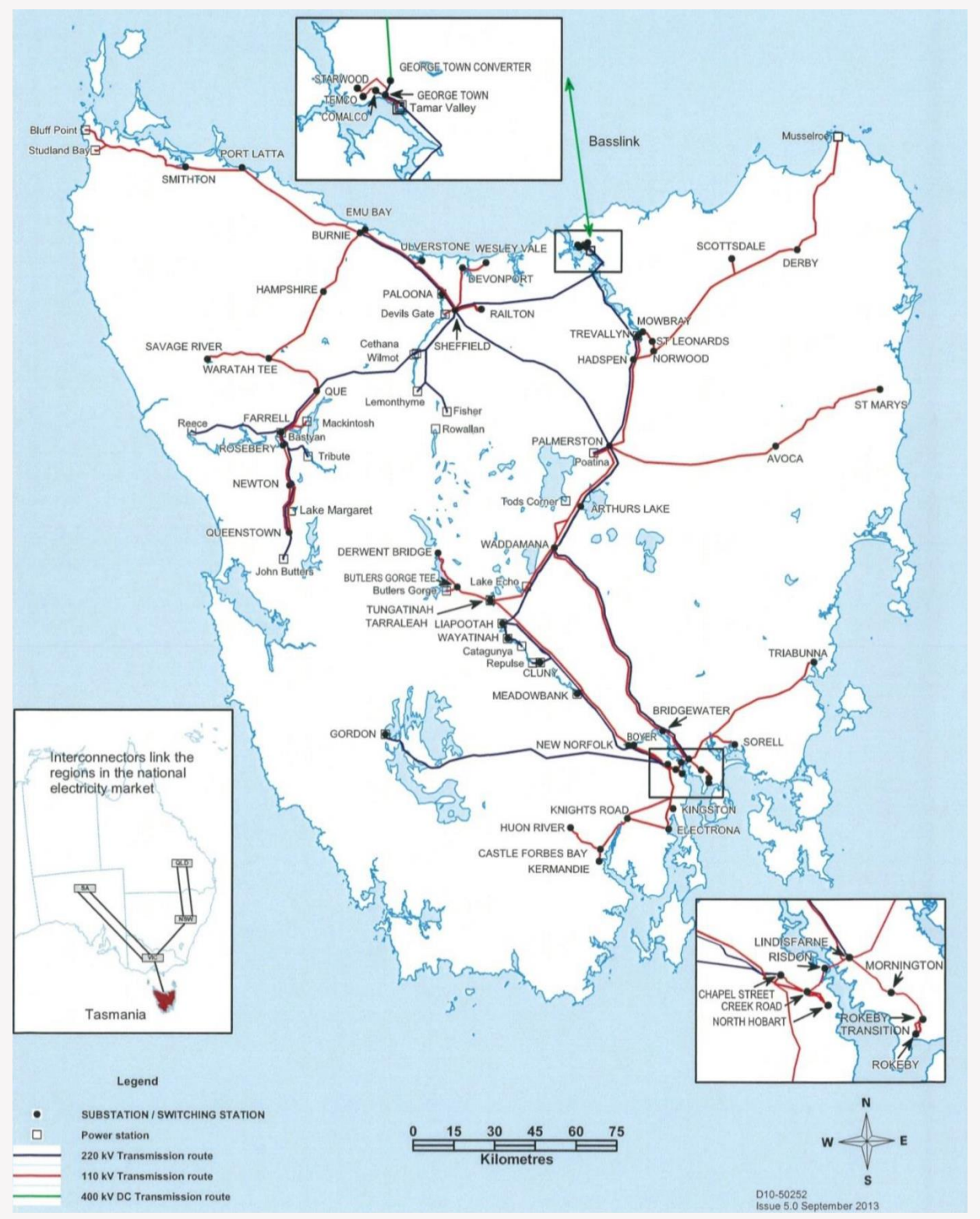


Figure 2: Tasmanian transmission network



1.4 Report structure

This report is structured as follows:

- **Chapter 1**: Introduction
- **Chapter 2**: Provides an overview of the review process.
- **Chapter 3**: Sets out AEMO's assessment methodology and findings for TransGrid and TasNetworks' proposed capacity-driven network augmentation projects.
- **Chapter 4**: Sets out AEMO's assessment methodology and findings for TransGrid and TasNetworks' proposed condition-driven asset replacement projects.
- **Chapter 5**: Provides a list of potential improvements AEMO has identified for further investigation.
- **Supplementary information**: Project assessment reports for TransGrid and Transend.

