

REVIEW

Australian Energy Market Commission

FINAL REPORT - NSW WORKSTREAM

Review of Distribution Reliability Outcomes and Standards

31 August 2012

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Reference: EPR0027

Citation

AEMC 2012, Review of Distribution Reliability Outcomes and Standards, Final Report - NSW workstream, 31 August 2012, Sydney

About the AEMC

The Council of Australian Governments (COAG), through its then Ministerial Council on Energy (MCE), established the Australian Energy Market Commission (AEMC) in July 2005. In June 2011 COAG announced it would establish the new Standing Council on Energy and Resources (SCER) to replace the MCE. The AEMC has two principal functions. We make and amend the national electricity, gas and energy retail rules, and we conduct independent reviews of the energy markets for the SCER.

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Executive summary

This report sets out the Australian Energy Market Commission's final advice on the costs and benefits of four alternative levels of distribution reliability in NSW, following a request for this advice from the Standing Council on Energy and Resources (SCER).¹ In preparing this advice, we have taken into account submissions we have received on our draft advice.

How we have developed our advice

The four scenarios for distribution reliability in NSW we considered involve a trade off for consumers between the cost of meeting the required level of reliability and the reliability performance experienced by consumers. Three of our scenarios provide for lower reliability outcomes, but with the benefit of lower costs for distribution reliability which would be expected to flow through to retail prices. One scenario provides for an improvement in reliability outcomes, but comes with higher costs and prices.

Each scenario has been compared to the continuation of the current requirements for distribution reliability. We have compared the change in distribution investment and reliability performance that may occur under each scenario, against the costs of maintaining the current level of reliability performance for each distribution network and the likely level of reliability performance that customers would experience if the current requirements were unchanged.

In considering the changes in investment and reliability performance that may occur under each scenario, it should be noted that the NSW distribution networks, particularly Endeavour Energy, are currently outperforming against the existing reliability standards.

This report does not make any recommendations on which, if any, of our scenarios should be adopted. This decision will be made by the NSW Government. The AEMC understands that if any changes are made to the NSW requirements for distribution reliability they would commence on 1 July 2014.²

Summary of our cost-benefit assessment

We have assessed the effect of each of our four scenarios for distribution reliability over a five year timeframe from 2014/15 to 2018/19 and a fifteen year timeframe from 2014/15 to 2028/29.

Figures 1 and 2 below illustrate the trade off between cost and the duration of supply interruptions in the years 2018/19 and 2028/29 for each of the four scenarios, and a

¹ The Ministerial Council on Energy (MCE) has changed its title to the Standing Council on Energy and Resources (SCER).

² Ministerial Council on Energy, 2011, Australian Energy Market Commission Review of Distribution Reliability Standards- Terms of reference, p.4.

baseline scenario which represents the continuation of the current NSW requirements for distribution reliability.

These figures demonstrate that the change in electricity bills and reliability performance increases over time. There is also a significant step change in bill impacts and the duration of supply interruptions between the scenario for a modest reduction in reliability outcomes and the scenario for a large reduction in reliability outcomes.

Figure 1 Trade-off between cost and reliability performance by scenario: 2018/19

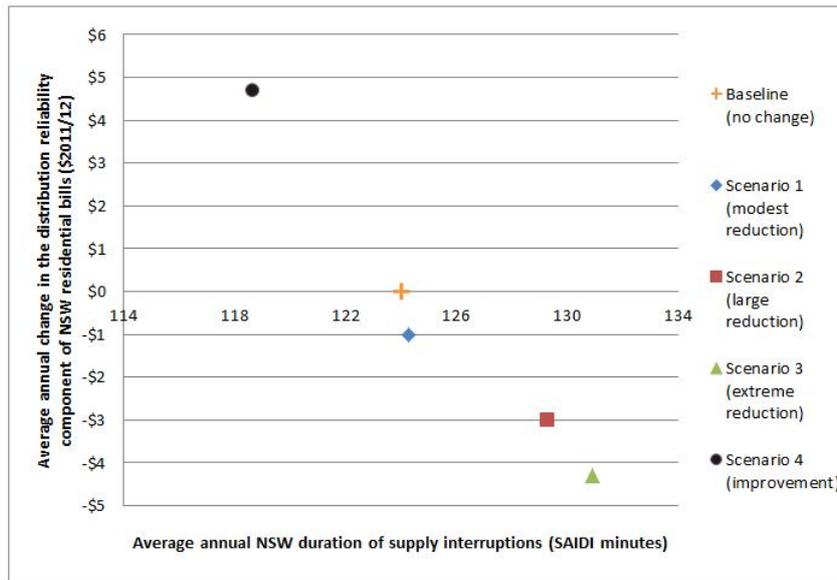
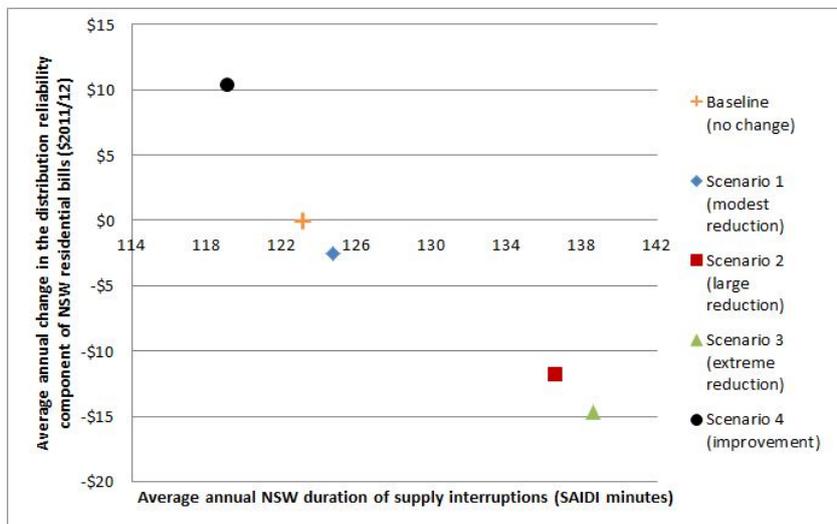


Figure 2 Trade-off between cost and reliability performance by scenario: 2028/29



In considering the effect on retail prices, we have only taken into account the costs associated with meeting NSW regulatory requirements for distribution reliability. We

note that significant investment has been made since the NSW distribution reliability requirements were increased in 2005 and that future investment will be incremental in order to maintain reliability at the current level.³

The possible cost savings for consumers are relatively modest under our scenarios. Costs relating to distribution reliability only form a relatively small driver of overall distribution prices which, in turn, form one component of total retail electricity prices. As a result, we are unable to determine how overall retail electricity prices may change, as there are a number of other factors which would affect these prices.

In accordance with the terms of reference for this review, we have only considered the impact of changes to the level of distribution reliability from 1 July 2014. Therefore, the estimated change in capital expenditure and retail electricity prices does not take into account the investment that has already been spent or committed by the NSW electricity distribution businesses. NSW consumers will be required to continue to fund these investments for the remainder of their asset lives, which may span 45 to 50 years. However, where reliability outcomes are reduced, these assets could still be used to meet growth in demand.

When the forecast reduction in distribution investment under each scenario is converted into retail electricity price impacts, it is estimated that the average NSW residential consumer in 2028/29 would save on the distribution reliability component of their electricity bill, when compared to the continuation of the current NSW requirements, approximately:

- \$3 a year under the scenario for a modest reduction in reliability outcomes;
- \$12 a year under the scenario for a large reduction in reliability outcomes; and
- \$15 a year under the scenario for an extreme reduction in reliability outcomes.⁴

However, these savings for consumers would come at a cost of increased interruptions to supply.

In 2028/29, these increased interruptions to supply for the average NSW consumer are estimated to be approximately:

- two minutes more a year under the scenario for a modest reduction in reliability outcomes;

³ The NSW distribution licence conditions were also amended in 2007 to include changes to the required compliance timeframes for the NSW distribution network service providers.

⁴ The retail price impacts presented in our final report are slightly lower than those presented in our draft report, as we have used the NSW DNSPs' real weighted average cost to capital of 7.36 per cent to calculate the return on capital that may occur under each scenario, rather than the NSW DNSPs' nominal weighted average cost of capital of 10.02 per cent. As the real weighted average cost of capital was lower, this has resulted in a lower estimated return on capital to the NSW DNSPs and as a result lower retail price impacts.

- thirteen minutes more a year under the scenario for a large reduction in reliability outcomes; and
- fifteen minutes more a year under the scenario for an extreme reduction in reliability outcomes.

In the Australian Energy Market Operator's (AEMO's) submission to the AEMC's draft report, AEMO suggested that NSW customers could save up to \$50 a year on their electricity bills from 2015 without any detrimental effect to current reliability levels if a probabilistic approach to distribution reliability was adopted over the current and next financial year.⁵ However, we note that this analysis is based on applying a probabilistic approach to only two of Ausgrid's substation projects and a number of high level assumptions. AEMO has also noted that further work would be required to justify its estimated saving and assess the potential impact on reliability levels.⁶ It is also unclear whether AEMO's approach could be implemented within its proposed timeframe.

Under our scenario for improved reliability outcomes, in 2028/29 the average NSW consumer would pay around \$11 more a year on the distribution reliability component of their electricity bill in return for around four minutes fewer supply interruptions a year.

The average impacts over a five year timeframe would be much smaller, ranging from an increase of less than one minute under the modest reduction in reliability outcomes scenario to seven minutes under the extreme reduction in reliability outcomes scenario.

These modelling results reflect the average change in reliability performance that may occur across NSW. The impact on reliability performance for individual customers may either be higher or lower, depending on which distribution network they are covered by and where they live within each network.

To understand the impact of changes in reliability performance on customers, we have undertaken a survey of almost 1,300 NSW customers. Our survey suggests that NSW customers place a relatively high value on a reliable electricity supply, and that this value has grown significantly since a similar survey was undertaken in Victoria in 2007. The value of customer reliability that was developed through this survey for each NSW distribution network service provider, as well as a NSW average, is set out below in Table 1.⁷

⁵ AEMO, Submission to the NSW workstream draft report, p. 1.

⁶ Ibid.

⁷ The NSW average value of customer reliability is based on a weighted average of the value of customer reliability for each of the three NSW distribution network service providers and has been weighted by the consumption in each distribution network.

Table 1 NSW value of customer reliability

NSW weighted average	Ausgrid	Endeavour Energy	Essential Energy
\$94,990/MWh	\$86,790/MWh	\$110,710/MWh	\$90,710/MWh

However, even when this relatively high customer value of reliability is taken into account, our analysis suggests there are significant net benefits for all three of the scenarios that provide for lower reliability outcomes.

