REVIEW OF THE ELECTRICITY TRANSMISSION CODE

ISSUES PAPER

April 2011

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REQUEST FOR SUBMISSIONS

The Essential Services Commission of SA (the Commission) invites written submissions from interested parties in relation to the proposed changes to the Electricity Transmission Code discussed in this paper. Written comments should be provided by **25 May 2011**. It is highly desirable for an electronic copy of the submission to accompany any written submission.

It is Commission policy to make all submissions publicly available via its website (www.escosa.sa.gov.au), except where a submission either wholly or partly contains confidential or commercially sensitive information provided on a confidential basis and appropriate prior notice has been given.

The Commission may also exercise its discretion not to exhibit any submission based on their length or content (for example containing material that is defamatory, offensive or in breach of any law).

Responses to this paper should be directed to:

Review of the Electricity Transmission Code - Issues Paper

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Information about the role and activities of the Commission, including copies of latest reports and submissions, can be found on the Commission's website at www.escosa.sa.gov.au.

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GLOSSARY OF TERMS

AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AMD	Agreed Maximum Demand
CBD	Central Business District
CODE	Electricity Transmission Code
COMMISSION, ESCOSA	Essential Services Commission of SA
DNSP	Distribution Network Service Provider
ESIPC	Electricity Supply Industry Planning Council
ESC ACT	Essential Services Commission Act 2002
MVA	Mega Volt Amps
MW	Mega Watt – 1,000,000 Watts
N RELIABILITY	Means the Transmission System is able to supply maximum demand provided all of the network elements are in service.
N–1 RELIABILITY	Means the ability of the transmission system to continue to supply the contracted loads connected to the system should any one element fail.
N–2 RELIABILITY	Means the ability of the transmission system to continue to supply the contracted loads connected to the system following the failure of any two single independent and diverse transmission elements.
NEM	National Electricity Market
NER	National Electricity Rules
RIT-T	Regulatory Investment Test - Transmission
SA	South Australia
TNSP	Transmission Network Service Provider
USE	Unserved Energy
VCR	Value of Customer Reliability

1 INTRODUCTION

ElectraNet SA Pty Ltd (**ElectraNet**) operates the main electricity transmission network in South Australia and is licensed by the Essential Services Commission (**Commission**) pursuant to Part 3 of the *Electricity Act 1996* to conduct such operations. As a condition of licence, ElectraNet is required to comply with the Electricity Transmission Code (**the code**), which has been made by the Commission pursuant to Part 4 of the Essential Services Commission Act 2002 (**ESC Act**).[1]

The code was first issued on 11 October 1999, at the time that the South Australian Government was preparing for the long-term lease of the Government-owned electricity assets. The code sets out the obligations that a licensed operator of a transmission system must comply with in relation to the provision of transmission services in this State. Section 2 of the code defines the service standards and incorporates specific exit point reliability standards. It is noted that the code, except for clause 2.3.1, also applies to Murraylink Transmission Company, operator of the Murraylink interconnector that links the Victorian transmission grid at Red Cliffs to the ElectraNet grid at the Monash substation near Berri.

1.1 Exit point reliability standards

Clause 2.3.1 of the code applies only to ElectraNet. It establishes specific network exit point reliability standards for each exit point (or in some cases, group of exit points) of ElectraNet's transmission network which ElectraNet is required to achieve and maintain, as shown in Table 1 below. These exit points connect either to ETSA Utilities' distribution network or to the supply points of a small number of large direct-connect customers.

1 Refer to http://www.escosa.sa.gov.au/webdata/resources/files/030527-D-ElectranetTransLicence.pdf for a copy of the transmission licence held by ElectraNet, and http://www.escosa.sa.gov.au/webdata/resources/files/030620-O-ESCOSAElecTransmissionCode-Final.pdf for a copy of the Electricity Transmission Code.

Table 1 - Exit point reliability categories

CATEGORY NAME	CONNECTION POINT
Category 1	• Baroota • Dalrymple • Florieton SWER • Kanmantoo Mine • Leigh Creek Coal * • Leigh Creek South • Mannum/Adelaide 1 * • Mannum/Adelaide 2 * • Mannum/Adelaide 3 * • Middleback* • Millbrook * • Morgan/Whyalla 1 * • Morgan/Whyalla 2 * • Morgan/Whyalla 3 * • Morgan/Whyalla 4 * • Mt Gunson • Murray/Hahndorf 1 * • Murray/Hahndorf 2 * • Murray/Hahndorf 3 * • Neuroodla • Roseworthy* • Stony Point (Whyalla Refiners) - distribution • Stony Point* • Waterloo- until 31 December 2009 • Whyalla LMF • Davenport * • Pimba * • Woomera* • Wudinna (until 30 June 2009) ** denotes a customer but does not include a distributor*
Category 2	• Ardrossan West • Kadina East • Wudinna (on and from 1 July 2009) • Yadnarie
Category 3	• Port Lincoln • Snuggery Rural • Whyalla Terminal – Main Bus (until 30 June 2010)
Category 4	• Angas Creek • Berri/Monash • Blanche • Brinkworth • [Bungama and Pt Pirie] • Clare North • Coonalpyn West • Dorrien • Templers • Hummocks • Keith • Kincraig • Mannum • Mobilong • Mt Barker • Mt Gambier • North West Bend • Playford • Snuggery Industrial • Tailem Bend • Waterloo – from 1 January 2010 • Whyalla Terminal – Main Bus (on and from 1 July 2010) • Penola West • [Dry Creek West, Kilburn, Lefevre, New Osborne and Torrens Island 66kV] • [Happy Valley , Magill and Morphett Vale East] • [Para and Parafield Gardens West]
Category 5	• [Dry Creek East, Magill and Northfield]
Category 6	• Adelaide Central [East Tce, new CityWest substation]

For each category, the code requires ElectraNet to maintain the specified level of reliability and supply restoration standards.[2] This may be achieved by use of transmission

2 It is noted that clause 2.3.1 of the ETC is phrased in terms of obligations placed on a TNSP. However, as noted previously, ElectraNet is the only TNSP to which clause 2.3.1 applies; as a consequence, the discussion in this paper refers to ElectraNet rather than to a TNSP.

assets or, where it is efficient to do so, by alternative means such as the purchase of other forms of network support arrangement. The standards require, in effect, a level of security (also referred to as spare capacity or redundancy) to be built into ElectraNet's transmission system so that it can maintain electricity supply even with equipment failures due to faults, incidents and outages.

ElectraNet must therefore plan, develop and maintain its transmission system such that specified standards are met in relation to each connection point or group of connection points. The code also requires that ElectraNet not contract for an amount of agreed maximum demand (**AMD**), as specified in the connection agreement between ElectraNet and the relevant "transmission customer", greater than 100% of installed line and transformer capacity. However, in the case of certain categories,[3] up to 120% of installed line and transformer capacity can be contracted where network support agreements have been established.

The current approach to reliability standards established under the code is transparent and easy to administer. Since the reliability categories are fixed, ElectraNet is obliged to ensure that reliability standards are met and is also required to choose the least-cost option in providing a reliable transmission network subject to the requirements of the National Electricity Rules (**NER**).[4]

ElectraNet provides the Commission with a report of its compliance with the transmission code exit point reliability service standards each year. The report identifies potential future exit point reliability standard breaches due to changes in load, the proposed solution to ensure that the relevant standard is not breached and the timing of implementing the solution. The service standards and the associated compliance reporting by ElectraNet against those standards provide for a high level of accountability in maintaining a highly reliable transmission network[5] in South Australia.

1.2 Electranet's obligations in meeting the standards

Importantly, whatever the means by which ElectraNet chooses to meet the exit point reliability standards, two principles apply: the manner in which the standard is met should be as efficient, technically and economically, as possible (as noted above and described further in section 1.6 below); and, the obligation to meet and maintain those standards is the responsibility of ElectraNet alone.

In the latter context, this means that where ElectraNet may choose to rely on network support arrangements to meet the reliability standards at the relevant exit point, for example, through the use of ETSA Utilities' sub-transmission or distribution system, the costs of doing so (including the costs of any upgrades to those network support arrangements to ensure ongoing adherence to the exit point reliability standards) are to be borne by ElectraNet and recovered through transmission use of system charges. The

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3 Currently categories 1 to 3.

4 For further detail on the NER requirements, refer section1.6 below.

5 Refer commentary on Electranet's transmission system performance and reliability in the Commissions 2009/10 Annual Performance Report page 2 refer http://www.escosa.sa.gov.au/library/101124-AnnualPerformanceReport_2009-10.pdf

code does not require any other party, regulated or otherwise, to make any investment nor does it have anything to say about the manner in which such an investment, when sought by ElectraNet, is to be funded – the assumption of the code is that ElectraNet will source and fund such investments.

1.3 The need for review of the exit point reliability standards

As may be appreciated from the nature and scope of transmission operations, exit point reliability standards are one of the drivers of ElectraNet's revenue requirements. Hence, any changes to the exit point reliability standards over time will have cost implications for ElectraNet and therefore price implications for South Australian consumers.