2 – REVIEW PROCESS

This chapter sets out the terms of this engagement developed through consultation with the AER, TransGrid, TasNetworks, and other stakeholders. It covers the guiding principles, scope, and assessment methodology for this review.

2.1 Guiding principles

AEMO has undertaken this review as part of its statutory national transmission planner function, which specifically includes overseeing future development of transmission networks in the NEM. AEMO is required to provide advice on transmission grid development and projects that could affect the grid,[21] and foster a national strategic perspective for transmission planning and coordination.[22]

In undertaking this review, AEMO has sought to be:

1) **Impartial**. The review is fact-based. AEMO is an independent entity with specialised technical capability and has no revenue at risk in transmission network revenue determination processes.
2) **Transparent**. AEMO provides access to its planning assumptions and assessment methodology so parties can replicate this review.
3) **Consistent**. The process will remain the same for subsequent TNSP reviews in other NEM jurisdictions. For all reviews, AEMO will apply its own connection point forecasts and take into account relevant jurisdictional planning criteria.
4) **Consultative**. AEMO developed the assessment process for this review in consultation with the AER, TNSPs, state governments, and other stakeholders.

2.2 Scope and assessment methodology

AEMO established the scope for this review in consultation with the AER, TransGrid and TasNetworks.

The review is [part of] a submission to the AER in its consideration of the TransGrid and TasNetworks revenue proposals.

AEMO and the AER achieved consensus on the guiding principles and assessment methodology for this review; these are outlined in Chapter 2 – .

In April 2014, AEMO briefed the New South Wales and Tasmanian governments on the purpose and nature of this review process.

AEMO engaged with TransGrid and TasNetworks since they commenced developing their NCIPAP proposals in 2013 and throughout the development of both their transitional and substantive regulatory proposals.

AEMO's assessment of the projects identified by TransGrid and TasNetworks to address localised transmission network needs is restricted to the two main classes of network capital expenditure:

- Capacity-driven investment, which increases (or augments) network capacity to meet forecast growth in electricity consumption or delivering positive net market benefits.
- Condition-driven investment, which refurbishes or replaces major transmission infrastructure to address the poor condition of assets currently in service.

[21] National Electricity Law s49(2)(c).
[22] National Electricity Law s49(2)(d).

The objective of this review is to support the efficient, reliable, and secure development of transmission networks in the best interest of customers. AEMO supports development where its independent analysis confirms the need, and suggests alternative (potentially lower cost) options to the proposed projects in some instances. AEMO does not support proposed projects where its analysis does not confirm their requirement.

AEMO's assessment of each proposed project depends on its analysis of the network ability to meeting projected demand. In making this assessment, AEMO uses its own connection point forecasts, to be published on AEMO's website in July 2014.

The agreed scope for this review is as follows:

- For proposed capacity-driven projects: Assess project need by identifying potential network limitations in the project area over the next seven years and comparing network capability against forecast demand. Consider whether alternative investment options would address capacity limitations under the applicable planning standards.
- For condition-driven investment: Assess whether proposed major asset replacement projects are required by evaluating whether network capability would meet the reliability standard if the asset was not replaced. Considering whether a more efficient configuration of assets would achieve this standard.

In some cases where AEMO considers the network need is justified, it suggests alternative options to a TNSP's proposed project, based on available information. However, this review has not undertaken detailed options and cost analysis. This report does not extend to advising the AER whether the condition of TNSP network assets necessitates their replacement.

AEMO applied the jurisdictional licence requirements that TransGrid and TasNetworks must adhere to when making transmission network investment decisions. This included the following regulatory obligations:

- In New South Wales: Transmission Network Design and Reliability Standard, published by New South Wales Department of Trade and Investment.
- In the Australian Capital Territory: Disallowable Instrument DI2012-267: Utilities Exemption 2012 (No. 3), 2012, published by the ACT Government.
- In Tasmania: Electricity Supply Industry (Network Planning Requirements) Regulations 2007.

Issues which are outside the scope of AEMO's review, but which are relevant to the AER's decision on forecast expenditure, include:

- Comment on the condition of the assets.
- Assessment of project costs.
- Detailed options analysis.
- Identification of new strategic land and easements.
- Operational expenditure.
- Other infrastructure or provisions not directly related to shared transmission network and connection point assets augmentations (e.g. IT, metering, telecommunications).