This result indicates that the potential costs savings for customers from lower levels of distribution investment to meet reliability requirements would outweigh the potential costs to customers from poorer reliability performance.

As the modelling for these scenarios was undertaken under a limited timeframe and covers a fifteen year modelling period, this modelling should be considered in terms of how expenditure requirements and reliability performance may change under each scenario rather than be viewed as a definitive forecast of the changes that would occur. The NSW value of customer reliability that has been developed also has some limitations due to the sample size that was obtained. In addition, as the NSW value of customer reliability is based on the cost impact of interruptions to supply at the worst possible time, the results will have a tendency to be on the higher end of a customer's value of reliability.

It should also be noted that since modelling for this review was finalised, demand forecasts in NSW have been revised down, which may affect the timing and level of changes in capital expenditure under each scenario. The reliability impacts for each scenario are also likely to be felt unevenly both across and within each of the three NSW distribution networks.

Over a fifteen year timeframe, each of our three scenarios for lower reliability outcomes would provide net benefits and would result in significant reductions in distribution expenditure for reliability:

- our scenario for a modest reduction in reliability outcomes results in around a \$500 million reduction in distribution investment;
- our scenario for a large reduction in reliability outcomes would result in around a \$2 billion reduction in distribution investment; and
- our scenario for an extreme reduction in reliability outcomes would provide close to a \$2.5 billion reduction in distribution investment.

It would take several years to obtain the full benefit of these expenditure reductions. However, each of these three scenarios also provide net benefits over a five year timeframe. The reductions in distribution investment over a five year timeframe range

from \$140 million under the modest reduction scenario to \$530 million under the extreme reduction scenario.

We have also undertaken some additional analysis on our large and extreme reduction in reliability outcomes scenarios to assess the impact on investment and reliability, where the reliability impacts that may occur for customers in Essential Energy's network are reduced. These changes were considered as analysis in our draft report suggested that these scenarios could lead to a significant reduction in reliability on the rural feeders in Essential's network, which already have the poorest reliability performance in NSW due to their remote nature. This analysis is set out in Chapter 5 of our report and suggests that there would still be net benefits across NSW over a five and fifteen year timeframe where the reliability impacts are limited in Essential Energy's network under these scenarios.

For the scenario for improved reliability outcomes, the costs of improving reliability performance outweighed the benefits of improved reliability for consumers. However, the expenditure and reliability data that was provided for this scenario is not as accurate as for the scenarios which provide for lower reliability outcomes, as the modelled capital expenditure is likely to be understated and the reliability improvements are likely to be slightly higher than modelled. Therefore, firm conclusions should not be drawn from this assessment.

A summary of the cost-benefit assessment for each scenario is outlined in the table below. This cost-benefit assessment represents the first time that NSW customers have been surveyed to assess the value they place on a reliable supply of electricity. We suggest that it is also the first time that the trade off between the costs of providing a reliable supply of electricity and reliability performance has been examined publicly in Australia in relation to distribution networks. The values in the table below have been converted into net present values to allow changes to be compared in today's dollars. The results presented below for our large reduction and extreme reduction scenarios do not include the changes to the scenarios we considered to limit the reliability impact in Essential Energy's network. These results are set out in Chapter 5.

Table 2 Comparison of scenario impacts⁸

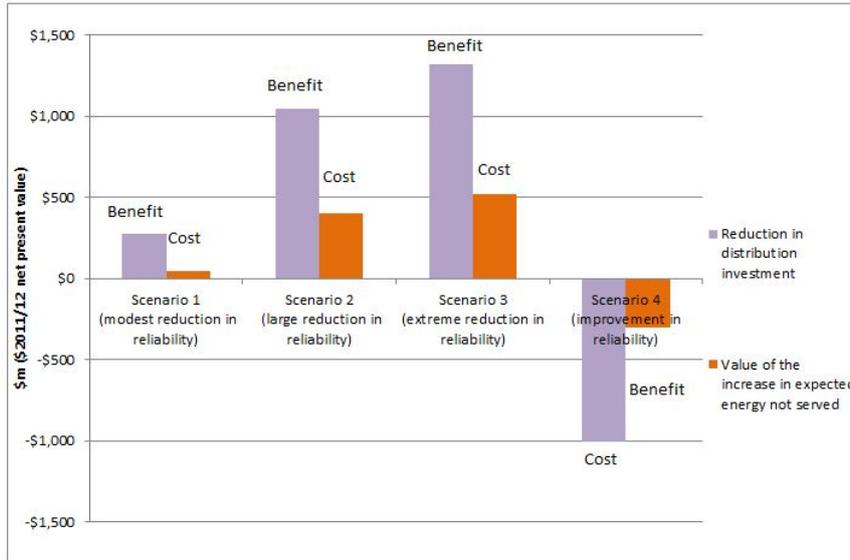
Scenario	Timeframe	Total change in capital expenditure (net present value)	Total value of the change in expected energy not served (net present value)	Result of cost-benefit assessment
1: Modest reduction in reliability	5 years	\$118m reduction	\$9m increase	Benefits exceed costs
	15 years	\$275m reduction	\$47m increase	Benefits exceed costs
2: Large reduction in reliability	5 years	\$328m reduction	\$83m increase	Benefits exceed costs
	15 years	\$1,049m reduction	\$404m increase	Benefits exceed costs
3: Extreme reduction in reliability	5 years	\$453m reduction	\$120m increase	Benefits exceed costs
	15 years	\$1,321m reduction	\$516m increase	Benefits exceed costs
4: Improvement in reliability	5 years	\$495m increase	\$123m reduction	Costs exceed benefits
	15 years	\$1,011m increase	\$306m reduction	Costs exceed benefits

Note- Totals may not sum due to rounding

⁸ The net present values in this table are slightly higher than those set out in our draft report. This has occurred as we have used the NSW DNSPs' real weighted average cost to capital of 7.36 per cent rather than the NSW DNSPs' nominal weighted average cost of capital of 10.02 per cent as the discount rate used to calculate the net present values for each scenario. As the real weighted average cost of capital was lower, this has meant that the change in capital expenditure and the value of the change in expected energy not served has been discounted by a lower amount. This has resulted in slightly higher net present values. However, the overall total change in capital expenditure and the total value of the change in expected energy not served has remained the same as those presented in our draft report.

A comparison of the net present value of the changes in capital expenditure and the net present value of the change in expected energy not served for each scenario over 2014/15 to 2028/29 is set out in Figure 3. Scenario 4 differs to the other scenarios as the increase in capital expenditure reflects the costs of the scenario, while the decrease in expected energy not served reflects the benefits of the scenario.

Figure 3 Comparison of the change in capital expenditure and expected energy not served by scenario: 2014/15 to 2028/29



National workstream of the Review

The SCER has also requested the AEMC, under the national workstream of this Review, to consider whether there is merit in a nationally consistent approach to distribution reliability across the National Electricity Market. We intend to publish a draft report in November 2012 for public consultation which will consider the range of approaches to distribution reliability, including deterministic, probabilistic, and hybrid approaches, and the relationship between the outcomes experienced by customers and the way in which distribution reliability standards are set. A key issue we will consider is how distribution reliability standards should be set to ensure that standards reflect the value placed on reliability by customers.

If requested by the SCER, we will then develop a best practice approach to distribution reliability that could be voluntarily adopted by jurisdictions or used as a reference to amend aspects of their existing approaches.

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1 Introduction

1.1 Purpose of this paper

The NSW electricity distribution network service providers (DNSPs) are currently subject to licence conditions which specify minimum requirements relating to the way their networks are planned and the frequency and number of unplanned outages that occur on their networks.

Following terms of reference from the Standing Council on Energy and Resources (SCER) the Australian Energy Market Commission (AEMC) has reviewed the NSW distribution licence conditions to assist the NSW Government to decide whether the licence conditions should be amended to reflect different reliability outcomes.⁹ If the NSW Government decides to make changes to the licence conditions, it intends to make any changes effective from 1 July 2014 for the start of the next regulatory control period for the NSW DNSPs.

This report sets out the AEMC's final advice on the trade-offs between cost and reliability performance for four scenarios for distribution reliability outcomes in NSW.

Our final advice has been developed after considering submissions provided on our draft report. Our response to each of the issues raised in submissions can be found in Appendix B.

1.2 Why have we undertaken this review?

Distribution network investment has been a significant contributor to rising electricity bills in recent years. Recent work by the AEMC estimates that increases in distribution prices may contribute around 46 per cent of total price increases in retail electricity bills in NSW over the next few years.¹⁰

One of the reasons for the high level of investment in NSW distribution networks has been the additional obligations placed on NSW DNSPs to meet enhanced design planning specifications and reliability standards in their licence conditions. The licence conditions accelerated upgrades to the NSW distribution networks to meet improved network design planning criteria by 1 July 2014, and meet decreasing supply interruption duration and frequency targets between 2005 and 2010. Prior to the introduction of the licence conditions in 2005, the NSW DNSPs were responsible for determining the appropriate level of reliability for their customers.

In light of the impact of reliability related network expenditure on retail electricity bills, on 20 August 2011 the SCER directed the AEMC to undertake a review of NSW

⁹ The Ministerial Council on Energy (MCE) has changed its title to the Standing Council on Energy and Resources (SCER).

¹⁰ AEMC, 2011, *Possible Future Retail Electricity Price Movements: 1 July 2011 to 30 June 2014*, final report, November, Sydney, p. 30.

distribution reliability outcomes (the NSW workstream). This workstream provides information on the costs and benefits of delivering alternative distribution reliability outcomes in NSW.

However, the need to comply with higher distribution reliability outcomes forms just one of the reasons for the significant growth in investment in NSW distribution networks in recent years. Other factors such as the need to replace ageing assets, growth in demand during peak periods due to increasing air conditioner penetration, and higher financing costs as a result of the global financial crisis have also led to increasing distribution prices in NSW in recent years.¹¹

In light of these other drivers of distribution network investment in NSW, changes to distribution reliability outcomes may only have a limited impact on overall future NSW distribution prices, and therefore, retail bills. Any changes are only likely to change the rate of future increases in distribution prices, rather than resulting in a significant difference in the overall level of retail bills.

The SCER's terms of reference also included a request to review the approaches to distribution reliability across the National Electricity Market (NEM) (the national workstream). The national workstream of the review is significantly broader in scope than the NSW workstream. In June 2012 we released an issues paper for public consultation which outlined the current approaches to distribution reliability in the NEM and set out the proposed scope and approach for the national workstream.