It is therefore important that those standards are set in an efficient manner which appropriately balances the need for reliability of supply and the costs of operating and maintaining the transmission system which are ultimately borne by South Australian consumers. This gives rise to the need for on-going review and oversight of the standards, which is one of the functions undertaken by the Commission. A periodic review of this nature should take into consideration load growth and the means by which ElectraNet can provide flexible solutions to reliability augmentations at the lowest possible cost to SA electricity consumers.

The exit point reliability standards upon which ElectraNet based its capital expenditure framework were last reviewed by the Commission during 2006, in anticipation of the regulatory revenue reset for ElectraNet undertaken by the Australian Energy Regulator (**AER**) in accordance with the provisions of the National Electricity (South Australia) Act 1996 and the National Electricity Rules (**NER**) made under that Act. Following a consultation process,[6] the Commission made a Final Decision on the review in September 2006 with the revised code provisions taking effect from 1 July 2008.[7]

For the purposes of ElectraNet's revenue allowance for the 5-year regulatory period 1 July 2013 to 30 June 2018, the AER will, during 2012-13, be reviewing ElectraNet's revenue requirements. Given that timing, it is appropriate for the Commission to consider and review at this stage whether or not there is a need to vary any of the existing exit point reliability standards for that forthcoming regulatory period.

Such a review needs to be undertaken in advance of the commencement of the AER price determination process, as that will allow cost variations arising from any exit point reliability standard variations (whether upwards or downwards variations) to be taken into account.

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6 Discussion paper refer to http://www.escosa.sa.gov.au/library/060208-ElectricityTransmissionCode-ReliabilityStandards-DiscussionPaper.pdf

7 Final Decision refer to http://www.escosa.sa.gov.au/library/060906-ElectricityTransmissionCode-ReliabilityStandards-FinalDecision.pdf

1.4 Reliability terminology

Terminology such as “N”, “N-1” and “N-2” is used in section 2 of the code (and throughout this Issues Paper) to describe levels of reliability of the ElectraNet transmission system.

N reliability means that the transmission system is able to supply the maximum demand, provided that all the network elements are in service. This means that the loss of a single transmission element (a line, a transformer or other associated equipment) could cause supply interruption to some customers.

A higher level of reliability is provided by **N-1 reliability.** With this reliability standard no customers would be affected even with one network element out of service. It is also possible to define N–1 reliability for a percentage of the time or for a percentage of the maximum demand.

N–2 reliability means that no customers would be affected even if two network elements were out of service. This is a very high level of security that is expensive in terms of capital expenditure. Accordingly, this level of reliability is generally limited to Central Business District (CBD) areas where such a high level of security is deemed necessary.

The code specifies reliability standards for N, N-1 or N-2 connection capacity as appropriate at each category. These reliability standards, except for category 1, may be delivered through any means, including transmission network capability, distribution network capability, and demand management or generation alternatives.

As these standards are overtaken by growth in demand over time, the code requires ElectraNet to augment the relevant connection point and, where necessary, the transmission network. ElectraNet is also required to use its best endeavours to correct any breach of the performance standards in the code within twelve months and, in any event, no later than three years.

In the case of a new connection point, ElectraNet is required by clause 2.12 to seek the approval of the Commission for the applicable reliability standards which must be developed having regard to a range of factors including size of the load, value of lost load, types and numbers of customers supplied through the connection point, location and costs of the installation of transmission assets relevant to the connection point.

Generally, high reliability equates to high cost and therefore it is normal industry practice to design the transmission network to achieve an appropriate balance between cost and reliability. For example, a single radial transmission line generally supplies communities in remote areas because the cost of providing a duplicate line, that may only be required a few hours per year for what could be considered marginal benefit, is difficult to justify.

The existing broad requirements of each code reliability category are summarised in the following table:

Table 2 - Existing reliability category requirements

CATEGORY	LINE RELIABILITY	TRANSFORMER RELIABILITY	TIME TO RESTORE LINE AFTER FAILURE	TIME TO RESTORE TRANSFORMER AFTER FAILURE	TIME TO RESTORE TO RELIABILITY STANDARD
1	N	N	2 days	8 days	N/A
2	N	N-1	2 days	As soon as possible to avoid outage due to subsequent transformer failure	Target:1yr, Max:3yr
3 [8]	N-1	N-1	2 days	As soon as possible to avoid outage due to subsequent transformer failure	Target:1yr, Max:3yr
4	N-1 Continuous	N-1 Continuous	12 hours	As soon as possible to avoid outage due to subsequent transformer failure	Target:1yr, Max:3yr
5	N-1 Continuous	N-1 Continuous	4 hours	As soon as possible to avoid outage due to subsequent transformer failure	Target:1yr, Max:3yr
6 (to 31/12/11)	N [9]	N	4 hours	As soon as possible to avoid outage due to subsequent transformer failure	Target:1yr, Max:3yr
6 (from 31/1/12)	N-1 Continuous	N-1 Continuous	4 hours	As soon as possible to avoid outage due to subsequent transformer failure	Target:1yr, Max:3yr

1.5 The setting and review of the exit point reliability standards

The methodology applied in the setting of transmission exit point reliability is a measure of the expected amount of energy at risk of not being delivered to consumers due to a lack of available capacity. Currently under the Reliability Standard[10], the level of expected unserved energy should not exceed 0.002% of the annual energy consumption per region.[11]

8 Category 3 connection points are to be restored to equivalent line and transformer capacity within one hour of an interruption of either transmission element.

9 The effect of Categories 5 and 6 provides for N-1 at an operational level, however this not a regulatory requirement.

10 Refer "Reliability Standard and Reliability Settings Review" 30 April 2010 www.aemc.gov.au

11 Final Report - Reliability Standard and Reliability Settings Review 30 April 2010 www.aemc.gov.au

The value of customer reliability (**VCR**) is a measure of the value to society of a reliable electricity supply or alternatively, a measure of the cost to society of unserved energy. The VCR is used in probabilistic transmission planning approaches to value changes in unserved energy that occur under alternative augmentation options.

In reviewing the code, each connection point is assessed by comparing the expected unserved energy with the connection point in the current category (e.g. N standard) with the expected unserved energy in the next category (e.g. N line, N-1 transformer standard). The difference in the cost of unserved energy (i.e. unserved energy multiplied by the VCR) is then compared with the cost of moving to the next category (i.e. the cost of installing a redundant transformer). If the saving in the cost of unserved energy is greater than the cost of moving up to the next category then the recommendation is that the connection point be moved up.

1.6 National Electricity Rules: Regulatory Investment Test – Transmission

The NER require a proposed new transmission network asset to satisfy a regulatory test referred to as a Regulatory Investment Test – Transmission (**RIT-T**)[12] as specified by the AER. The regulatory test has two components; a market benefit assessment; and a reliability augmentation assessment. The preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options. Where the identified need is for reliability corrective action, a preferred option may have a negative net economic benefit (that is, a net economic cost).

For a reliability augmentation to satisfy the regulatory test, the transmission entity must demonstrate that the proposed new transmission asset is necessary so as to meet the minimum network performance requirements set out in the NER, relevant legislation, regulations or any statutory instruments which apply to that entity.

1.7 The process for this review

In March 2010, as a key input into the Commission's review, the Commission requested the Australian Energy Market Operator (**AEMO**) to investigate the transmission network exit point reliability standards specified in the code to determine their appropriateness for the coming regulatory period for ElectraNet. This Issues Paper should be read in conjunction with the report provided by AEMO following its review.

Specifically, AEMO was asked to consider:

- How should connection point reliability be established?
- Is the current reliability standard for each connection point appropriate?

12 Australian Energy Regulatory, 2010, *Regulatory investment test for transmission*, http://www.aer.gov.au/content/index.phtml/itemId/730920

- Should the reliability standards for any connection points be improved, taking into consideration load growth, demographic changes, and/or network developments (transmission and distribution) etc?
- If the reliability standard of any connection point is considered to be inappropriate, what should the standard be and what network extension and/or augmentation would be required to meet such a standard in a cost effective and efficient way (transmission and/or distribution)? What would be the indicative capital cost required to meet the new standard?

The Commission received the final AEMO report on the review of the transmission code reliability standards in December 2010.[13] The AEMO report was compiled following discussions and subsequent contributions from ElectraNet, ETSA Utilities and Commission staff.

AEMO made a number of recommendations associated with:

- specific connection point categorisation;
- proposed amendments to the code; and
- additional connection point studies.

It is noted that the AEMO report recommends some amendments to several clauses within section 2 of the code, in particular to some of the reliability categories. The report also recommends further amendments to the code that build on the amendments to section 2 (relating to the Adelaide Central area) and clarification of the intent of various existing clauses with additional relevant clauses and definitions.

The Commission will consider the merits of such amendments in terms of the resultant impacts on the achievement of the objectives for the Commission as specified at s. 6(1) of the ESC Act, and in particular the Commission's principal objective, which is to protect the long term interests of South Australian consumers with respect to the price, reliability and quality of supply of electricity services.

This Issues Paper outlines and seeks comment on the findings of the AEMO report in relation to the exit point reliability standards and other related matters. AEMO's proposed amendments to the exit point reliability standards are discussed in Section 2 of this Issues Paper, with its proposed amendments to the code discussed in Section 3 and additional connection point studies discussed in Section 4. The reporting of switching incidents, which is an issue raised by the Commission as a matter separate to that of reliability standards, is discussed in Section 5.