3 – REVIEW OF CAPACITY-DRIVEN INVESTMENT

This chapter sets out AEMO's assessment approach and findings for TasNetworks and TransGrid's proposed capacity-driven network augmentation projects.

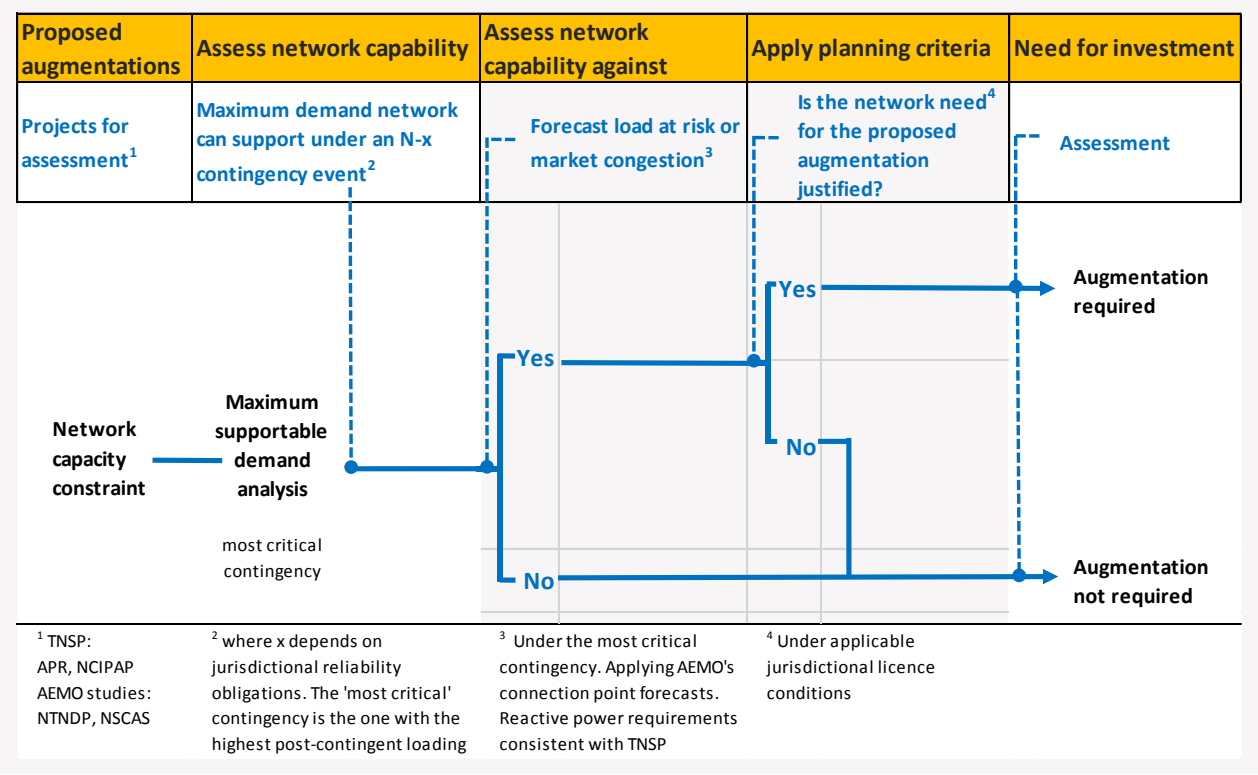
3.1 Scope of assessment and methodology

Capacity-driven investment increases network capacity to address forecast maximum demand growth or delivers market benefits.

The figure below sets out AEMO's process for assessing TransGrid and TasNetworks' proposed capacity-driven investment. For each proposed network augmentation project, AEMO assessed:

1. Network capability: what level of demand can the network support for all credible contingency events, to determine the most critical contingency event?
2. Network capability against forecast demand: applying AEMO's 2014 connection point forecasts, is there load at risk or market congestion expected over the next seven years, under the most critical contingency event?
3. The need for the project under the applicable planning criteria: if yes in point 2 above, augmentation may be required within the regulatory period, under the relevant jurisdictional reliability criteria. If no in point 2, augmentation is not required.

Figure 3: Assessment approach for capacity-driven investment



3.2 Results

This section presents AEMO's findings for TransGrid and TasNetworks' proposed capacity-driven network augmentation projects.