After considering submissions on the national workstream issues paper, we will then assess if there is merit in developing a nationally consistent framework for expressing, delivering, and reporting on distribution reliability outcomes. If requested by the SCER, we will also develop a framework that delivers nationally consistent reliability outcomes that could be voluntarily adopted or used as a reference by the jurisdictions.

1.3 Interactions between the NSW and national workstreams

As discussed above, the AEMC understands that any changes to the NSW distribution licence conditions would apply from 1 July 2014. Any changes to the NSW distribution licence conditions from 2014 would not preclude the potential for broader changes to the NSW framework for distribution reliability to be made at a later date, if a nationally consistent framework is developed and adopted.

While the adoption of such a framework would remain the decision of each jurisdictional government, we consider that there is the potential for a number of possible benefits from greater consistency in the approach to distribution reliability across the NEM.

¹¹ AER, 2008, *New South Wales draft distribution determination 2009-10 to 2013-14*, 21 November, p. xiv-xv; AEMC, 2011, *Possible Future Retail Electricity Price Movements: 1 July 2011 to 30 June 2014*, final report, November, Sydney, p. 30-32.

1.4 The remainder of the final report is structured as follows:

- Chapter 2 - Current framework for NSW distribution reliability and recent performance and network investment.
- Chapter 3 - Methodology used in our advice.
- Chapter 4 - Customer survey results, which were used to assess the value placed on reliability by NSW customers.
- Chapter 5 - Cost-benefit assessment of our scenarios for NSW distribution reliability outcomes.
- Chapter 6 - Implementation considerations associated with a change in the NSW distribution licence conditions.
- Appendix A- Further detail on the scenarios for NSW distribution reliability outcomes that were developed by the AEMC and modelled by the NSW DNSPs.
- Appendix B - Summary of submissions on the NSW workstream draft report.

2 Current framework for NSW distribution reliability and recent performance

Box 2.1: Summary box

- The current framework for distribution reliability in NSW is set out in the NSW electricity distribution licence conditions.
- The licence conditions contain design planning criteria, reliability standards, and individual feeder standards, each of which is within the scope of this review.
- The Commission considers that the existing expression and structure of distribution reliability obligations in the NSW licence conditions remains appropriate for the next regulatory control period, which will cover 2014/15 to 2019/20. However, the national workstream of the review will further explore the key differences between the current NSW approach and other best practice approaches to distribution reliability.
- Over the current regulatory control period of 2009/10 to 2013/14, the forecast capital expenditure of the NSW DNSPs has increased significantly relative to previous regulatory control periods due to a number of factors. Recent performance against the reliability standards indicates that the NSW DNSPs have been out-performing against the standards, which may suggest that compliance with the standards could have been achieved with a lower amount of expenditure.
- Indicative modelling prepared by the NSW DNSPs suggests that reliability-related capital expenditure over the 2014/15 to 2018/19 regulatory control period is likely to be significantly lower in total over the three DNSPs compared to the current 2009/10 to 2013/14 period, if no changes are made to the current licence conditions.

This indicates that the majority of the capital expenditure to meet the existing licence conditions has already been included in the allowed revenues for the NSW DNSPs for the current regulatory control period. Any changes to the licence conditions arising from this review would not affect capital expenditure or customer bills in the current regulatory control period.

This Chapter provides an overview of the current framework for distribution reliability in NSW. It also outlines the recent reliability performance and level of network investment undertaken by the NSW DNSPs. In addition, we provide an indication of the level of network investment over future regulatory control periods if the current distribution licence conditions remain unchanged.

2.1 Current distribution reliability licence conditions and recent reliability performance

The current requirements for distribution reliability are implemented and enforced through the NSW electricity distribution licence conditions, which have been determined by the NSW Minister for Energy under the *Electricity Industry Supply Act 1995* (NSW). The NSW distribution licence conditions contain four broad categories of requirements:

- design planning criteria (Schedule 1 of the licence conditions);
- reliability standards (Schedule 2);
- individual feeder standards (Schedule 3); and
- customer service standards (Schedule 5).¹²

Each of these components of the licence conditions are discussed in further detail below. The licence conditions apply across the three distribution networks in NSW: Ausgrid, Endeavour Energy, and Essential Energy. The Queensland component of Essential Energy's network is also subject to these conditions.¹³

In March 2012, the NSW Government announced a merger of the three NSW DNSPs into a single corporate structure, which is scheduled to commence from 1 July 2012.¹⁴ Under this merger, the three NSW DNSPs will continue to provide operational services under their existing brands, but will be owned and operated by a new state owned corporation.¹⁵ As it is unclear what implications the merger will have for the NSW distribution licence conditions, we have based our advice on the current structure of the licence conditions which specify different requirements for each NSW DNSP.

2.1.1 Design planning criteria

The design planning criteria specify the level of redundancy that different parts of the network must be built to achieve. A diagram of the different parts of a typical electricity distribution network is set out in Figure 2.1 below.

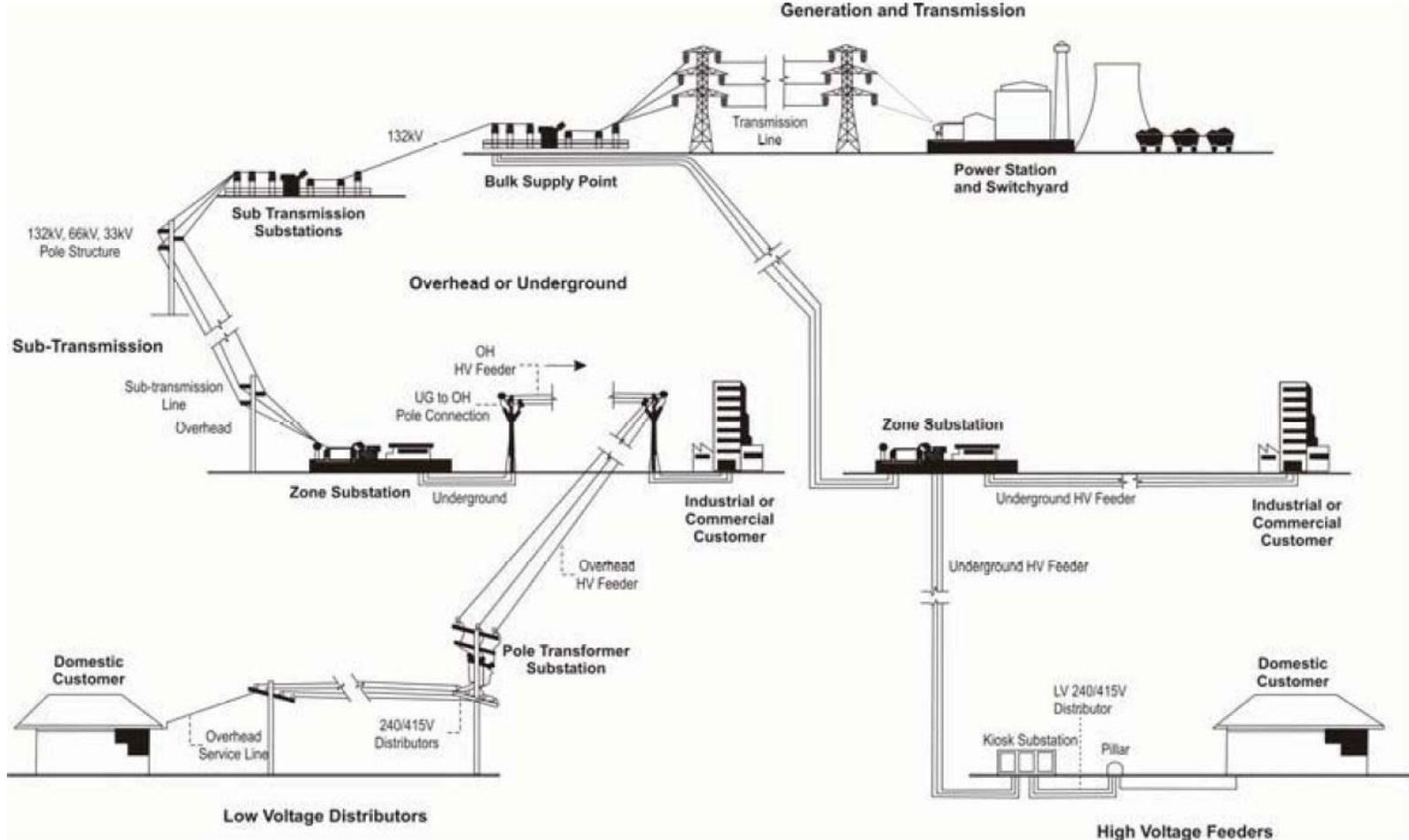
¹² Schedule 4 of the NSW distribution licence conditions relates to the definition of excluded interruptions.

¹³ Essential Energy operates a very small amount of their network in the border area of Queensland that is connected to Essential Energy's NSW distribution network. A small part of its network was also in Victoria, however the Victorian component of their network was transferred to SP AusNet on 29 June 2012.

¹⁴ C Hartcher (Minister for Resources and Energy), *Electricity network merger to provide benefits to NSW households*, media release, 18 March 2012.

¹⁵ NSW Department of Trade & Investment, 'NSW Electricity Network Reforms', viewed 24 April 2012, <http://www.trade.nsw.gov.au/energy/electricity/networks/reforms>.

Figure 2.1 Typical structure of an electricity distribution system¹⁶



¹⁶ Ausgrid, 2011, *Network Management Plan*, March, p. 13.

The design planning criteria are expressed in terms of N-x, where x is the number of system elements which can be out of operation without interruption to supply. For example, where x equals 1, N-1 means that if one system element fails, there should be no interruption to supply. However, if two system elements are out of operation at any one time, customers may lose supply.

The criteria also require the DNSPs to restore supply within defined timeframes where there is an outage.

The design planning criteria vary across different parts of each DNSP's network, with the level of redundancy (or back up supply arrangements) dependent on the total amount of the customer load being serviced and the geographic area.