The process for finalisation of this review will involve the release of a Draft Decision in July 2011 followed by a Final Decision in October 2011. The resulting amended version of the code will commence from 1 July 2013, co-incident with the commencement of the new regulatory period for ElectraNet.

13 Australian Energy Market Operator, "*Review of the South Australian Electricity Transmission Code*", 23 December 2010. http://www.escosa.sa.gov.au/library/101223-ReviewSAElectricityTransmissionCode-AEMO.pdf

2 AEMO'S PROPOSED AMENDMENTS TO RELIABILITY CATEGORIES

The approach adopted by AEMO in conducting the exit point study involved a probabilistic cost-benefit approach to compare the capital cost of moving to the next reliability category with the value of the increased reliability delivered to the relevant connection point.

The assessment process for each exit point involved the following considerations:

- Calculating the average number of hours each exit point will be without power. This probabilistic method relies on typical failure rate data, which is based on historical observations, and is collected for different categories of equipment (transformers, lines, cables) at different voltage levels.
- Multiplying the number of outage hours by the exit point demand to establish the number of megawatt hours (MWh) that, on average, are unable to be supplied each year.
- Assessing the value of lost customer load or unserved energy,[14] as being the number of lost MWh multiplied by the value of unserved energy to customers.
- For exit points with a high value of lost customer load, comparing the capital cost of upgrading to a higher reliability standard with the benefit in reduced unserved energy provided by the upgrade.

This economic assessment technique used by AEMO was used in the previous review of the code during 2005/06 as an appropriate means by which the impacts of reliability improvements on the long-term interests of consumers can be considered.

In conducting such assessments, various matters arise in terms of the structure of the categories, resulting in recommendations by AEMO for some amendments to the categories.

> *Issue 1.*
>
> *The Commission seeks stakeholder comment on AEMO's assessment methodology for proposed category upgrades based on annual cost of unserved energy.*

2.1 AEMO's methodological assumptions

The AEMO exit point study was based on assumptions made on the components listed below. A more complete description of the assessment methodology and the assumptions used can be found in Section 4 of the AEMO report.

[14] The unserved energy reliability standard is a measure of the expected amount of energy at risk of not being delivered to consumers due to a lack of available capacity. Refer "Reliability Standard and Reliability Settings Review" 30 April 2010 www.aemc.gov.au

2.1.1 Network Demand

The maximum demand forecasts at connection points used for the AEMO assessment are ETSA Utilities' medium growth connection point forecasts and represent the summer peak demand forecasts.

AEMO argues that transformers are more likely to fail when under stress during peak load periods, and hence the forecast maximum demand was assumed for calculating the value of expected unserved energy due to transformer outages. Transmission line and cable faults are generally less dependent on line loading and as such, an average load factor was used to convert the maximum demand to average demand, which was then used when calculating the value of expected unserved energy due to line outages.

An average load factor was used for calculating the value of expected unserved energy due to line outages and expected unserved energy during planned outages, including demand not met due to forced outages for planned maintenance. The average load factor applied to all connection points was 49% and was based on the 2009/10 South Australian total system load duration curve.

2.1.2 Transmission system reliability

The expected hours of unserved energy per annum for each connection point was calculated using ElectraNet's historical data on the average failure rates and outage durations due to planned and unplanned outages which was compared with industry-wide statistics for consistency.

When applying the failure rates it was assumed that single supply lines are maintained through live line techniques to minimise supply outages to radial connection points. It has also been assumed that single supply lines have zero annual maintenance outage hours.

Overhead transmission lines are shown to be highly reliable and terminal stations connected by four or more transmission lines, such as Para, Davenport, and Robertstown, are expected to be particularly reliable points of supply. The probability of having three or more concurrent line outages is very low and therefore these supply points are almost always expected to be capable of supplying power to the local transmission network. It is the reliability of the transmission network directly supplying a connection point that predominantly determines the overall connection point reliability.

Probabilistically, these highly reliable supply points are expected to contribute negligible unserved energy, with the majority of unserved energy being caused by the network connecting these supply points to the connection point.

Highly reliable terminal stations with four or more connecting transmission lines have been used as reference points, and the reliability of each connection point

was based on the transmission plant reliability between these supply points and each connection point.

2.1.3 Value of customer reliability (VCR)

A set of VCR values for the Victorian region were originally estimated in 1997 using direct survey methods. This work was updated in 2002 and 2008 and is indexed to Victorian income measures between surveys so that the values are updated annually to reflect current income growth and consumption shares for identified economic sectors (agricultural, industrial, commercial, and residential).

In 2010, AEMO undertook to develop VCR estimates for regions other than Victoria using existing Victorian survey data to calculate VCRs. The 2007 VCR for each sector and each region was updated to 2010 values using the indexation method.

The regional data on outages and sector consumption were provided by the distribution network service providers (DNSPs) within each region.

The VCR developed for South Australia was $45,767/MWh (in 2010 Australian dollars), and was used by AEMO as a base value in its report. The sensitivity analysis for this VCR applied values of $38,240 and $53,295 (in 2010 Australian dollars).

2.1.4 Transmission upgrade costs

Transmission augmentation projects were nominated by ElectraNet. These augmentation projects and the associated transmission costs are outlined in ElectraNet's Annual Planning Report[15]. Where included, additional distribution costs were provided by ETSA Utilities, based on recent connection cost estimates obtained for similar projects.

Sensitivity analysis was performed with variations of ±30% on these cost estimates.

A comparison of the transmission augmentation costs supplied by ElectraNet and the costs used by AEMO when undertaking its planning functions found the two to be reasonably consistent

2.1.5 Economic assumptions

AEMO's cost-benefit assessment was performed for the period from 2010/11-2029/30. Based on information provided by ElectraNet, a new transformer was assumed to have an asset life of 45 years, and a new transmission line or underground cable was assumed to have an asset life of 55 years.

[15] Refer to ElectraNet web site http://www.electranet.com.au/assets/Uploads/annualplanningreport2010.pdf

The annual payments resulting from each investment were calculated using the appropriate asset life and an assumed real discount rate of 10% (for the base case), with sensitivities of 7% and 13%. These assumptions are consistent with the RIT-T, which specifies that the assessment must use a commercial discount rate appropriate for the analysis of a private enterprise investment in the electricity sector.

The RIT-T also suggests that the sensitivity testing should be performed with the lower bound being the AER mandated regulatory real pre-tax weighted average cost of capital (WACC) for transmission investments.

The annual capital costs payments and the costs of unserved energy were discounted to a net present value using the same discount rates (and sensitivities). A terminal value approach was used to reflect the value of the capital expenditure and the unserved energy at the end of the assessment period (2029/30). To calculate the terminal value it was assumed that the last year's unserved energy costs continued in perpetuity.

Issue 2.

The Commission seeks stakeholder comment on the assumptions used by AEMO for its review of the exit point reliability standards.

2.2 Specific exit point categories

When assessing the value of expected unserved energy on a probabilistic basis, AEMO found that the Category 1 exit points at Baroota and Dalrymple showed a positive net present value based on the capital cost estimates to install a new supply transformer at each connection point.

AEMO noted that its economic assessment identified that upgrading the reliability of supply at both the Baroota and Dalrymple exit points from Category 1 to Category 2 is economically appropriate within ElectraNet's upcoming regulatory period (2013-2018).

In addition, AEMO recommended changes to Category 5 and Category 6 to clarify the supply requirements to Adelaide Central and Adelaide's surrounding suburbs.

The full cost-benefit assessment results supporting each recommendation are included in Appendix F of the AEMO report. Sensitivities to the base assumptions are included in Appendix B of the report.

2.2.1 Category 1 connection points - Baroota and Dalrymple

Currently, Baroota and Dalrymple are among the few remaining Category 1 exit points (other than small pumping station loads and remote mining sites). The AEMO report recommends increasing the reliability standard of these two exit

points from Category 1 to Category 2 i.e. from 'N' (line and transformer) to 'N' (line) and 'N-1' (transformer); thus adding a level of redundancy at each exit point.

Baroota has a forecast maximum demand of approximately 10MW, and Dalrymple has a forecast maximum demand of approximately 12MW. The assessment of each exit point by AEMO shows that installing an additional exit point transformer is economically justifiable based on the expected level and annual cost of unserved energy. Each installation requires both transmission and distribution elements to be augmented.

Table 3 and Table 4 show the net benefits of installing additional transformers at Baroota and Dalrymple within the 2013-2018 regulatory period. Sensitivities to VCR, discount rate and augmentation costs can be found in Appendix D of the AEMO report, while detailed connection point assessments for these and other connection points can be found in Appendix F.

Baroota

AEMO noted that the estimated capital cost to install a new transformer at Baroota is $22 million, comprising $14 million transmission works by ElectraNet (with supply of the transformer), and $8 million associated distribution works by ETSA Utilities.

The expected unserved energy at the Baroota connection point in 2017/18 is approximately 103MWh. With the installation of a second transformer at Baroota, the expected unserved energy decreases to approximately 7MWh, which AEMO noted will result in savings of almost $4.4 million from the unserved energy avoided in that year alone.