For each project, the tables below set out: the TNSP's proposed investment driver and commissioning date, whether the TNSP included it in its transitional and substantive proposals, and AEMO's assessment the network need.

Table 1: Results for AEMO's assessment of TransGrid's proposed capacity-driven investment

		TransGrid			AEMO
Driver	**Project**	**Proposed commissioning year**	**Transitional proposal 31 Jan 2014**	**Substantive proposal 31 May 2014**	**Assessment of project need July 2014**
Distribution capacity	Hallidays Point 132/66 kV Substation	2015	Included	Deferred	Excluded at the substantive proposal stage.
Distribution capacity	Supply to the Inner Sydney Area	2018	Contingent	Contingent	Need contingent on demand growth, DM levels and cable condition.
Market benefit	NSW to Qld Transmission Capacity Upgrade	2019	Included	Deferred	Excluded at the substantive proposal stage. The 2013 NTNDP did not identify need to upgrade QNI Interconnector.
Market benefit	Snowy to Sydney 330 kV System Upgrade	2019	Contingent	Continent	Need contingent on market benefit assessment, and following enablement of dynamic ratings as per NCIPAP submission.
Regulatory	Development of Southern Supply to the Australian Capital Territory	2018	Included	Included	Justified network need.
Transmission capacity	Supply to the Gunnedah, Narrabri and Moree	2020	Included	Included	Justified network need.

Table 2: Results for AEMO's assessment of TasNetworks' proposed capacity-driven investment

		TasNetworks			AEMO
Driver	**Project**	**Proposed commissioning year**	**Transitional proposal 31 January 2014**	**Substantive proposal 31 May 2014**	**Assessment of project need July 2014**
Market benefit	Waddamana-Palmerston	2018-19	Included	Included	Need contingent on full market benefit assessment.

		TasNetworks			AEMO
Driver	**Project**	**Proposed commissioning year**	**Transitional proposal 31 January 2014**	**Substantive proposal 31 May 2014**	**Assessment of project need July 2014**
	220 kV security augmentation				
Reliability obligation	Northern dynamic reactive support	Within regulatory period	Included	Deferred	Excluded at the substantive proposal stage.
Reliability obligation	Kingston area Transmission line augmentation	Within regulatory period	Included	Deferred	Excluded at the substantive proposal stage.
Reliability obligation	Newton-Queenstown security augmentation	2016-17	Included	Included	Need contingent on closure of industrial load.
Reliability obligation	Bridgewater substation new 110/33 kV connection point	Within regulatory period	Included	Deferred	Excluded at the substantive proposal stage.
Reliability obligation	Rosebery substation transformer capacity augmentation	2016-17	Included	Included	Justified network need.

4 – REVIEW OF CONDITION-DRIVEN INVESTMENT

This chapter sets out AEMO's assessment approach and findings for TransGrid and TasNetworks' proposed condition-driven network augmentation projects.