Key aspects of the current design planning criteria include:

- **Geographic areas and network elements:** The current licence conditions distinguish between the level of redundancy required for customers in the Sydney Central Business District (CBD), urban and non-urban areas. The level of redundancy also differs for different components of the network, or network elements. Generally, higher levels of redundancy are provided for the sub-transmission elements of the network compared to the distribution elements of the network, as outages in the sub-transmission elements affect a larger number of customers.
- **Forecast or expected level of demand:** In the Sydney CBD, the required level of redundancy is the same regardless of the size of the customer load. However, the standards for urban and non-urban areas vary depending on the amount of customer load being served by the relevant network element. Currently, a 10 megavolt amperes (MVA) 'breakpoint' (15 MVA for Essential Energy) is used to define when an N-1 security level is required. Ten MVA of demand could be considered as roughly equivalent to around 7,500 customers. If there is an outage in areas where the load is below 10 MVA, supply may be interrupted as DNSPs are not required to provide any redundancy.
- **Customer interruption (or restoration) times:** The licence conditions define the time in which DNSPs must restore supply following an outage for different parts of the network. The CBD has the lowest interruption times, while small customer loads in urban and non-urban areas, which do not have any network redundancy, have the longest interruption times and are subject to 'best practice repair times' following an outage.
- **Customer load at risk:** The design planning criteria allows peak demand to exceed capacity in some circumstances to account for the low probability that outages may occur at times of peak load. However, this only applies to non-CBD zone substations and sub-transmission overhead feeders.

Table 2.1 below outlines the existing design planning criteria in the licence conditions. Schedule 1 of the licence conditions also includes a number of notes which affect how

the design planning criteria are applied by the DNSPs, which have not been included in the table.

Table 2.1 NSW distribution licence conditions - Design planning criteria

Network element	Load type	Forecast or expected demand	Security standard	Customer interruption time
Sub Transmission line	CBD	Any	N-2	Nil for the outage of one system element <1 hour for the outage of two system elements
	Urban and non-urban	≥ 10 MVA	N-1	< 1 minute
	Urban and non-urban	< 10 MVA	N	Best practice repair time
Sub Transmission substation	CBD	Any	N-2	Nil for outage of one system element < 1 hour for outage of two system elements
	Urban and non-urban	Any	N-1	< 1 minute
Zone substation	CBD	Any	N-2	Nil for the outage of one system element < 1 hour for outage of two system elements
	Urban and non-urban	≥ 10 MVA	N-1	< 1 minute
	Urban and non-urban	< 10 MVA	N	Best practice repair time
Distribution feeder	CBD	Any	N-1	Nil
	Urban	Any	N	< 4 hours
	Non-urban	Any	N	Best practice repair time
Distribution substation	CBD	Any	N-1	Nil
	Urban and non-urban	Any	N	Best practice repair time

Under the current licence conditions, NSW DNSPs are required to be as compliant as "reasonably practicable" by 1 July 2014, and fully compliant by 1 July 2019.¹⁷

2.1.2 Reliability standards

The reliability standards set out requirements for the maximum duration and frequency of unplanned outages, by feeder type, for each network. These standards are referred to as the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI). Different SAIDIs and SAIFIs apply for the following feeder types, which are based around customer density:

- CBD;
- urban;
- short-rural; and
- long-rural.

The reliability standards relate to the *average performance* that must be achieved across each feeder type.

Under the current licence conditions, the NSW DNSPs are required to meet the standards in every year, and are required to report on their performance against the standards.

However, for the current 2009/10 to 2013/14 regulatory control period the AER has approved different levels of capital expenditure for each of the NSW DNSPs based on varying levels of targeted compliance with the standards:

- Essential Energy proposed reliability expenditure targeting an 80 per cent probability of compliance in any year, and provided information which suggested that to achieve a 95 per cent probability of compliance an additional \$219 million each year would be required to address fundamental rural network design standards;¹⁸
- Ausgrid proposed works to achieve a 95 per cent probability of compliance;¹⁹ and
- Endeavour Energy proposed to target 100 per cent probability of compliance with the reliability standards.²⁰

¹⁷ NSW Design, reliability and performance licence conditions for distribution network service providers, clause 14.2

¹⁸ AER, 2009, *Draft Decision - New South Wales draft distribution determination 2009-10 to 2013-14*, p. 144

¹⁹ AER, 2009, *Draft Decision - New South Wales draft distribution determination 2009-10 to 2013-14*, p. 144.

²⁰ AER, 2009, *Draft Decision - New South Wales draft distribution determination 2009-10 to 2013-14*, p. 144

In its distribution determination, the AER determined that the NSW DNSPs "have targeted appropriate levels of compliance given the relative costs and benefits of the alternatives they considered" and approved the reliability related expenditure proposed by the DNSPs.²¹ As a result, in the current regulatory control period, the three DNSPs appear to be taking different approaches to achieving compliance with the reliability standards.

The following table shows the 2010/11 SAIDI and SAIFI targets and the performance achieved by the NSW DNSPs. The DNSPs out-performed the standards for 2010/11 for most feeder types for both SAIDI and SAIFI.

Table 2.2 Performance against the reliability standards for 2010/11

DNSP	Feeder	SAIDI (duration of supply interruptions in minutes)		SAIFI (number of supply interruptions)	
		Standard	2010/11 performance	Standard	2010/11 performance
Essential Energy	Urban	125	66	1.8	0.85
	Short rural	300	245	3.0	2.38
	Long rural	700	493	4.5	3.37
Ausgrid	CBD	45	5.11	0.3	0.06
	Urban	80	82.62	1.2	0.97
	Short rural	300	225.10	3.2	2.06
	Long rural	700	467.57	3.0	4.31
Endeavour Energy	Urban	80	52.5	1.2	0.7
	Short rural	300	149.3	2.80	1.4
	Long rural ²²	n/a	922.7	n/a	2.1

Source: AEMC Reliability Panel, 2012, *Annual Market Performance Review*, final report, p. 64.

2.1.3 Individual feeder standards

In addition to the reliability standards, the licence conditions also require the DNSPs to comply with SAIDI and SAIFI standards for individual feeders. While the reliability standards require the DNSPs to maintain an *average* level of reliability performance across their network, the individual feeder standards provide a *minimum* level of reliability performance for all customers.

²¹ AER, 2009, *Draft Decision - New South Wales draft distribution determination 2009-10 to 2013-14*, p. 144.

The purpose of the individual feeder standards is to ensure that the level of reliability experienced by customers in the worst served areas, which are usually remote rural areas, does not fall below a specified minimum level.

Table 2.3 outlines the current SAIDI and SAIFI standards for individual feeders. As discussed, these standards are significantly higher than the average reliability standards in Table 2.2 above.

Table 2.3 Individual feeder standards

DNSP	Feeder	SAIDI (duration of supply interruptions in minutes)	SAIFI (number of supply interruptions)
Essential Energy	Urban	400	6
	Short rural	1000	8
	Long rural	1400	10
Ausgrid	CBD	100	1.4
	Urban	350	4
	Short rural	1000	8
	Long rural	1400	10
Endeavour Energy	Urban	350	4
	Short rural	1000	8
	Long rural	1400	10

Source: NSW design, reliability and performance licence conditions for distribution network service providers, 2007, Schedule 3

The DNSPs are required to report the actual individual feeder performance against the required standards on an annual basis.²³ Additional reporting is required where a DNSP does not meet the individual standard. In these instances, the DNSP must investigate and report to the Minister on the causes for exceeding the standard and identify any action to improve the performance. DNSPs must complete any operational actions which were identified within six months of finalising their investigation. The DNSP must also develop a project plan for any required non-operational actions, including non-network solutions.²⁴

22 Endeavour Energy does not have targets for its long rural feeders as it only has two long rural feeders.

23 NSW Licence Conditions, cl. 18.7-18.8

24 NSW Licence Conditions, Schedule 3, cl. 16, cl. 18.4

In practice, it is unlikely to be practical or economic to ensure that all feeders comply with the individual feeder standards every year. For example, a feeder may fail to meet the standard in one year due to unusual weather conditions but may comply with the standard in later years without any remedial work being required. Other feeders may not comply with the standards, but may only serve a small number of customers and be extremely costly to improve their performance to meet the standard.

Table 2.4 sets out the percentage of non-compliant feeders for each DNSP against the current individual feeder standards. The DNSPs are not required to indicate whether non-compliance is due to exceeding the individual SAIDI or SAIFI standards in their annual public reporting. However, we understand that most instances of non-compliance relate to the SAIDI standards rather than the SAIFI standards.

Table 2.4 Non-compliant feeders as at 1 July 2011 - Individual feeder standards

DNSP	Feeder type	per cent and number of non-compliant feeders- SAIDI and SAIFI
Essential Energy	Urban	2.4% (7)
	Short rural	8.0% (72)
	Long rural	14.6% (35)
Ausgrid	CBD	10.7% (6)
	Urban	5.1% (89)
	Short rural	4.2% (11)
	Long rural	0% (0)
Endeavour Energy	Urban	0.7% (7)
	Short rural	1.6% (4)
	Long rural	0% (0)

Source: Ausgrid, *Network Performance Report 2010/2011*, 2011, pg. 25; Endeavour Energy, *Electricity Network Performance Report 2010-2011*, November 2011 pg. 32; Essential Energy, *Electricity Network Performance Report 2010/2011*, 2011, pg. 30.

2.1.4 Customer service standards

The licence conditions also include customer service standards, which specify the circumstances where DNSPs are required to pay compensation to customers who have experienced poor reliability performance.

In the issues paper, we proposed that the customer service standards are outside the scope of the NSW workstream, and invited stakeholder views on this issue.²⁵ Submissions to the issues paper revealed broad stakeholder support for our proposed position.²⁶

However, submissions from Essential Energy, the Customer Council of Essential Energy, and the Essential Energy Rural Advisory Group all expressed the view that customer service standards are related to distribution reliability outcomes.²⁷ The submissions suggested the scope of the NSW workstream should be expanded to consider customer service standards from the perspective of increased customer communication and engagement in relation to power outages.²⁸

The AEMC noted the views expressed by these stakeholders, but considered that the customer service standards in Schedule 5 of the licence conditions are unlikely to drive investment decisions or reliability performance by DNSPs to the same extent as the other three schedules in the licence conditions. This is because the value of customer payments are relatively low, particularly when compared to the annual allowed revenues of each DNSP. Customer payments of \$80 for each supply interruption which exceeds the customer service standards are available upon application and are capped at \$320 per a premises in any one financial year.²⁹

In addition, the type of communication which is provided following a supply interruption does not currently form part of the requirements in the customer service standards. The customer service standards in the licence conditions relate solely to compensation for customers that experience more than a specified number or duration of supply interruptions.

Consequently, we consider that customer payments for supply interruptions and customer communication requirements are not within the scope of the NSW workstream. However, these issues may be considered under the national workstream of this review.

²⁵ AEMC, 2011, Issues Paper - NSW Workstream - Review of Distribution Reliability Outcomes and Standards, p. 21

²⁶ Endeavour Energy, 2011, Submission to NSW workstream issues paper, p. 1; Citipower/ Powercor, 2011, Submission to NSW workstream issues paper, p. 4; Major Energy Users, 2011, Submission to NSW workstream issues paper, p. 15; Ausgrid, 2011, Submission to NSW workstream issues paper, p. 2.