AEMO also noted that the 33kV sub-transmission network can also connect Baroota to the Bungama exit point. That sub-transmission network connection is operated in a "normally-open" configuration and, although the sub-transmission network can be closed to support the Baroota demand during a transmission outage, ETSA Utilities advised that this may not be possible during peak demand periods due to excessive network voltages. Additionally, the sub-transmission network is not capable of supplying the entire forecast demand and has limited automatic change-over capability, with the majority of the Baroota network relying on manual fault finding and restoration.

As a result, and due to the higher expected outage rate of the 33kV sub-transmission network, demand support via sub-transmission is estimated to provide negligible benefits. However, as a matter of course, consideration should be given to sub-transmission network upgrades to meet Category 2 reliability levels, as these may be more cost-effective than installing a second exit point transformer.

Table 3 - Baroota economic assessment

Reliability standard category	2017/18 forecast demand (MW)	Expected unserved energy (MWh/annum)	Annual cost of unserved energy ($USE)
Category 1	10.0	103	$5,548,000
Category 2	10.0	7	$163,000
	Annual Benefits in 2017/18		$4,385,000
	NPV net benefits of augmentation (over 45 year project life)		$13,263,000

Dalrymple

AEMO noted that Dalrymple requires a capacitor bank installation during the 2013-2018 regulatory period resulting in only a modest incremental cost for the new transformer installation. As a result, the estimated capital cost to install a new transformer at Dalrymple is $15 million, comprising $7 million transmission works by ElectraNet (with supply of the transformer), and $8 million of associated distribution works by ETSA Utilities.

The expected unserved energy at the Dalrymple connection point in 2016/17 is approximately 128MWh. With the installation of a second transformer at Dalrymple, the expected unserved energy decreases to approximately 12MWh, resulting in savings of more than $5.3 million of unserved energy avoided in that year alone.

Table 4 - Dalrymple economic assessment

Reliability standard category	2017/18 forecast demand (MW)	Expected unserved energy (MWh/annum)	Annual cost of unserved energy ($USE)
Category 1	12.1	128	$5,615,000
Category 2	12.1	12	$310,000
	Annual Benefits in 2016/17		$5,305,000
	NPV net benefits of augmentation (over 45 year project life)		$27,743,000

AEMO's recommendations

With the Baroota and Dalrymple installations demonstrating positive net economic benefits of approximately $13 million and $28 million (respectively) over the life of the assets, AEMO recommends moving the Baroota and Dalrymple exit points from Category 1 to the Category 2 reliability standard.

To allow reasonable time for the proposed augmentations, the proposed timing for reclassification is as follows:

- Baroota reclassified to Category 2 effective from 1 December 2017; and

- Dalrymple reclassified to Category 2 effective from 1 December 2016.

In considering these recommendations the Commission notes that:

- there is an economic benefit to the electricity customers in these locations by significantly reducing the amount of unserved energy;
- additional transformer capacity can provide significantly improved reliability at relatively modest levels of capital expenditure (typically, an extra transformer is much cheaper than the cost of a new transmission line); and
- the additional transformers will marginally reduce total energy losses.

Issue 3.

The Commission seeks stakeholder comment on:

- *the proposal to upgrade the Baroota and Dalrymple exit points from Category 1 to Category 2 and associated issues; and*
- *the proposed timing of the Baroota and Dalrymple exit point upgrades.*

2.2.2 Category 5 exit points

The Adelaide eastern suburbs exit points of Dry Creek East, Magill (East), and Northfield are Category 5 exit points. AEMO reasoned that these Category 5 exit points currently have a higher reliability standard than the southern, northern, and western suburbs because they form part of the meshed network supplying the Adelaide Central[16] region, including the Adelaide Central Business District.

The transmission line and transformer capacity requirements at Category 5 exit points are defined, in part, by an equation in clauses 2.9.1 and 2.9.2 of the code based on demand at the connection point as well as the demand within the Adelaide Central region as follows;

2.9.1 (c) provide *N-2 equivalent line capacity* for at least X% of Z, where:

(i) Z = the sum of the *agreed maximum demand* for all *connection points* within Category 5 and Category 6;

(ii) X% = $Y\% + \left(\frac{100\% - Y\%}{2}\right)$;

(iii) Y% = $\left(\frac{AMD_{CBD}}{Z}\right) \times 100$; and

(iv) AMD_{CBD} = the *agreed maximum demand* for *Adelaide Central*;

2.9.2 (c) provide *N-2 equivalent transformer capacity* for at least X% of Z, where the terms X% and Z have the meanings given in clause 2.9.1(c);

[16] As defined in the code – the area of Adelaide located east of West Terrace, North of South Terrace, west of East Terrace and south of the River Torrens.

A similar mathematical approach was used in the code prior to the Category 6 reliability standard and was intended to represent the requirement for an increased reliability standard in the Adelaide Central region rather than in the Eastern suburbs themselves.

The 2006 code review established Category 6, which includes the existing East Terrace and the future City West (to be commissioned by 31 December 2011) exit points, which directly serve Adelaide Central, with the intention of defining the Adelaide Central region's current and future reliability standard. However, the previous code review retained Category 5 connection points; Dry Creek East, Magill (East), and Northfield primarily to cover the time until the new City West exit point is commissioned.

As a result, the AEMO report recommends that the exit points in Category 5; namely Dry Creek East, Magill (East), and Northfield be moved back into Category 4, and that the current Category 5 be removed from the code (making current Category 6 into a new Category 5).

The Commission notes that moving these exit points to Category 4 affects the network support arrangements provided by those exit points via the code to the Adelaide Central region. The level of network support defined by the formula in clauses 2.9.1(c) and 2.9.2(c) would become obsolete once City West is commissioned. The current formula is perceived as difficult to understand and moving the current Category 5 exit points to Category 4 simplifies the approach to reliability standards.

Although the current Category 5 exit points noted above may have adequate line and transformer capacity at the moment to supply the Adelaide Central region through either the transmission or distribution system, in the event of a failure of two lines or transformers (which may involve some load shedding in the Eastern suburbs), AEMO is of the view that the requirement for the Adelaide Central area reliability is better expressed by Category 6.

Further discussion on network arrangements and the interdependency between for Adelaide Central and surrounding exit points can be found in section 3.2 of this Issues Paper. Additional exit point studies for Pt Lincoln, the Fleurieu Peninsula and Kadina East can be found in section 4 of this Issues Paper.

Refer to Table 5 below for a summary of the proposed new categories.

Issue 4.

The Commission notes that moving the Category5 connection points to Category 4 does not reduce the reliability standard of the connection points supplying the surrounding suburbs, i.e. the N-1 continuous reliability standard is maintained.

The Commission seeks stakeholders' comment on the recommendation by AEMO to move the current Category 5 exit points to Category 4 (i.e. to provide an N–1 reliability standard, where N–1 is defined as N–1 continuous) and remove the existing Category 5 from code.

2.3 Summary of the proposed changes to exit point categories

Table 5 summarises the allocation of exit points to categories as per the recommendations by AEMO as discussed, noting the inclusion of the Munno Para exit point within the Para and Parafield Gardens West grouped exit point.

Table 5 - Summary of connection point categories

Category	**Connection Point [ ]** = Grouped	
Category 1	• Baroota (until 1 December 2017) • Dalrymple (until 1 December 2016) • Davenport * • Florieton SWER • Kanmantoo Mine • Leigh Creek Coal * • Leigh Creek South • Mannum/Adelaide 1 * • Mannum/Adelaide 2 * • Mannum/Adelaide 3 * • Middleback* • Millbrook * • Morgan/Whyalla 1 * • Morgan/Whyalla 2 *	• Morgan/Whyalla 3 * • Morgan/Whyalla 4 * • Mt Gunson • Murray/Hahndorf 1 * • Murray/Hahndorf 2 * • Murray/Hahndorf 3 * • Neuroodla • Pimba * • Roseworthy* • Stony Point (Whyalla Refiners) - distribution • Stony Point* • Whyalla LMF • Woomera* ** denotes a customer but does not include a distributor*
Category 2	• Ardrossan West • Baroota (on and from 1 December 2017) • Dalrymple (on and from 1 December 2016)	• Kadina East • Wudinna • Yadnarie
Category 3	• Port Lincoln	• Snuggery Rural
Category 4	• Angas Creek • Berri/Monash • Blanche • Brinkworth • Clare North • Coonalpyn West • Dorrien • Templers • Hummocks • Keith • Kincraig • Mannum • Mobilong • Mt Barker • Mt Gambier	• North West Bend • Penola West • Playford (Davenport West) • Snuggery Industrial • Tailem Bend • Waterloo • Whyalla Terminal – Main Bus • [Bungama and Pt Pirie] • [Dry Creek West, Kilburn, LeFevre, New Osborne and Torrens Island 66kV] • [Happy Valley, Magill (South) and Morphett Vale East] • [Para, Munno Para and Parafield Gardens West] • [Dry Creek East, Magill (East) and Northfield]
Category 5	• Adelaide Central [East Tce, City West]	

3 AEMO'S PROPOSED AMENDMENTS TO THE ELECTRICITY TRANSMISSION CODE

This section outlines particular amendments to the code proposed by AEMO in its review. Proposed wording amendments are included to explain the context of the amendments. AEMO's proposed wording is presented in red to assist in identifying the proposed amendments.