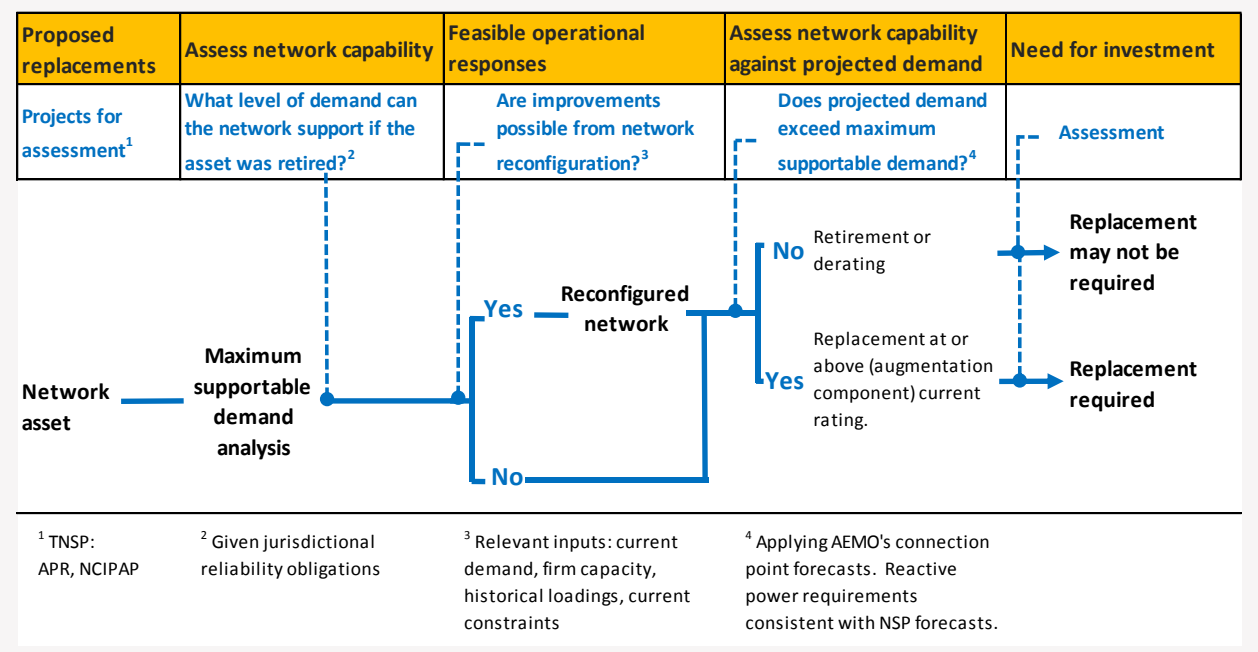
4.1 Scope of assessment and methodology

Condition-driven investment replaces or refurbishes network infrastructure to address the poor condition of assets currently in service.

The figure below sets out the process that AEMO undertook to assess TransGrid and TasNetworks' proposed condition-driven investment. For each proposed asset replacement project, AEMO assessed:

1. Network capability: what level of demand could the network support if the asset was retired – under the applicable reliability standards, after considering any alternative, more efficient configuration of network assets?
2. Network capability against forecast demand: applying AEMO's 2014 connection point forecasts, is there load at risk or market congestion expected over the next seven years?
3. The need for the project under the applicable planning criteria: if yes in point 2 above, replacement (at or above current capacity) is required within the regulatory period. If no in point 2, replacement may not be required: retirement, derating or replacement with lower capacity may suffice.

Figure 4: Assessment approach for condition-driven investment



This report does not provide a comprehensive review of replacement expenditure for the AER's purposes; it does not attempt to provide advice on the condition of TransGrid and TasNetworks' assets.

Even if AEMO finds that a proposed replacement project is justified on grounds that the assets are required to meet the reliability standard, the AER may still reject proposed expenditure on grounds that the existing assets are in good condition.

4.2 Results

Condition-driven investment replaces or refurbishes network infrastructure to address the poor condition of assets currently in service.

This section presents AEMO's findings for TransGrid and TasNetworks' proposed condition-driven asset replacement projects.

For each project, the tables below set out: the type of asset the TNSP's proposes to replace and commissioning date, whether the TNSP included it in its transitional and substantive proposals, and AEMO's assessment of the network need.

Table 3: Results for AEMO's assessment of TransGrid's proposed condition-driven investment

		TransGrid		AEMO
Asset type	**Project**	**Transitional proposal 31 January 2014**	**Substantive proposal 31 May 2014**	**Assessment of project need July 2014**
Reactive plant	Broken Hill 132kV No. 1 and 2 Reactor Replacement	Included	Included	Justified network need. No alternatives identified.
Reactive plant	Broken Hill No. 3 and 4 Capacitor Replacement	Included	Included	Justified network need. No alternatives identified.
Reactive plant	Canberra 330/132 kV Substation Capacitors	Included	Included	Justified network need. No alternatives identified.
Reactive plant	Buronga 275/220 kV Substation line No.X2 220 kV reactor replacement	Included	Included	Justified network need. No alternatives identified.
Substation	Cooma substation replacement	Included	Included	Justified network need. No alternatives identified.
Substation	Vales Point 330 kV substation rebuild	Included	Included	Justified network need. No alternatives identified.
Substation	Canberra 330 kV substation rebuild	Included	Included	Justified network need. No alternatives identified.
Substation	Munmorah 330 kV substation rebuild with reduced substation footprint	Included	Included	Justified network need. Proposed replacement with reduced substation footprint is credible (connection to power station no longer required).
Transformer	Tamworth 330 kV No.2 Transformer Replacement	Included	Included	Justified network need. Proposed replacement of the existing three transformers with two higher capacity transformers is credible
Transformer	Forbes No. 1 and No.2 132/66 kV transformer replacement	Included	Included	Justified network need. Possible alternative may be to replace with lower rating.
Transformer	Yanco 132/33 kV substation transformer	Included	Included	Justified network need. No alternatives identified.