²⁷ Essential Energy, 2011, Submission to NSW workstream issues paper, p. 1; Customer Council of Essential Energy, 2011, NSW workstream issues paper; Essential Energy Rural Advisory Group, 2011, NSW workstream issues paper.

²⁸ Essential Energy, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper, p. 1; Customer Council of Essential Energy, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper; Essential Energy Rural Advisory Group, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper

²⁹ NSW Licence Conditions, cl. 17.

2.1.5 Verification of current framework for distribution reliability in NSW

As part of the MCE's terms of reference for this review, the AEMC is required to verify that the current expression of distribution reliability outcomes in the NSW licence conditions remains appropriate.³⁰

In addressing this requirement, we have considered whether the current expression and structure of the NSW licence conditions are appropriate for use in the next NSW regulatory control period, rather than whether they represent the best possible approach to reliability. The national workstream of this review may recommend adopting a nationally consistent framework for distribution reliability in the NEM, which may have implications for the structure of the NSW licence conditions. However, if any such recommendations were adopted, we expect that they would not be implemented in NSW until after the next regulatory control period.

In undertaking this assessment, we analysed the differences between the NSW approach to distribution reliability and those used elsewhere, both within Australia and internationally. To assist with this element of the review, the AEMC engaged The Brattle Group to undertake an empirically-based study of Australian and international approaches to distribution reliability regulation.

The Brattle Group's report showed that there are considerable differences between the approaches to distribution reliability, both within Australia and compared with other international jurisdictions.

The Commission's view is that the general approach to distribution reliability in NSW is consistent in most respects with many other national and international approaches and The Brattle Group's recommendations for a best practice approach to distribution reliability in Australia. In particular, the approach used in NSW is consistent in relation to the:

- use of SAIDI and SAIFI as measures of reliability;
- reporting of reliability performance at a regional level (ie by feeder type);
- use of incentive payments to improve reliability performance, which is expected to occur for NSW DNSPs from the next regulatory control period under the AER's Service Target Performance Incentive Scheme (STPIS);
- inclusion of additional measures targeted at improving reliability performance for the worst-served customers; and
- the availability of customer payments for poor reliability performance.

The most significant difference between the approach used in NSW and those used in other Australian and international jurisdictions is the inclusion of legally binding

³⁰ Ministerial Council on Energy, 2011, Australian Energy Market Commission Review of Distribution Reliability Standards - Terms of Reference, p. 4

design planning criteria, which specify how DNSPs must plan their networks. The Brattle Group found that NSW is unusual in that design planning criteria appear to be driving significant amounts of investment in NSW. This has been confirmed by the modelling undertaken by the NSW DNSPs for this review. In contrast, most of the other jurisdictions reviewed by The Brattle Group generally focussed on the reliability performance that DNSPs need to achieve, rather than also specifying how DNSPs must plan their networks to meet their performance targets.³¹

The Brattle Group did find that some other jurisdictions use design planning criteria in some form. Distribution businesses in the United Kingdom are subject to design planning criteria under their licences. In Queensland, DNSPs must develop management plans that set out design planning criteria. A similar approach is adopted in South Australia and by some New Zealand DNSPs.

Where design planning criteria are used in other jurisdictions, those criteria are generally expressed in a similar form to the NSW licence conditions. In particular, the NSW approach of expressing the criteria in terms of n-x based redundancy requirements that vary between -2 and n depending on the geographic location, nature and size of connected customers and/or type of network element is consistent with the approach in other jurisdictions. However, The Brattle Group suggests that the design planning criteria in other jurisdictions does not appear to be driving investment in the same way as in NSW, as the criteria used in other jurisdictions are less stringent.

However, it would be a very significant change for the NSW licence conditions to move away from an approach that incorporates design planning criteria. Further analysis would be required before determining whether such a change was appropriate. Such a change would also require the NSW DNSPs to make significant changes to how they plan and operate their networks and it is unlikely that it could be implemented before the start of the next regulatory control period. As a result, we consider that the existing expression and structure of distribution reliability obligations in the NSW licence conditions remains appropriate for the next regulatory control period from 2014/15 to 2018/19.

A number of submissions raised concerns about the expression and structure of the existing NSW distribution reliability standards. These concerns and the Commission's response are discussed in section 6.1 in Chapter 6 of our report.

2.2 Recent reliability investment in NSW distribution networks

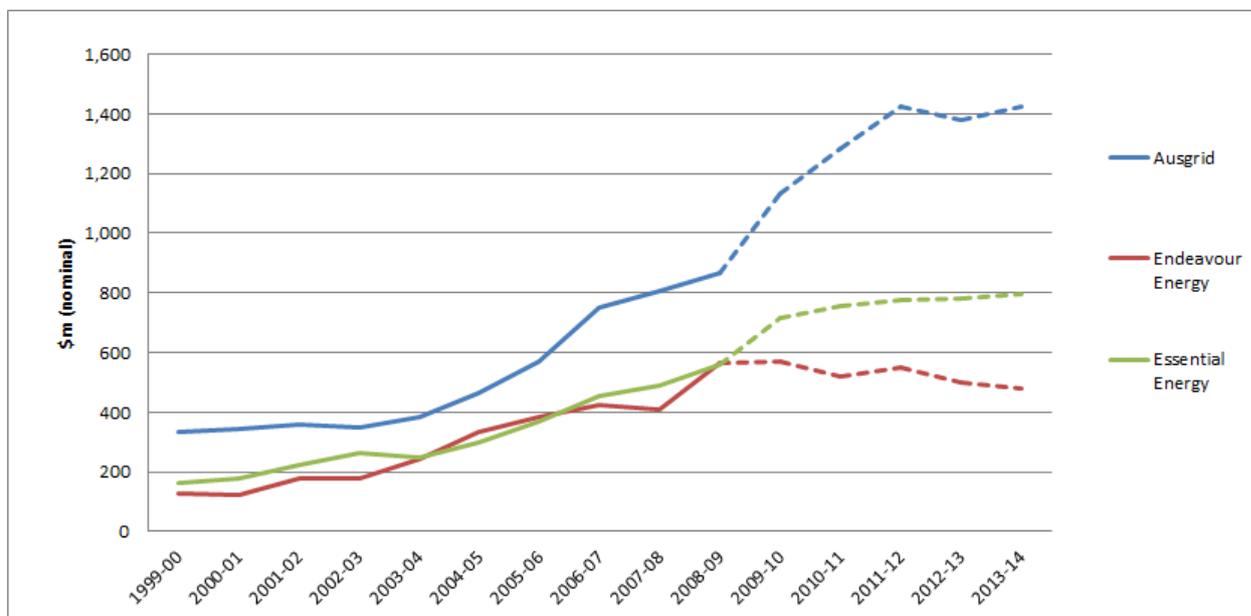
Over the current regulatory control period, the NSW DNSPs are undertaking a significant increase in capital expenditure compared to the previous period. For Ausgrid, the increase in capital expenditure over the current period compared with the previous period is 116 per cent; for Endeavour Energy it is 37 per cent, and for Essential Energy it is 87 per cent.³² Figure 2.2 below demonstrates the growth (actual

³¹ The Brattle Group, 2012, *Approach to setting electric distribution standards and outcomes*, 6 February, p. 146

³² Australian Energy Regulator, 2011, *State of the Energy Market 2011*, 9 December, pg. 62

and forecast) in capital expenditure over the period 1999-2000 to 2013-14 for each DNSP.

Figure 2.2 Actual and forecast annual capital expenditure in NSW distribution networks: 1999/00 to 2013/14



Note: Forecast capital expenditure is used from 2008/09 onwards based on the AER's current NSW distribution determination. Source: AER, 2009, *Final Decision - New South Wales distribution determination 2009-10 to 2013-14*; AER, 2009, *2009 State of Energy Market*, AEMC analysis.

This increase in capital expenditure is contributing to a significant increase in retail electricity prices in NSW. Recent analysis undertaken by the AEMC has estimated that regulated retail electricity prices in NSW may increase by 42 per cent in nominal terms between 2010/11 and 2013/14, with increases in distribution prices contributing around 36 per cent of this total increase.³³

IPART has recently released its final determination for regulated NSW retail electricity prices, which would result in an average increase of around 18 per cent in nominal terms across NSW for regulated prices over 2012/13.³⁴ The increase in network costs is driving around 50 per cent of the average increase in regulated retail electricity prices in IPART's final determination.³⁵ The significant contribution of rising distribution prices to retail electricity price increases has led to concerns about the level of distribution investment in NSW.

³³ AEMC, 2011, *Possible Future Retail Electricity Price Movements: 1 July 2011 to 30 June 2014*, final report, 9 December. Note this projected increase includes the impact of a price on carbon emissions from 1 July 2012.

³⁴ IPART, 2012, *Changes in regulated electricity retail prices from 1 July 2012*, final report, June, p. 1.

³⁵ Id, p.2.

Distribution investment is being driven by a number of factors, including the need to replace and reinforce a significant number of ageing assets, and to allow the network to handle upward trends in peak demand.³⁶ In addition, the current distribution licence conditions have also driven increases in capital expenditure.

Some of the drivers of capital expenditure in the licence conditions over the current regulatory control period include the need:

- to increase the level of redundancy for sub-transmission lines and sub-transmission substations that must be provided in the Sydney CBD from -1 to -2, which falls within Ausgrid's network;
- to provide an -1 level of redundancy for CBD and urban distribution feeders;
- for the NSW DNSPs to be as compliant as reasonably possible by 1 July 2014 with the design planning criteria;
- for NSW DNSPs to meet higher SAIDI and SAIFI targets in the reliability standards; and
- to meet the individual feeder standards and undertake work to improve the performance of non-compliant feeders, which has been a particular issue for Essential Energy's network.

It is difficult to isolate the amount of capital expenditure which would be spent purely as a result of the licence conditions over the current regulatory control period from the information set out in DNSP's regulatory proposals and the AER's distribution determination. This is because this expenditure is likely to also be driven in part by the need to replace assets and meet increases in demand.

The increase in capital expenditure over the current regulatory control period appears to have contributed to the reliability performance achieved by the NSW DNSPs. As outlined above, the DNSPs are significantly outperforming against the required reliability standards in the licence conditions. In part, this over achievement is likely to be linked to the presence of uncontrollable weather conditions which effectively require the DNSPs to outperform against the Schedule 2 reliability standards to ensure compliance in any one year.