3.1 Timeframe to remedy exit point reliability breaches

Network planning by ElectraNet to meet the transmission code reliability standards is based on contracted agreed maximum demand. Currently, the agreed maximum demand is contracted on a 12-month forecast and could be considered to provide limited opportunity for planning. A small error in the demand forecast would not have a significant impact. However, if the demand forecast is substantially over-calculated, the TNSP could be forced to invest unnecessarily to meet what may be perceived as an illusory reliability standard.

The majority of transmission network augmentations have protracted lead-times. It is therefore inevitable that the reliability standard will rarely be achieved within the 12-month obligation to rectify a breach under the code provisions. AEMO noted that it was advised by ElectraNet of the difficulty it experienced in receiving regulated funding to complete augmentations within the 12-month best endeavours period because of the timeframe permitted by the code to rectify such a breach within a 3-year period.

Clause 6.3.1 of the code aids in reducing the likely period of breach by placing a best endeavours obligation on the transmission entity to obtain planning approvals and acquire easements based on forecasts prior to agreed maximum demand breaching the required reliability standard.

Due to the difficulties in contracting agreed maximum demand beyond a 12-month forecast, AEMO has recommended that clause 6.3.1 be expanded to include forecast agreed maximum demand and a best endeavours obligation on the transmission entity to complete all necessary design work, approvals and acquisitions outlined as follows:

> *6.3.1. A **transmission entity** must use its **best endeavours** to complete all necessary design work, obtain all necessary planning approvals and acquire all necessary land and easements on the basis of forecast demand prior to **forecast agreed maximum demand** breaching the reliability standards in this industry code so as to ensure they are in a position to meet their obligations.*

Consistent with this recommendation, AEMO has also proposed wording for a new definition to be included in the section 10.1 (definitions) of the code, as follows:

> ***Forecast agreed maximum demand** means the **agreed maximum demand** forecast for a given year that is provided by the customer three years prior to when the **agreed maximum demand** is contracted.*

AEMO suggests that the proposed amendments to clause 6.3.1 should assist in reducing any breach period and proposes that the 3-year grace period should be removed from the code to clarify the application of the 12-month best endeavours obligation to rectify any breach.

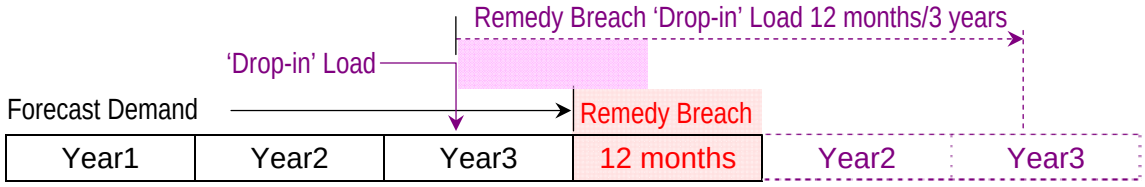
Under this proposed amendment, changes to each of clauses 2.6.3, 2.7.3, 2.8.3, 2.9.3 and 2.10.3 will be required, demonstrated as follows:

> *2.6.3. In the event that **forecast agreed maximum demand** at a **connection point** or group of **connection points** exceeds the **equivalent transformer capacity** standard required by this clause 2.6, a **transmission entity** must:*
>
> *(a) ~~use its **best endeavours** to~~ ensure that the **equivalent transformer capacity** at the **connection point** or group of **connection points** meets the required standard within 12 months~~; and~~*
>
> *~~(b) ensure that the **equivalent transformer capacity** at the **connection point** or group of **connection points** meets the required standard within 3 years.~~*

However, the eventual contracted agreed maximum demand may possibly exceed the forecast agreed maximum demand as a result of unanticipated increases in load growth or increases in demand such as 'drop-in' customer spikes that were obviously not included in the forecast demand. To avoid such unforeseen demand increases giving rise to a possible reliability breach, the AEMO report recommends the inclusion of the following additional clause which allows such a breach to be remedied within a 3-year period rather than 12 months represented diagrammatically in Figure XX);

> *6.3.2. A **transmission entity** must ensure a breach in the reliability standard is remedied within 12 months of the **forecast agreed maximum demand** exceeding the reliability standard. In the case of a breach not appearing in the **forecast agreed maximum demand** prepared 3 years prior, such breach is excluded from the 12 month obligation and the **transmission entity** must use its **best endeavours** to remedy the breach within 12 months from the time of the breach and must, in any case, remedy the breach within three years from the time of breach.*

Figure 1 – Timeline of remedy of breach of reliability standards



The Commission notes that the magnitude of what could be determined unanticipated increases in load or 'drop-in' loads should be specified for the purposes of AEMO's proposed clause 6.3.2.

The tightening of the timeframe to a mandatory obligation of 12 months provides greater certainty in resolving a breach of the reliability standards. The 3-year agreed forecast demand period presents an extended forward planning window and should provide the appropriate indicators as to the probability of a breach of the reliability standard at a given connection point. The NER prescribes minimum planning period[17] for the purposes of the annual planning reviews for distribution and transmission network service providers. ETSA Utilities provides 10-year connection point demand forecasts to ElectraNet which ElectraNet uses in its Annual Planning Report in determining network planning on a 20-year horizon. Trend analysis of the forecast demand data should also provide an indication of load growth areas.

Issue 5.

In amending the timeframe to remedy a breach of the reliability standards in the Electricity Transmission Code, a number of amendments proposed by AEMO are to be considered, namely;

- *the amendment of clause 6.3.1;*
- *the introduction of a new definition of forecast agreed maximum demand;*
- *the amendment of clause 2.6.3, 2.7.3, 2.8.3, 2.9.3 and 2.10.3; and*
- *the introduction of new clause 6.3.2*

The Commission seeks comment on the proposal to amend the timeframe to remedy a breach of the reliability standards and the amendments to the code above. The Commission also seeks stakeholder views on any other matters that may further clarify ElectraNet's responsibilities in resolving breaches, simplifying the definition of timelines and allowing for the impact of unanticipated increases in demand and unforeseen 'drop-in' customers (and specification of their limits) in the planning and remediation process.

3.2 Supply to Adelaide Central and surrounding suburbs

As noted in section 2.1.2 of this Issues Paper, AEMO has recommended that the current Category 5 exit points should be moved to Category 4. This would render obsolete the provision for calculating the level of network support for the Category 6 (Adelaide Central)[18] exit points from the surrounding Eastern suburbs network. The reliability standards and the interdependency between the Adelaide Central area and surrounding suburbs are discussed further in this section with further recommendations by AEMO as a practical consequence of the recommendations in section 2 and to provide greater clarity to the code provisions.

[17] Refer NER rule 5.6.2(d) http://www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html

[18] Adelaide Central (mainly comprising the Adelaide CBD) is in reliability Category 6, the category with the highest reliability standard due to its location and because it has the highest density of government, business and commercial activity in the State.

Under current code provisions, Category 5 and Category 6 exit points comprise some grouped exit points that, together with ETSA Utilities' meshed sub-transmission network, supply Adelaide Central and surrounding suburbs. The current provisions of the code are intended to deliver a highly reliable electricity transmission supply to Adelaide Central and Adelaide's surrounding suburbs.

The existing Category 5 requires ElectraNet to provide transmission line capacity and transformer capacity at the grouped exit points of Dry Creek East, Magill and Northfield, as follows:

- N-1 equivalent capacity for 100% of agreed maximum demand equal to that of Adelaide's surrounding eastern suburbs' load;
- N-1 equivalent capacity for 100% of agreed maximum demand equal to that of Adelaide Central's load;
- N-2 equivalent capacity for 50% of agreed maximum demand equal to that of Adelaide's surrounding eastern suburbs' load; and
- N-2 equivalent capacity for 100% of agreed maximum demand equal to that of Adelaide Central's load (obligation via Category 5) post 31 December 2011.

Importantly, this required level of reliability is for the Dry Creek East, Magill, and Northfield group of transmission exit points, and not the main Adelaide Central (Category 6) exit point of East Terrace.

For the Adelaide Central Area, the code currently provides that ElectraNet is to provide N transformer and transmission line capacity until the end of 2011, after which time it is required to provide N-1 transformer and transmission line capacity. That N-1 capacity is itself required to be provided by means of an independent and diverse substation located west of King William Street. That substation is currently under construction by ElectraNet and is referred to as the City West substation. [19]

This regime was established by the Commission in 2006. In its Final Decision on exit point reliability standards, the Commission noted that:

> *For connection points that are assigned to Category 6 (being any connection points for the Adelaide Central area), the Commission's Final Decision is that ElectraNet will be required, from 1 July 2008, to provide a level of reliability for transmission lines and transformers such that:*
>
> - *until 31 December 2011, 100% of AMD can be supplied provided that all relevant lines and transformers are in service (that is, an N reliability standard); and*
> - *after 1 January 2012, 100% of AMD can be supplied provided that all relevant lines and transformers are in service, even in the event that one line or transformer is out of service (that is, an N-1 reliability standard).*

[19] Refer ElectraNet website: http://www.electranet.com.au/network/current-planned-developments/near-metro/adelaide-central-reinforcement/

This outcome is achieved through specification of standards for transmission line and transformer capacity for two distinct periods (1 July 2008 to 31 December 2011; and 1 January 2012 onwards). There are two elements to that process, with the second element further divided based on the two time periods. First, ElectraNet is prohibited (by clauses 2.10.1(a) and 2.10.2(a) respectively) from contracting with its customers to deliver amounts of AMD in excess of 100% of the installed line or transformer capacity.