		TransGrid		AEMO
Asset type	**Project**	**Transitional proposal 31 January 2014**	**Substantive proposal 31 May 2014**	**Assessment of project need July 2014**
Transformer	Griffith 132/33 kV substation transformer	Included	Included	Justified network need. No alternatives identified.
Transformer	Newcastle 330/132 kV substation transformer	Included	Included	Justified network need. Possible alternative may be to reduce Newcastle substation to 2 transformers.
Transmission line	Installation of reactive support in response to Wallerawang – Orange North Transmission line reaching end of life	Included	Included	Justified network need. Installation of reactive support is a credible alternative to line replacement.
Transmission line	Line 970 Yass to Burrinjuck Pole Replacements	Included	Included	Justified network need. No alternatives identified.
Transmission line	Line 96H Coffs Harbour to Koolkhan Pole Replacements	Included	Included	Justified network need. No alternatives identified.
Transmission line	Line 99J Yanco to Griffith Rebuild	Included	Included	Justified network need. No alternatives identified.
Transmission line	Line 99F Yanco to Uranquinty Pole Replacements	Included	Included	Justified network need. No alternatives identified.

Table 4: Results for AEMO's assessment of TasNetworks' proposed condition-driven investment

		TasNetworks		AEMO
Asset type	**Project**	**Transitional Proposal 31 January 2014**	**Substantive proposal 31 May 2014**	**Assessment of project need July 2014**
Transformer	Lindisfarne Substation transformer replacement	Included	Included	Justified network need. Possible alternative may be to replace with lower-rated transformer.
Substation	George Town substation 110 kV redevelopment	Included	Included	Justified network need. No alternatives identified.
Common spare	Strategic spare mobile 110/33/22/11 kV substation	Included	Included	Justified network need. No alternatives identified.

5 – IMPROVEMENTS

In conducting this review for the first time, AEMO identified several areas that could be further investigated and improved for future AEMO reviews, such as:

- Conducting ‘bottom-up’ assessments for future network development plans
- Examining the nature and timing of the review

6 – SUPPLEMENTARY INFORMATION

Attachment A - TransGrid project assessment reports

Attachment B - TasNetworks project assessment reports

MEASURES AND ABBREVIATIONS

Units of measure

Abbreviation	Unit of measure
kV	Kilovolts
MW	Megawatts
MWh	Megawatt hours

Abbreviations

Abbreviation	Expanded name
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
COAG	Council of Australian Governments
NCIPAP	Network Capability Incentive Parameter Action Plan
NTNDP	National Transmission Network Development Plan
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
NEL	National Electricity Law
NTP	National transmission planner
TNSP	Transmission network service provider

GLOSSARY

Definitions

Many of the listed terms are already defined in the National Electricity Rules (NER), version 63.[23] For ease of reference, these terms are highlighted in light blue. Some terms, although defined in the NER, have been clarified, and these terms are highlighted in green.

Term	Definition
Active power	See electrical power.
Annual planning report	An annual report providing forecasts of gas or electricity (or both) supply, capacity, and demand, and other planning information.
Augmentation	The process of upgrading the capacity or service potential of some part of a transmission (or a distribution) network.
Connection point	The point at which the transmission and distribution network meet.
Constraint	Any limitation on the operation of the transmission system that will give rise to unserved energy (USE) or to generation re-dispatch costs.
Coincident forecasts	Maximum demand forecasts of a connection point at the time of system peak. See diversity factor.
Consumer	See customer.
Contingency event	An event affecting the power system, such as the failure or unplanned removal from operational service of a generating unit or transmission network element.
Credible contingency event	A contingency event AEMO considers reasonably possible, given the circumstances in the power system.
Critical contingency	The specific forced or planned outage that has the greatest potential to impact on the electricity transmission network at any given time.
Customer	A person who engages in the activity of purchasing electricity supplied through a transmission or distribution system to a connection point.
Demand	See electricity demand.
Demand-side management	The act of administering electricity demand-side participants (possibly through a demand-side response aggregator).
Demand-side participation (DSP)	The situation where customers vary their electricity consumption in response to a change in market conditions, such as the spot price.
Distribution network	A network that is not a transmission network.
Diversity factor	Refers to the ratio of the maximum demand of a connection point/terminal station to the demand of that connection point at the time of system peak. This is sometimes referred to as the demand factor, and is always less than or equal to one. When the diversity factor equals one, the connection point peak coincides with the system peak.
Electrical energy	The average electrical power over a time period, multiplied by the length of the time period.