However, the significant level of over-achievement particularly in relation to some feeder types may also suggest that the DNSPs could have achieved compliance with the reliability standards with a lower level of expenditure. Endeavour Energy has also noted that its improvement in reliability performance has also been affected by improving asset management practices and the connection of new customers to new and more reliable sections of its network.³⁷

³⁶ Australian Energy Regulator, 2011, *State of the Energy Market 2011*, 9 December, p. 63

³⁷ Endeavour Energy, Submission on NSW workstream draft report, p. 4.

In its submission to the draft report, the Major Energy Users suggested that the Commission should have related the actual performance of the NSW DNSPs to the amount of capital and operating expenditure they have used over the current regulatory control period.³⁸ However, the Commission was requested to consider the costs and benefits of future changes to distribution reliability in NSW, rather than examine current and historical expenditure on distribution reliability and reliability performance. Therefore, this task is considered outside the scope of SCER's terms of reference for the NSW workstream.

2.3 Expected future distribution reliability investment in NSW under current licence conditions

While investment in the NSW distribution networks has risen steeply over the current regulatory control period, investment to meet the distribution licence conditions over future regulatory control periods is expected to decline in comparison. This suggests that the majority of the capital expenditure to meet the licence conditions would be spent in the current regulatory control period, as would be expected given that the DNSPs are required to be as compliant as reasonably practicable with Schedule 1 of the licence conditions by 1 July 2014.

Therefore, the potential for significant cost savings as a result of changes to the licence conditions may be limited. Instead, the implementation of any of the AEMC's scenarios for lower reliability outcomes would only slow the rate of increase in distribution prices.

This decline in capital expenditure over the next regulatory control period and future periods is demonstrated in modelling undertaken by the NSW DNSPs for the AEMC to estimate the capital expenditure required to meet the current licence conditions over the next three regulatory control periods. This modelling has formed the baseline for the AEMC's assessment of the four scenarios for NSW distribution reliability outcomes, which is set out in Chapter 5. Modelling of the possible capital expenditure required over the next three regulatory control periods by each DNSP to meet the current licence conditions is set out below in Figure 2.3 to Figure 2.5.

As this modelling was undertaken under short timeframes and at a high level, a number of simplifying assumptions have been made by the DNSPs in preparing this modelling. As a result, this modelling should be treated as indicative only rather than as a definitive forecast of the likely capital expenditure that the DNSPs may seek over future regulatory control periods if the existing licence conditions remain in place. Ausgrid has also suggested that since this modelling was undertaken, demand forecasts for the 2014/15 to 2019/20 regulatory control period have now been lowered which would reduce the level of capital expenditure which may be spent over the next regulatory control period under the baseline and each of our four scenarios.³⁹

³⁸ Major Energy Users, Submission on the NSW workstream draft report, p. 9.

³⁹ Ausgrid, Submission on the NSW workstream draft report, p. 5.

Figure 2.3 Ausgrid: Estimated reliability capital expenditure under the current licence conditions

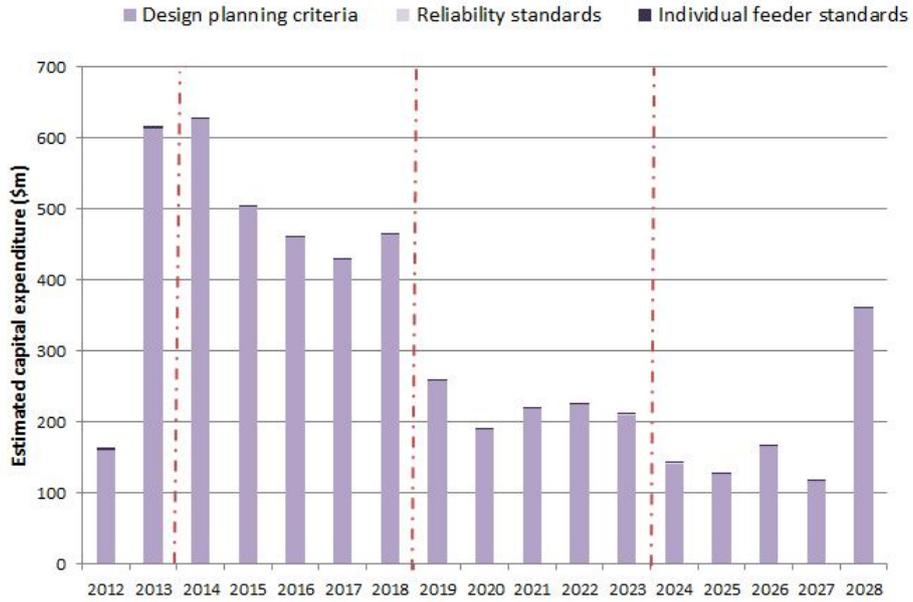


Figure 2.4 Endeavour Energy: Estimated reliability capital expenditure under the current licence conditions

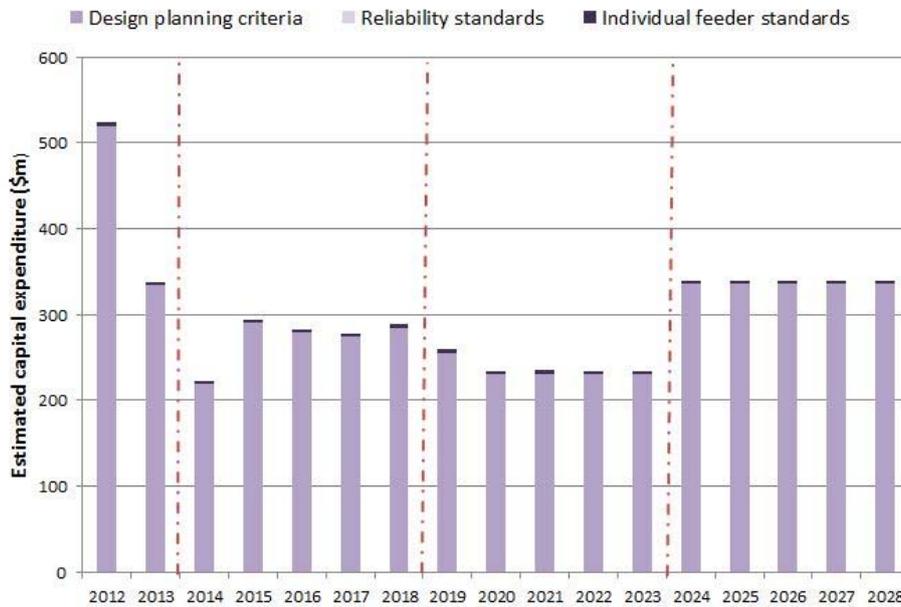
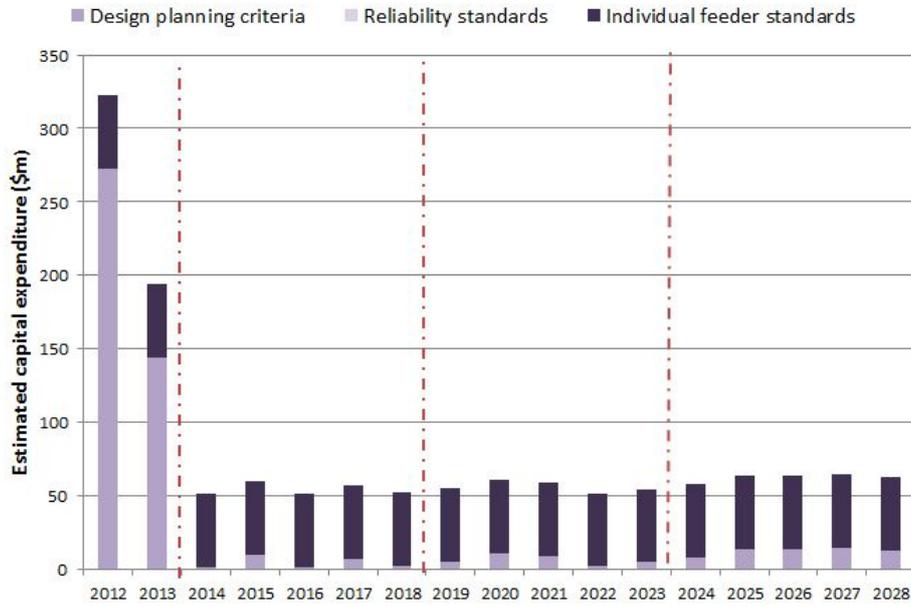


Figure 2.5 Essential Energy: Estimated reliability capital expenditure under the current licence conditions



3 Methodology

Box 3.1: Summary box

- We developed four scenarios for NSW distribution reliability outcomes. Three scenarios provide for lower reliability outcomes and one scenario provides for higher reliability outcomes.
- The NSW DNSPs modelled the impact of each of the four scenarios against a baseline of no change over a fifteen year period from 1 July 2014 to 30 June 2029. The NSW DNSPs modelled the change in capital expenditure as well as the change in expected energy not served and SAIDI for each scenario. This was independently reviewed by the AEMC's consultants, Nuttall Consulting.
- We developed a value of customer reliability for each NSW DNSP. AEMO's Victorian value of customer reliability methodology was used as a basis for the survey design, with some amendments to ensure the survey was appropriate to assess the value placed on distribution reliability and reflected the characteristics of NSW customers.
- Some additional questions relating to willingness to pay, customer priorities for distribution investment, customer hardship, and the availability of alternative more reliable power sources were also included in the survey
- A cost-benefit assessment for each scenario has been developed over a five year timeframe and a fifteen year timeframe, using the expenditure and reliability modelling undertaken by the NSW DNSPs and the value of customer reliability for each DNSP. The results of this cost/benefit assessment are set out in chapter 5.

This Chapter sets out the methodology that was used by the AEMC in the development of our advice on the costs and benefits of alternative NSW distribution reliability outcomes. In particular, the chapter outlines:

- the four scenarios for NSW distribution reliability outcomes that were considered and the cost and reliability modelling that was developed to assess the impact of these scenarios;
- the process that was used to develop a NSW value of customer reliability (VCR); and
- how the cost and reliability modelling and the NSW VCR values were brought together in our cost/benefit assessment of each of the four scenarios.

Further detail on the cost and reliability modelling for each scenario and the NSW VCR we have developed can be found in consultant reports by Nuttall Consulting and Oakley Greenwood respectively, which are available on the AEMC website.