Secondly, the reliability standards for both transmission lines and transformers are specified by reference to requirement in the period 1 July 2008 to 31 December 2011 and then from 1 January 2012 onwards.

In relation to the period 1 July 2008 to 31 December 2011, clauses 2.10.1(b) and 2.10.2(b) require ElectraNet to be able to supply AMD provided that all relevant lines and transformers are in service. That is, the required standard for both transmission lines and transformers for this period is N.

After 1 January 2012, clauses 2.10.1(c)(i) and 2.10.2(c)(i) require ElectraNet to be able to supply AMD even in the event that one transmission line or transformer (noting that equivalent capacity is not applicable to Category 6 – all capacity must be actual capacity) is out of service; i.e. the standard applicable after 1 January 2012 is N-1.

Supporting the requirements of clauses 2.10.1(c)(i) and 2.10.2(c)(i) in relation to the N-1 standard, clauses 2.10.1(c)(ii) and 2.10.2(c)(ii) require the relevant capacity to be provide by means of independent and diverse substations, which must be commissioned and available by 1 January 2012, one of which must be located west of King William Street. This mandatory obligation, which is unusual in its specificity, is appropriate in this case to ensure diversity in the transmission system supplying the Adelaide Central area.[20]

It is to be noted that, notwithstanding the current N and N-1 obligations on ElectraNet established under the code, there is some inherent operational network support capacity for Adelaide Central which is provided by ETSA Utilities' network. That support, while not mandated as a regulatory exit point reliability requirement under the code, provides ElectraNet with operational redundancy for Adelaide Central – but only following switching and the possible loss of up to 50% of the load in the eastern suburbs of Adelaide, depending on load conditions at the time. As has been previously recognised by the Commission, the capacity for ETSA Utilities to provide this level of network support is expected to diminish over time due to demand growth in Adelaide Central and surrounding suburbs.[21]

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[20] Essential Services Commission, Review of the Reliability Standards specified in clause 2.2.2 of the Electricity Transmission Code, Final Decision, pages 39 to 40. Available at http://www.escosa.sa.gov.au/library/060906-ElectricityTransmissionCode-ReliabilityStandards-FinalDecision.pdf

[21] Essential Services Commission, Review of the Reliability Standards specified in clause 2.2.2 of the Electricity Transmission Code, Final Decision, pages 25 to 26 and page 31. Available at http://www.escosa.sa.gov.au/library/060906-ElectricityTransmissionCode-ReliabilityStandards-FinalDecision.pdf

3.2.1 AEMO's proposal

In its report, AEMO has noted this underlying operational network support provided to Adelaide Central by ETSA Utilities' sub-transmission and distribution network and the fact that, following the commencement of the N-1 exit point reliability standard for that area from 2012, it will operationally be the case that, in certain circumstances, equivalent operational N-2 reliability may be achieved. The AEMO report therefore suggests that, to the extent that there is a need for an enhanced standard to be mandated for Adelaide Central, the code would need to be amended in that regard.

If this were to be the case, AEMO recommends that the reliability standards be reworded to provide:

- N-1 capacity to Adelaide Central without interruption (as currently prescribed);
- Interruptible N-2 capacity to Adelaide Central from a combination of Adelaide Central and outer suburban connection points (and supporting distribution networks); and
- N-1 capacity to the suburbs surrounding Adelaide Central.

To achieve this, AEMO recommends that the following would need to be implemented:

- as set out in section 2.1.2 of this Issues Paper, deleting the current Category 5 and moving the current connection points to Category 4 (making current Category 6 into a new Category 5), and
- rewording the new Category 5 to include a code requirement for the new Category 5 to have an N-1 continuous and an interruptible N-2 reliability standard to Adelaide Central.

3.2.2 Commission commentary

The Commission notes that the proposal suggested by AEMO would involve a change to the position adopted by the Commission in 2006. That is to say, in 2006 the Commission, relying on advice from the then Electricity Supply Industry Planning Council, determined that the relevant regulatory standard to apply to ElectraNet for exit point reliability into the Adelaide Central area should move from N to N-1 from 2012.

While the Commission considered the need for further enhancement of exit point reliability for Adelaide Central during the 2006 review, at that time it concluded that:

> *Taking into consideration the very high costs associated with reinforcing supply to the Adelaide Central area with additional transmission entry points, the Commission is satisfied that the risk of sustained outages in the Adelaide Central area is minimised if ElectraNet installs an additional*

independent and diverse transmission entry point into the Adelaide Central area in the near future.[22]

The Commission went on to note that the existence of ETSA Utilities' network support as described above would provide an equivalent operational N-2 outcome in certain circumstances, albeit that the reliability of that outcome would diminish over time given load growth.

The question which arises from AEMO's report is whether or not, having established but not yet implemented (in the sense that the City West substation is not required to be operational until 1 January 2012) the formal N-1 exit point reliability standard, the Commission should consider further enhancing the exit point reliability standard for, or some time during, the 2013 to 2018 regulatory period?

Ultimately this is a question which is to be answered on efficiency grounds through the conduct of a cost/benefit analysis in a manner consistent with the provisions of the NER. Such an analysis needs to consider not only whether there is overall benefit in providing a higher level of support to the Adelaide Central Area which would outweigh the likely significant cost impost placed on consumers, but also the means by which that may be achieved.

In that context it is important to confirm the Commission's position, as noted at the outset of this Issues Paper, that exit point reliability standards apply to ElectraNet and that it is the responsibility of ElectraNet to meet and fund implementation of those standards in the most efficient economic and technical manner possible. To the extent that any operational capacity provided by ETSA Utilities may be used in a future requirement (if any) to meet an enhanced standard, procurement of that capacity will be a matter which ElectraNet would be required to fund and manage.[23]

Having regard to the foregoing, the Commission is seeking stakeholder comment on the need, if any, to further enhance the reliability standard for the Adelaide Central Area for the 2013 to 2018 regulatory period. In doing so, the Commission notes that it is necessary to consider the costs and benefits of such a change and it has therefore sought further advice from AEMO on those matters. That subsequent advice will be published by the Commission in the next stage of this review to further inform the debate. In the interim, however, the Commission remains keen to understand stakeholders' initial responses on this matter,

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22 Essential Services Commission, Review of the Reliability Standards specified in clause 2.2.2 of the Electricity Transmission Code, Final Decision, page 27. Available at http://www.escosa.sa.gov.au/library/060906-ElectricityTransmissionCode-ReliabilityStandards-FinalDecision.pdf

23 While this is the case in circumstances where ElectraNet chooses to use network support provided by ETSA Utilities to meet a code exit point reliability standard, it should be noted that in some cases ETSA Utilities may need to augment its own network to transfer capacity from an ElectraNet substation which has itself been augmented to meet a code reliability standard. In those cases, ETSA Utilities has the responsibility of funding such augmentation through NER revenue determination processes.

including any details of costs or benefits which they may identify in either keeping the current standard or moving to a new standard.

Issue 6.

Noting that the current provisions of the code require the provision by ElectraNet of an N-1 exit point reliability standard to the Adelaide Central Area from 1 January 2012 and that this level of reliability will be provided by independent and diverse transmission entry points which themselves come from diverse parts of the ElectraNet network, the Commission seeks stakeholder comment on whether or not there is a need to amend the code to further enhance the reliability standard (whether interruptible or continuous) to Adelaide Central during the 2013 to 2018 regulatory period.

In particular, the Commission seeks comment on the need for a heightened level of reliability and the costs and benefits associated with such a proposal.

3.3 Planning

In addition to the obligations of the NER[24] for joint planning, the AEMO report proposes that a new clause be included under section 6 of the code, outlined as follows:

> *6.4.1 Where the most economically feasible option to meet the reliability standards of clauses 2.5 to 2.10 relies on a combination of transmission and sub-transmission services, the **transmission entity** must ensure that the reliability standard required by that category is capable of being delivered to the **agreed maximum demand** points within that category, including for any contingency events that the category requires for that reliability category.*

This proposal reinforces the view of the Commission that it is ElectraNet's responsibility under the code to ensure that, where the best option to meet its exit point reliability obligations (whether transmission or non-transmission), such options are firm, robust and available to meet the needs of South Australian consumers.

Issue 7.

The Commission seeks comment on the appropriateness of the proposal by AEMO to include an additional clause in the code as set out above.

3.4 Limitation on supply from non-network support

Currently, to meet the reliability standards, the agreed maximum demand for each connection point category must not exceed 100% of line capacity or 100% of transformer

[24] Refer NER Clause 5.6.2 (c) http://www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html

capacity or, in the case of Categories 1, 2 and 3, 120% of line or transformer capacity where appropriate network support arrangements are in place.

However, limiting the agreed maximum demand based on network capability may impose transmission network augmentation on ElectraNet notwithstanding that a more cost-efficient, reliable option of local non-transmission support may be available.