[23] An electronic copy of the latest version of the NER can be obtained from http://www.aemc.gov.au/energy-rules/national-electricity-rules/current-rules.

Term	Definition
Electrical power	The instantaneous rate at which electrical energy is consumed, generated or transmitted.
Electricity demand	The electrical power requirement met by generating units.
Energy efficiency	Potential annual energy or maximum demand that is mitigated by the introduction of energy efficiency measures.
Flow path	Those elements of the electricity transmission networks used to transport significant amounts of electricity between generation centres and major load centres.
Generation	The production of electrical power by converting another form of energy in a generating unit.
Generation capacity	The amount (in megawatts (MW)) of electricity that a generating unit can produce under nominated conditions.
Generator	A person who engages in the activity of owning, controlling or operating a generating system that is connected to, or who otherwise supplies electricity to, a transmission or distribution system and who is registered by AEMO as a generator under Chapter 2 (of the NER) and, for the purposes of Chapter 5 (of the NER), the term includes a person who is required to, or intends to register in that capacity.
Interconnector	A transmission line or group of transmission lines that connects the transmission networks in adjacent regions.
Interconnector flow	The quantity of electricity in MW being transmitted by an interconnector.
Jurisdictional planning body (JPB)	An entity nominated by the relevant Minister of the relevant participating jurisdiction as having transmission system planning responsibility (in that participating jurisdiction).
Load	A connection point or defined set of connection points at which electrical power is delivered to a person or to another network or the amount of electrical power delivered at a defined instant at a connection point, or aggregated over a defined set of connection points.
Load shedding	Reducing or disconnecting load from the power system.
Load transfer	A deliberate shift of electricity demand from one point to another.
Maximum demand (MD)	The highest amount of electrical power delivered, or forecast to be delivered, over a defined period (day, week, month, season, or year) either at a connection point, or simultaneously at a defined set of connection points.
National Electricity Law	The National Electricity Law (NEL) is a schedule to the National Electricity (South Australia) Act 1996, which is applied in other participating jurisdictions by application acts. The NEL sets out some of the key high-level elements of the electricity regulatory framework, such as the functions and powers of NEM institutions, including AEMO, the AEMC, and the AER.
National Electricity Market (NEM)	The wholesale exchange of electricity operated by AEMO under the National Electricity Rules (NER).
National Electricity Objective (NEO)	To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to: • price, quality, safety, reliability and security of supply of electricity, and • the reliability, safety and security of the national electricity system. This is defined in Section 7 of the National Electricity Law (NEL).
National Electricity Rules (NER)	The National Electricity Rules (NER) describes the day-to-day operations of the NEM and the framework for network regulations. See also 'National Electricity Law'.