3.1 Scenarios considered and cost and reliability impact modelling

3.1.1 Scenario development

We have developed four scenarios for NSW distribution reliability outcomes. Three of the scenarios provide for a lowering of distribution reliability outcomes, while one of the scenarios provides for improved outcomes. These scenarios are:

- Scenario 1 - A moderate lowering of outcomes.
- Scenario 2 - A large lowering of outcomes.
- Scenario 3 - An extreme lowering of outcomes.
- Scenario 4 - An improvement in outcomes.

Nuttall Consulting was engaged by the AEMC to develop these scenarios, and was also assisted by secondments from two of the NSW DNSPs. These four scenarios were developed after considering comments on the issues paper and in consultation with the NSW DNSPs. The NSW DNSPs were provided with a draft version of these scenarios for comment and to provide advice on whether the scenarios could be implemented in practice.

A summary of the four scenarios we have developed is set out in Figure 3.1 below. Each scenario is comprised of a combination of changes across the three schedules in the licence conditions. We have developed the scenarios in this way as the three NSW DNSPs have suggested to us that they have different expenditure drivers across the licence conditions. As a result, making changes across the three schedules would provide for expenditure and reliability changes across the three DNSPs. For instance, Ausgrid's main driver of capital expenditure from the current licence conditions has been the design planning criteria in Schedule 1, while Essential Energy's capital expenditure has been mainly driven by the individual feeder standards in Schedule 3 of the licence conditions.

Further detail on the scenarios can be found in Chapter 5, Appendix A, and in the Nuttall Consulting report, which is available on the AEMC website. In addition, marked up versions of the licence conditions for each scenario are available on the AEMC website.

Figure 3.1 Summary of the scenarios for NSW distribution reliability outcomes

Licence condition	Issue	Scenario 1: Modest reduction of outcomes	Scenario 2: Large reduction of outcomes	Scenario 3: Extreme reduction of outcomes	Scenario 4: Improvement in outcomes
Design planning criteria (Schedule 1)	CBD areas	- Some load at risk if there is an outage during peak periods	- Moderate levels of load at risk if there is an outage during peak periods	- Higher levels of load at risk if there is an outage during peak periods - Less network redundancy (n-2 standard reduced to n-1)	No change
	Urban areas	- Some load at risk if there is an outage during peak periods - Reduced capacity buffer during normal operation	- Moderate levels of load at risk if there is an outage during peak periods - Less network redundancy for medium loads (n-1 standard reduced to n) in some areas - Reduced capacity buffer for normal operations	- Higher levels of load at risk if there is an outage during peak periods - Removal of capacity buffer for normal operations (but buffer still applies for emergency operations) - Less network redundancy for large loads (n-1 standard reduced to n) in some areas	No change
	Non-urban areas	- Reduced capacity buffer during normal operation	- Reduced capacity buffer for normal operations - Less network redundancy for medium loads (n-1 standard reduced to n) in some areas	- Removal of capacity buffer for normal operations (but buffer still applies for emergency operations) - Less network redundancy for large loads (n-1 standard reduced to n) in some areas	No change
	Forecast demand used for planning (applies to all areas)	No change	No change	No change	Demand forecasts expected to be exceeded no more than one year in ten (rather than one year in two)
Reliability standards (Schedule 2)	Average duration and frequency of outages for feeders	DNSP to be 75% confident that current standards will not be exceeded	DNSP to be 50% confident that current standards will not be exceeded	DNSP to be 50% confident that current standards will not be exceeded	DNSP to be 99% confident that current standards will not be exceeded
Individual feeder standards (Schedule 3)	Individual duration and frequency of outages for each feeder	No change	Increase SAIDI and SAIFI standards by 10%	Increase SAIDI and SAIFI standards by 20%	Reduce SAIDI and SAIFI standards by 20%
	Work to be done on underperforming feeders	Work restricted to a maximum of 4% of total feeders each year	Work restricted to a maximum of 2% of total feeders each year	Work restricted to a maximum of 1% of total feeders each year	Work restricted to a maximum of 10% of total feeders each year

3.1.2 Expenditure and reliability impact modelling

Modelling requested from the NSW DNSPs

Once the scenarios were finalised, we requested the NSW DNSPs model the expenditure and reliability impacts of each scenario. We asked the DNSPs to model impacts over fifteen years for each scenario, which is equivalent to the next three regulatory control periods. We assumed that any amended licence conditions would commence on 1 July 2014, so the DNSPs were requested to model changes from this date to 30 June 2029.

We asked the DNSPs to model the changes in:

- capital expenditure;
- operational expenditure;
- unserved energy; and
- average SAIDI and SAIFI

for each scenario against a baseline of no change to the existing licence conditions.

The DNSPs were also requested to provide supporting information on the methodology and assumptions they used to model these impacts and any other risks or issues that may arise under each scenario.

The DNSPs were requested to separate out the impacts of the proposed changes in each schedule in the licence conditions, so the key drivers of expenditure and reliability outcomes could be assessed. The DNSPs were requested to only record impacts associated with the proposed changes to the licence conditions. As a result, other changes in expenditure and reliability outcomes that may be driven by factors outside of the licence conditions have not been modelled by the DNSPs. Therefore, judgements about the overall potential change in distribution prices and reliability outcomes over the modelling period cannot be made from the data provided by the DNSPs.

The Commission has not requested the NSW DNSPs to undertake any further modelling following the publication of the draft report, due to the limited timeframe for the Commission's final report and as incremental changes to the scenarios were unlikely to have a significant effect on the overall costs and benefits of each scenario. However, further detail has been included on the effect on capital expenditure and reliability that may occur in Essential Energy's network under Scenarios 2 and 3, where the cap on work that can be done on underperforming feeders in Schedule 3 of the licence conditions is removed. Modelling to assess the impact of this change was undertaken by Essential Energy prior to the publication of the draft report.

The implications of this change to Scenarios 2 and 3 have only been considered for Essential Energy's network as the cap on underperforming feeders only has a limited

impact on Ausgrid's and Endeavour Energy's networks, but a significant effect on the reliability outcomes in Essential Energy's network. Details on the impact of this change are set out in Chapter 5.

Submissions from Ausgrid and Endeavour Energy did not support any further changes to the scenarios due to the cost and time involved to undertake further modelling.⁴⁰ However, the Public Interest Advocacy Centre suggested that the Commission should consider scenarios which have more significant reductions in reliability standards to provide larger reductions in customer bills.⁴¹

We note that the modelled impact on residential customer bills under the three lower reliability scenarios is relatively modest. However, the savings on capital expenditure are relatively large in overall dollar terms and also as a percentage of the DNSPs' baseline expenditure on reliability. Due to the limited timeframe for the NSW workstream, we have been unable to request the NSW DNSPs to undertake further modelling as this would have taken a number of months to prepare and review. As a result, we have not considered any additional scenarios which would provide for further reductions in reliability.

Limitations of the modelling undertaken

The DNSPs made a number of simplifying assumptions to prepare this data in the relatively short timeframe provided. As a result, the DNSP's data should be considered as providing high level trends rather than as definitive estimates of the impacts of the scenarios.

Further, even where any of the proposed scenarios are adopted by the NSW Government, the actual change in distribution prices would depend on the maximum allowed revenue which is determined by the AER for each DNSP. The maximum allowed revenue of each DNSP may be influenced by a number of other investment drivers, beyond the requirements for distribution reliability. Therefore, the expenditure and reliability impacts modelled by the DNSPs should be considered with a degree of caution.

The data and supporting information that each DNSP submitted to the AEMC varied in the level of detail provided. All of the NSW DNSPs suggested there would be limited impacts on operational expenditure, so none of the DNSPs modelled changes in operational expenditure in detail. Some of the components of the scenarios were not modelled by some of the DNSPs, as they did not have sufficient time to model these changes or they considered that these changes were unlikely to have a significant impact on expenditure and reliability outcomes.

For example, Endeavour Energy did not model the effect of Scenario 4 (the reliability improvement scenario) in relation to Schedule 1 of the licence conditions at the distribution level, while Essential Energy did not model the impact of this scenario in

⁴⁰ See submissions on the NSW workstream draft report from: Ausgrid, p. 4; Endeavour Energy, p. 2.

⁴¹ Public Interest Advocacy Centre, Submission on the NSW workstream draft report, p. 5.

relation to any of its assets for Schedule 1 of the licence conditions. This modelling was not undertaken as these DNSPs did not have a 10 per cent probability of exceedance (POE) forecast available for these assets. Further details on the components of each scenario that were not modelled are set out in chapters 8 and 9 of Nuttall Consulting's report.

The modelling methodologies and assumptions that were made by each NSW DNSPs also differed, which has led to differences in results. These differences are due in part to differences in the three networks and the way they are operated, and in part to differences in the models and modelling methodologies that each DNSP has used.

Nuttall Consulting's review of the modelling undertaken

Nuttall Consulting reviewed the data and supporting information provided by the DNSPs, with assistance from secondments from two of the NSW DNSPs and SP AusNet (who operates the Victorian DNSP SPI Electricity). As noted in Nuttall Consulting's report, Nuttall Consulting has reviewed whether the DNSPs' estimates represent a "realistic forecast", rather than whether they reflect the efficient costs of complying with the licence conditions.⁴²

We have consulted extensively with the NSW DNSPs to clarify aspects of their modelling. We have also provided them with opportunities to amend their modelling where we have raised concerns about the methodologies they have used.

The expenditure and reliability impacts presented for each scenario in this report and Nuttall Consulting's report represent the finalised version of modelling that was provided by the DNSPs.

Nuttall Consulting's report contains a review of the expenditure and reliability forecasts provided by each DNSP. That report concludes that:

- the DNSPs' forecasts of the capital expenditure impacts of each of the scenarios are generally reasonable. However, Nuttall Consulting has identified some issues with the forecast capital expenditure for Scenario 4, which suggest the level of capital expenditure required to achieve the forecast reliability improvements has been understated;
- the DNSPs' forecasts of the expected energy not served associated with the sub-transmission parts of the DNSPs' networks are generally reasonable;
- however, Nuttall Consulting has some concerns that the methodologies used by the DNSPs to estimate the expected energy not served associated with the distribution parts of the DNSPs' networks may overstate the reliability impacts of some of the scenarios.⁴³ Nuttall Consulting has also identified some issues with

⁴² Nuttall Consulting, 2012, *NSW DNSP reliability: Review of licence conditions*, June, p. 9

⁴³ Further discussion on the methodologies used by the DNSP to forecast expected energy not served is outlined in chapter 8 of Nuttall Consulting's report.

the modelling methodologies used to estimate the change in expected energy not served under Scenario 4, which may mean the reliability improvements are understated for Essential Energy and Endeavour Energy but overstated for Ausgrid.