AEMO has put a view that the amount of supply that can be provided from network support arrangements or non-network support options should be based on the reliability and economics of utilising non-network support in comparison with augmenting the transmission network.

The Category 3 connection point at Pt Lincoln is a case in which investment in local generation is more cost efficient to meet the required reliability standard as compared to duplicating the transmission line that supplies Pt Lincoln (refer Appendix A of the AEMO report).

However, where a network support arrangement provides a high proportion of network capacity, i.e. greater than 120%, it sh6ould provide the equivalent level of reliability that would be required of the transmission network.

As such, the AEMO report recommends the removal of clauses 2.5.1(a), 2.5.2(a), 2.6.1(a), 2.6.2(a), 2.7.1(a), 2.7.2(a), 2.8.1(a), 2.8.2(a), 2.9.1(a), 2.9.2(a), 2.10.1(a) and 2.10.2(a) from the code, leaving the option on how to provide equivalent line capacity to the transmission entity, as shown by the following example:

*2.6.1. For **transmission line** capacity, a **transmission entity** must:*

~~*(a) not contract for an amount of **agreed maximum demand** greater than:*~~

~~*(i) 100% of installed **transmission line** capacity ; or*~~

~~*(ii) where the **transmission entity** has appropriate **network support arrangements** in place, 120% of installed **transmission line** capacity;*~~

*(b) provide **equivalent line capacity** for at least 100% of contracted **agreed maximum demand**.*

To ensure the above proposed amendments do not lead to a reduction in the level of reliability, or to place undue reliability obligations on generators that are only contracted to provide supply during peak demand periods, AEMO proposes the following amendments and new clauses in place of the existing clause 2.11.1:

*2.11.1 In providing **equivalent** **transmission line** capacity or **equivalent** **transformer** capacity for the purposes of this Chapter 2 by means of a **network support arrangement** a **transmission entity** must:*

*(a) In the case of network support arrangements providing up to 20% of **agreed maximum demand**, ensure that the **network support arrangement** delivers the required **equivalent line capacity** or **equivalent transformer capacity** within the prescribed timeframe on at least 95% of occasions on which it is sought to be utilised within any 12 month period ending on 30 June.*

*(b) In the case of a **network support arrangement** providing above 20% of **agreed maximum demand**, ensure that the **network support arrangement** delivers the equivalent level of reliability that could reasonably be expected from a transmission network option.*

*2.11.2. Where the required reliability level or supply capability relies on a **network support arrangement**, the **transmission entity** should ensure the capability and availability of the **network support arrangement** by entering into a network support agreement with each network support provider.*

The proposed amendments allow the reliability of network support arrangements to be lower if they are only in place for peak shaving requirements. However, if the network support arrangement is in place to supply a higher proportion of the demand it is required to have an equivalent level of reliability that would be expected from a transmission network option.

To achieve an equivalent level of reliability from network support arrangements, as can reasonably be expected from a transmission network option, it is anticipated that the network support options will require additional levels of redundancy. An example of such arrangements is provided on page 26 of the AEMO report.

In support of the proposed code amendments, AEMO suggests that limiting the supply that can be provided by network support arrangements potentially conflicts with the NER's intent where non-network options must be considered as alternatives to network augmentation.

Issue 8.

The Commission seeks comment on the recommendation by AEMO for the removal of clauses 2.5.1(a), 2.5.2(a), 2.6.1(a), 2.6.2(a), 2.7.1(a), 2.7.2(a), 2.8.1(a), 2.8.2(a), 2.9.1(a), 2.9.2(a), 2.10.1(a) and 2.10.2(a) from the code, leaving the option on how to provide equivalent line capacity to the transmission entity.

The Commission also seeks the views of stakeholders on the proposed amendments to clause 2.11.1 and the introduction of clause 2.11.2 which seek to deliver the appropriate level of reliability where network support options are utilised.

3.5 Murraylink capability and assessment of reliability standards

ElectraNet currently includes the capability of Murraylink in its assessment of the Riverland area reliability which is captured in ElectraNet's connection agreement with Murraylink for the provision of prescribed transmission services. ElectraNet is also reliant on AEMO for the available level of inter-regional transfer capacity (i.e., via the constraint equation) at times of peak demand.

Transfer from Victoria to South Australia via the Murraylink interconnector is determined by limitations in regions other than just South Australia such as voltage stability and thermal line constraints in Victoria. The design transfer capability of 220MW is based on a Victorian demand of 9,600MW. This transfer capability decreases by approximately 5MW per 100MW increase in Victorian demand above 9,600MW.

Essentially, the AEMO report recommends that the capacity of Murraylink should be calculated using the Murraylink transfer limit equation and assuming worst-case peak-demand conditions, including applying the Victorian maximum demand forecast. In addition, AEMO considers it appropriate for ElectraNet to approach other TNSPs to undertake joint planning (as required by the NER) to identify the most economically viable solution to meet their reliability standards.

The recommended inclusion of a new clause 6.4.1 (refer section 3.3 of this Issues Paper) promotes identification of the most economically viable reliability solution whether it requires augmentation of any utilities' transmission or distribution networks or new generation. AEMO proposes a further extension to this new clause to assist in clarifying the treatment of Murraylink's capability and to ensure that contingencies in networks other than ElectraNet's transmission system are considered in meeting the reliability standards.

This is because contingencies in the sub-transmission network or other regions can potentially have a higher impact on supply capability through Murraylink than outages on ElectraNet's transmission network. The additional sub-clauses under the new joint planning clause are proposed by AEMO as follows:

> *6.4.2. A **transmission entity** which provides **equivalent transmission line capacity** or **equivalent transformer capacity** for the purposes of Chapter 2 must consider network plant failures in any NEM region, including distribution systems, where such plant failures might impact on the applicable level of redundancy or reliability.*
>
> *6.4.3. For the purpose of assessing **connection point** reliability, the capability of the Murraylink interconnector should be calculated using the Murraylink transfer limit equation under peak Victorian demand conditions.*

Issue 9.

The Commission notes that network plant failures and demand in associated NEM regions can influence the achievement of reliability standards where there is a dependence on interconnection. Having regard to that matter, should these influences be considered in assessing the overall value in meeting the transmission reliability standards for South Australia? If so, should consideration of such influences be only limited to Victoria or should the wider impacts of the interconnected transmission network e.g. other inter-regional constraints, be considered?

The Commission seeks the views of stakeholders on the proposed introduction of clauses 6.4.2 and 6.4.3 which are designed to clarify the capability of the Murraylink interconnector.

3.6 Clarification that Category 3 loads have an N-1 interruptible reliability level

The N-1 capacity of Category 3 loads can be provided by transmission system capability, distribution system capability, generation capability, or any combination of these where load interruptibility may be required to meet the reliability standard.

There are two Category 3 connection points; Pt Lincoln and Snuggery. The Pt Lincoln connection point is interruptible as, once transmission supply is lost, back-up generation, which requires time to start up, must be brought on-line and associated switching must occur prior to restoration. Therefore, while there is N-1 capability, that capability can only be invoked once those processes have occurred.

When an interruption occurs at Snuggery, manual switching is required for network restoration. Restoration of the equivalent line and transformer capacity at these two connection points must occur within one hour. These operations required to restore supply after interruption are referred to as "post-contingent operations".

Without altering obligations under the existing Category 3 reliability standards, AEMO recommended that clause 2.7.1 (b) and 2.7.2 (b) be expanded to further clarify what it considers to be "the intent", and confirm that Category 3 loads do not require an N-1 supply on a firm, uninterruptible basis.

As a result, AEMO proposes the expansion of clause 2.7.1 (b) and 2.7.2 (b) to include the phrase "through post-contingent operation" as follows:

> *2.7.1 (b) provide **equivalent line capacity** such that at least 100% of **agreed maximum demand** can be met, through post-contingent operation, following the failure of any relevant **transmission line** or **network support arrangement**;*
>
> *2.7.2 (b) provide **equivalent transformer capacity** such that at least 100% of **agreed maximum demand** can be met~~,~~ through post-contingent operation~~,~~ following the failure of any installed **transformer** or **network support arrangement**;*

Issue 10.

The Commission seeks comment on the proposed amendment of clauses 2.7.1(b) and 2.7.2(b) which would provide that Category 3 loads do not require an N-1 supply on a firm, uninterruptible basis.

3.7 Quality of supply and system reliability

Clause 2.1.1 and 2.1.2 are concerned with the quality of supply and system reliability respectively and require that ElectraNet not shed load and minimises the likelihood of load shedding in developing and operating the transmission network and transmission system. This is designed to ensure that load is not shed by ElectraNet under normal and reasonably foreseeable operating conditions in the planning, development and operation of its network to achieve the reliability standards.

Although it is understood that these clauses relate to the quality of transmission services, rather than the reliability standards, AEMO believes that these clauses can potentially be misinterpreted to contradict the reliability standards defined in the code.