Term	Definition
National Transmission Network Development Plan (NTNDP)	An annual report to be produced by AEMO that replaces the existing National Transmission Statement (NTS) from December 2010. Having a 20-year outlook, the NTNDP will identify transmission and generation development opportunities for a range of market development scenarios, consistent with addressing reliability needs and maximising net market benefits, while appropriately considering non-network options.
Network	The apparatus, equipment, plant and buildings used to convey, and control the conveyance of, electricity to customers (whether wholesale or retail) excluding any connection assets. In relation to a network service provider, a network owned, operated or controlled by that network service provider.
Network capability	The capability of the network or part of the network to transfer electricity from one location to another.
Network congestion	When a transmission network cannot accommodate the dispatch of the least-cost combination of available generation to meet demand.
Network limit	Defines the power system's secure operating range. Network limits also take into account equipment/network element ratings. See also 'ratings'.
Network limitation	Describes network limits that cause frequently binding network constraint equations, and can represent major sources of network congestion. See also 'network congestion'.
Non-network option	An option intended to relieve a limitation without modifying or installing network elements. Typically, non-network options involve demand-side participation (DSP) (including post contingent load relief) and new generation on the load side of the limitation.
Planning criteria	Criteria intended to enable the jurisdictional planning bodies (JPBs) to discharge their obligations under the NER and relevant regional transmission planning standards.
Power	See 'electrical power'.
Power system	The National Electricity Market's (NEM) entire electricity infrastructure (including associated generation, transmission, and distribution networks) for the supply of electricity, operated as an integrated arrangement.
Power system reliability	The ability of the power system to supply adequate power to satisfy customer demand, allowing for credible generation and transmission network contingencies.
Power system security	The safe scheduling, operation, and control of the power system on a continuous basis in accordance with the principles set out in clause 4.2.6 (of the NER).
Probability of exceedance (POE) maximum demand	The probability, as a percentage, that a maximum demand (MD) level will be met or exceeded (for example, due to weather conditions) in a particular period of time. For example, for a 10% POE MD for any given season, there is a 10% probability that the corresponding 10% POE projected MD level will be met or exceeded. This means that 10% POE projected MD levels for a given season are expected to be met or exceeded, on average, 1 year in 10.
Ratings	Describes an aspect of a network element's operating parameters, including categories like current-carrying capability, maximum voltage rating, and maximum fault level interrupting and withstand capability. Network elements must always be operated within their ratings. Network elements may have ratings that depend on time duration (such as short-term current-carrying capacity).
Reactive energy	A measure, in varhour-(varh), of the alternating exchange of stored energy in inductors and capacitors, which is the time-integral of the product of voltage and the out-of phase component of current flow across a connection point.

Term	Definition
Reactive power	The rate at which reactive energy is transferred. Reactive power, which is different to active power, is a necessary component of alternating current electricity. In large power systems it is measured in MVAr (1,000,000 volt-amperes reactive). It is predominantly consumed in the creation of magnetic fields in motors and transformers and produced by plant such as: • alternating current generators • capacitors, including the capacitive effect of parallel transmission wires, and • synchronous condensers. Management of reactive power is necessary to ensure network voltage levels remain within required limits, which is in turn essential for maintaining power system security and reliability.
Region	An area determined by the AEMC in accordance with Chapter 2A of the National Electricity Rules (NER).
Regulatory investment test for transmission (RIT-T)	The test developed and published by the AER in accordance with clause 5.6.5B, as in force from time to time, and includes amendments made in accordance with clause 5.6.5B.
Reliability	The probability that plant, equipment, a system, or a device, will perform adequately for the period of time intended, under the operating conditions encountered. Also, the expression of a recognised degree of confidence in the certainty of an event or action occurring when expected.
Reliability benefit	A benefit deriving from improved customer reliability as measured by reduced unserved energy (USE). See also unserved energy (USE).
Summer	Unless otherwise specified, refers to the period 1 November–31 March (for all regions except Tasmania), and 1 December–28 February (for Tasmania only).
Supply	The delivery of electricity.
Transmission network	A network within any National Electricity Market (NEM) participating jurisdiction operating at nominal voltages of 220 kV and above plus: (a) any part of a network operating at nominal voltages between 66 kV and 220 kV that operates in parallel to and provides support to the higher voltage transmission network, (b) any part of a network operating at nominal voltages between 66 kV and 220 kV that is not referred to in paragraph (a) but is deemed by the Australian Energy Regulator (AER) to be part of the transmission network.
Transmission system	A transmission network, together with the connection assets associated with the transmission network (such as transformers), which is connected to another transmission or distribution system.
Unserved energy (USE)	The amount of energy that cannot be supplied because there is insufficient generation capacity, demand-side participation (DSP), or network capability to meet demand.
Value of Customer Reliability (VCR)	A measure of the cost of unserved energy used in Regulatory Test assessments for planned augmentations for the Victorian electricity transmission system.
Winter	Unless otherwise specified, refers to the period 1 June–31 August (for all regions).
Zone substation	Station within the distribution network where incoming electricity is transformed from a higher voltage from the connection or bulk supply point to a lower one. Electricity is then provided to feeders which lower the voltages even lower for distribution to customers.

LIST OF COMPANY NAMES

The following table lists the full name and Australian Business Number (ABN) of companies that may be referred to in this document.

Company	Full company name	ABN/CAN
AEMC	Australian Energy Market Commission	49 236 270 144
AEMO	Australian Energy Market Operator	92 072 010 327
TransGrid	TransGrid	19 622 755 774
TasNetworks	Tasmanian Networks Pty Limited	24 167 357 299