To clarify the intent of the code, AEMO recommends that clauses 2.1.1 and 2.1.2 be modified to be subject to the clause 2 reliability standards, as follows:

> 2.1.1. Subject to the service standards specified in this clause 2, a ***transmission entity*** must use its ***best endeavours*** to plan, develop and operate the ***transmission network*** to meet the standards imposed by the ***National Electricity Rules*** in relation to the quality of ***transmission services*** such that there will be no requirements to shed load to achieve these standards under normal and reasonably foreseeable operating conditions.
>
> 2.1.2. Subject to the service standards specified in this clause 2, a ***transmission entity*** must use its ***best endeavours*** to plan, develop and operate the ***transmission system*** so as to meet the standards imposed by the ***National Electricity Rules*** in relation to ***transmission network*** reliability such that there will be minimal requirements to shed load under normal and reasonably foreseeable operating conditions.

Issue 11.

The Commission seeks comment on the appropriateness of AEMO's proposed amendment of clauses 2.1.1 and 2.1.2 which AEMO considers will assist in avoiding any misinterpretation of the reliability standards regarding load shedding in the code.

3.8 New connection points

Clause 2.12 of the code outlines ElectraNet's approval process for establishing new connection points.

Consistent with AEMO's understanding of the intent of the transmission reliability standards, AEMO recommends that the requirement to consult with the Commission on the establishment of new connection points be clarified so that it only applies to new transmission customer and distributor connection points, and not new generator

connection points. AEMO has therefore recommended that clause 2.12.1 be amended as follows:

> 2.12.1. Where a new **transmission customer** or **distribution** **connection point** is provided by a **transmission entity,** the **transmission entity** must submit the application standards for that **connection point** to the **Commission** for approval. The standards submitted must be developed having regard to:
>
> (a) any recommendations of ~~**Planning Council**~~ AEMO;
>
> (b) the size of the load;
>
> (c) the value of lost load and types of **customers**;
>
> (d) the number of customers;
>
> (e) the distance from **Adelaide Central**; and
>
> (f) the cost of installation of transmission assets relevant to the **connection point**.

Issue 12.

The Commission seeks comment on AEMO's proposed amendment of clause 2.12.1 to ensure that it cannot be interpreted as applying to new generation connection points.

4 ADDITIONAL CONNECTION POINT STUDIES

In addition to the Baroota and Dalrymple connection point analysis, AEMO has included additional connection point studies which can be found in Appendix A of the AEMO report which it considers worth noting due to the level of expected unserved energy.

The connection point reliability at Pt Lincoln and the capacity of the electrical supply system to the Fleurieu Peninsula are of particular interest to the Commission as the level of reliability at Pt Lincoln is perceived as "degrading" with no available alternative transmission line options and the Fleurieu Peninsula is experiencing steady and firm growth. The Kadina East and Pt Lincoln connection points were identified by AEMO for detailed assessment due to the amount of expected unserved energy.

Pt Lincoln

The AEMO report notes ElectraNet's concerns regarding the need for major line augmentation on the Eyre Peninsula by approximately 2017/18 to meet the existing Category 3 reliability standards applying to Pt Lincoln.

ElectraNet asserts that cost benefit analyses of two transmission line augmentation options it considered are uneconomic and that neither satisfies an assessment based on unserved energy alone. ElectraNet highlighted that the option of increasing the allowable level of network support, beyond the present restrictions limiting the contracted agreed maximum demand to 120% of transmission line capacity, would be required to continue meeting the existing Category 3 reliability level.

The AEMO report recommends that the Pt Lincoln connection point remains in Category 3 and that ElectraNet investigates alternative augmentation options to continue meeting its Category 3 obligations beyond 2017/18.

Fleurieu Peninsula

The AEMO report notes that ETSA Utilities has identified that the capacity of the electrical supply system to the Fleurieu Peninsula is nearing its limits and suggests that major augmentation will soon be required to maintain local voltage levels and reliable supply to its customers. AEMO notes that ETSA Utilities and ElectraNet will be required to undertake a joint Regulatory Test assessment in order to identify the most efficient option for this region.

AEMO has calculated the level of reliability that it considers economically suitable if a transmission option is selected to service the growing Fleurieu Peninsula load. Based on the estimated augmentation costs, AEMO's assessment shows that a Category 4, N-1 reliability standard provides positive benefits over the life of the asset.

AEMO recommends that ETSA Utilities and ElectraNet continue to undertake a joint Regulatory Test assessment in order to identify the most efficient option for this region.

Kadina East

The augmentation of the Kadina East connection point proposed by AEMO involves establishing a new line between Kadina East and Ardrossan West.

In its assessment, AEMO noted that the level of unserved energy is expected to be approximately 18MWh in 2017/18. Based on the headline VCR of $45,767, this equates to approximately $497,000 of unserved energy in 2017/18. ElectraNet noted that this load in the locality is primarily agricultural and that a higher, sector-specific VCR may be more appropriate than the average headline value.

Using the headline VCR, AEMO's assessment of the Kadina East connection point resulted in negative net benefits. The same outcome was derived using the higher Victorian agricultural VCR of $109,311 to test sensitivity. AEMO therefore recommended that the Kadina East connection point remains as Category 2.

Interested parties should refer to the AEMO report for full commentary, VCR sensitivities and financial analysis of each connection point studied. At this time, the Commission proposes no action. Any connection point proposal (new or upgraded), would be subject to an RIT-T assessment and the reliability of each connection point would be considered at the conclusion of the individual assessments.

Issue 13.

The Commission seeks the views of interested parties as to the appropriateness of creating/upgrading connection points presented by AEMO in its review of the code. Consideration should be given to cost benefit, demand growth, generation proposals, unaccounted-for new load connections and lower cost alternatives to transmission network solutions.

5 CLAUSE 6.2.5 – SWITCHING MANUAL

This section of the code review is not within the scope of the review undertaken by AEMO. Clause 6 of the code addresses the requirement of a switching manual which is developed between transmission entities, system controllers, generators and distributors. A possible amendment to Clause 6.2.5 is raised by the Commission following concerns by ETSA Utilities that it may have breached its obligations under clause 6.2.5 and reporting practices by other responsible parties.

ETSA Utilities' concerns were raised by the number of switching incidents that routinely occur due to the number of switching operations and that lodging a report for each incident as required by the code makes the reporting an onerous process.

5.1 Reporting of switching incidents

Clause 6.2.5 requires an electricity entity to report to the Commission within 20 business days, of all breaches of its internal switching manual including breaches by contractors or customers of which it becomes aware (who are contractually bound to comply with the entities' internal manual).

Switching incidents occur much less frequently on ElectraNet's transmission network than occur on ETSA Utilities' distribution network. This is due to the nature of the distribution network where switching is required more frequently for such things as access for customer work, network faults and switching due to third party causes such as pole collisions and cables being damaged by excavation.

ElectraNet has reported around six switching incidents each year over the past 3 years. ETSA Utilities, by comparison, has reported between 20 and 40 switching incidents per year over the past six years, of which between 15 and 25 are due to human error. The Commission is concerned that, with the number of switching incidents that occur on the distribution network, the reporting of each incident within 20 business days involves an obligation that, due to the number of events, makes a breach of clause 6.2.5 more likely.

It may be considered that the reporting requirements for ElectraNet should be more stringent than that of ETSA Utilities, as there is possibly greater potential to compromise system security by switching incidents on the transmission network than the impact of switching incidents on the local distribution network.

Under the current code provisions, the reporting of switching incidents by ElectraNet to the Commission is effective and assists the Commission in monitoring the performance of ElectraNet. However, in terms of the likelihood of ETSA Utilities' switching incidents affecting the transmission network, the current requirement for reporting may exceed the benefits of monitoring ETSA Utilities' performance.

Because of the number of incidents, the provision of collective reports by ETSA Utilities to the Commission on a regular basis, e.g. monthly or quarterly rather than individual reports

within 20 business days, could be considered. Such a proposal may allow for more relevant reporting based on the number of incidents as shown in the frequency of switching incidents by ETSA Utilities.

However, having regard to the potentially serious nature of switching incidents, an integral part of any such proposal would involve a grading of incidents, with different reporting requirements applying to different grades. For example, where injury or major asset damage occurs as a result of a switching incident, such matters would continue to be required to be reported to the Commission within current timeframes. For more minor incidents, a monthly (or other appropriate time period) batched report of incidents may suffice to ensure appropriate oversight of this important regulatory area.

Issue 14.

The Commission seeks comment from interested parties as to the appropriateness and frequency for reporting switching incidents by ElectraNet and ETSA Utilities in the context to the number of incidents, the severity of the incidents and the impact on the transmission network.

6 OTHER MATTERS

The Commission has identified, in this Issues Paper, a number of matters on which it seeks the specific comment of interested parties.

The Commission is, however, open to receiving comments on other matters which stakeholders consider ought to be addressed in this review of the code.

> *Issue 15.*
>
> *The Commission seeks comment from interested parties on other matters which should be addressed in the review of the code.*

7 NEXT STEPS

This Issues Paper, on proposed amendments to the Electricity Transmission Code, will be open for public consultation until Wednesday 25 May 2011.

The Commission seeks comments from all interested parties on the issues raised in this Issues Paper.

Following the period of public consultation, and after consideration of any comments received, the Commission will prepare a draft decision on the proposed changes to the Electricity Transmission Code.

The Commission expects to publish that draft decision by July 2011 for further public comment before finalising the code changes by the end of October 2011. The final code changes will take effect from 1 July 2013.

APPENDIX 1 - MAP OF ELECTRICITY SUPPLY TO CBD