These issues are further explained in Nuttall Consulting's report. The impact of these concerns on our cost-benefit assessment are discussed in chapter 5, along with the results of the expenditure and reliability modelling prepared by the DNSPs for each scenario.

Where we continue to have concerns about the modelling methodologies the DNSPs have used, we have generally outlined how these methodologies may affect the data for each scenario rather than adjust the data provided by the DNSPs.

3.2 NSW value of customer reliability

3.2.1 Use of the value of customer reliability

The SCER's terms of reference requires the Commission to estimate the willingness of the NSW community to pay for a range of reliability outcomes.⁴⁴ An estimate of willingness to pay is needed to assess the costs and benefits of our scenarios for distribution reliability.

We have adopted a modified version of the Australian Energy Market Operator's (AEMO's) Victorian VCR methodology to estimate the willingness of NSW customers to pay. The VCR estimates the costs for consumers of supply interruptions of different lengths. On the basis that consumers should be willing to pay at least the equivalent of the avoided cost of a supply interruption, a VCR can be considered a suitable proxy for willingness to pay. We have developed separate VCRs at a NSW, DNSP, and feeder level for three different customer types.

In submissions to the issues paper, a number of stakeholders noted that VCR and willingness to pay were not interchangeable concepts, and cautioned against the use of the Victorian VCR methodology without suitable modifications and adjustments for NSW circumstances.⁴⁵ The Commission understands these views and recognises that VCR and willingness to pay estimates are not perfect substitutes.

However, we consider using a VCR for the purposes of the NSW workstream provides a suitable and useable proxy for willingness to pay estimates. Developing reliable willingness to pay estimates would require extensive lead times for construction, testing and completion of customer surveys, as well as analysis and reporting of responses and data. Under the compressed timeframe for the NSW workstream, it was

⁴⁴ Ministerial Council on Energy, 2011, Australian Energy Market Commission Review of Distribution Reliability Standards Terms of Reference, p. 4

⁴⁵ See, for example, submissions from Ausgrid, Endeavour Energy, Essential Energy and the Major Energy Users Association.

not possible to develop and complete a meaningful and robust NSW willingness to pay study.

In addition, the Commission considers that, given the absence of relevant willingness to pay studies, using a VCR approach will allow a degree of comparability between NSW and Victoria. This is especially the case in light of AEMO's recent decision to not undertake the development of region specific VCRs and to allow other bodies to undertake jurisdictional surveys instead.⁴⁶

The VCR methodology used by the Commission has been modified and adapted to suit the particular circumstances of NSW DNSPs and NSW end users. These changes are discussed further in the following section.

The surveys also included specific questions which were aimed at gathering some willingness to pay and accept information from residential consumers. These questions included asking half the respondents whether they would be willing to pay 1 per cent more on their electricity bill to receive a total of one hour less interruptions a year. The other half of the survey respondents were asked whether they were willing to accept a total of one hour more interruptions a year in return for a 1 per cent reduction on their electricity bill.⁴⁷

Further details on the results of the customer survey, including the VCRs that were developed, are set out in chapter 4.

3.2.2 Methodology for estimating the NSW VCR

AEMO's Victorian VCR methodology

The calculation of the NSW VCR has followed the Victorian VCR methodology, but with some important changes to the customer surveys. To calculate the Victorian VCR, AEMO (formerly VenCorp) use a direct survey approach to gather data on the costs of different interruption types for different customer categories. Broadly speaking, the Victorian approach is as follows:

- Surveys are developed and undertaken for different customer types, so that the results represent a cross section of the overall population. AEMO use four different customer types/ sectors: residential, agricultural, industrial and commercial. These surveys are designed to capture specific costs related to hypothetical supply interruption scenarios of different durations. The surveys reflect the different activities undertaken by each customer type and differing interruption characteristics, both of which impact the costs of supply interruptions.

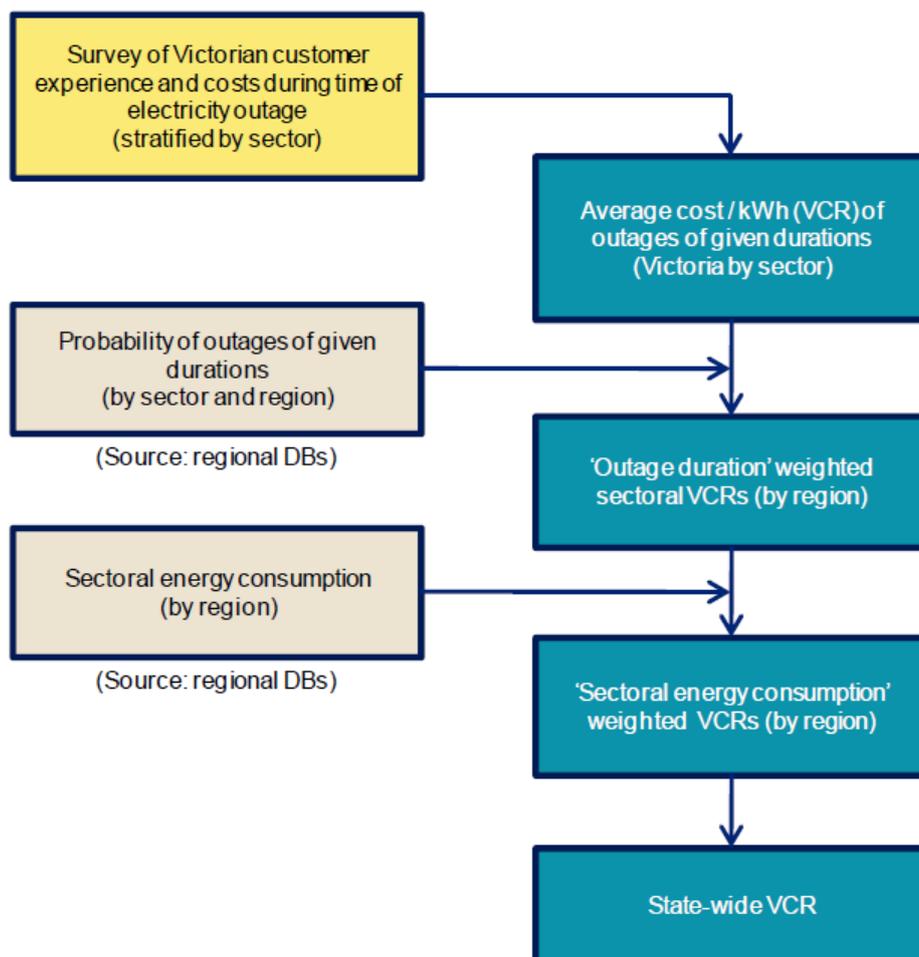
⁴⁶ AEMO has instead decided to use re-weighted VCRs for each NEM region, developed by Oakley Greenwood, and derived from the Victorian surveys conducted in 2007. AEMO, 2012, National Value of Customer Reliability Final Report, pg. 2.

⁴⁷ In the actual survey questions, the 1 per cent figure was converted into a dollar amount based on each respondent's estimate of their total bill size.

- The reported total cost for each customer type and supply interruption length is then normalised by the actual consumption of each respondent. This is used to develop an average cost of a supply interruption per kWh of consumption for each customer type.
- These supply interruption costs are then weighted by the probability of an interruption of a given duration.
- A VCR for each customer type is then calculated as the sum of the probability-weighted normalised supply interruption costs.
- Finally, the state-wide VCR is calculated by weighting the VCRs for each customer type by the proportion of electricity consumed by each type across the state, and summing across the customer types.⁴⁸

The methodology for the Victorian VCR is set out in below in Figure 3.2.

Figure 3.2 Victorian VCR methodology



Source: Oakley Greenwood, 2011, *Valuing reliability in the National Electricity Market*, final report, March, p. 12.

⁴⁸ Oakley Greenwood, 2011, *Valuing Reliability in the National Electricity Market Final Report*, p. 12

The residential survey asks respondents which actions (which are provided to the respondent from a list) they would be most likely to take in the event of a supply interruption of a specified duration. The estimated cost of each action item is provided to the respondent. As a result, the value of customer reliability for residential customers is derived from a substitution approach as respondents are asked what substitute actions they would take to mitigate the effects of a supply interruption.

In contrast, the business survey is based on a direct cost approach. In the business survey respondents are asked to estimate the costs they would be likely to incur as a result of a supply interruption of a specified duration. This allows the business survey to take into account the variety of costs that business customers may incur.

For both the residential and business survey, respondents are asked to estimate the cost of a supply interruption at the *worst* possible time for each respondent. As a result, the VCR results will have a tendency to be on the higher end of customer's value of reliability. A copy of the residential and business surveys are set out in Oakley Greenwood's consultant report, which is available on the AEMC website.

All the surveys also collected additional information such as the customer's experience with supply interruptions, customer demographics and characteristics.⁴⁹

Differences between AEMO's Victorian VCR methodology and the AEMC's NSW VCR methodology

The approach we have used is broadly consistent with that outlined for Victoria above, with some important adjustments to the customer surveys so that the results better reflect the value placed on distribution reliability by NSW customers.

One of the key differences between the Victorian VCR survey and the survey undertaken by the AEMC is that the Victorian survey is intended to be used to assess the value placed on transmission reliability for transmission planning.⁵⁰ Therefore, regional differences in how reliability is valued are less important, as only a state based VCR is required. In contrast, the AEMC survey is seeking to assess the value placed on distribution reliability. As a consequence, statistically significant VCRs at a DNSP level are required.

The AEMC's NSW VCR survey included the following changes to the Victorian VCR survey:

- **Customer types:** We changed the customer types to residential, small business, medium sized business, and large/industrial business, as NSW DNSPs did not have records which enabled them to distinguish between different business

⁴⁹ Oakley Greenwood, 2011, *Valuing Reliability in the National Electricity Market Final Report*, 30 May, p. 11

⁵⁰ However, we understand that Victorian DNSPs also use the Victorian VCR in planning their networks.

types.⁵¹ However, as discussed in chapter 4, as limited responses were obtained from large/industrial businesses, we have compressed the results for medium and large businesses into a single medium/large business category. This differs from the Victorian approach of dividing customers into residential, agricultural, industrial and commercial categories.

- **DNSP level VCRs:** We segmented customer types by individual distribution networks, to ascertain whether the NSW VCR varies across the different NSW DNSPs. In Victoria, only a state level VCR has been developed to date.
- **Surveying by feeder type:** We also segmented customer types by feeder type (ie CBD, urban, short-rural and long-rural), to establish how the VCR varies with population density. However, as discussed in chapter 4, as limited responses were obtained from customers on long rural feeders, we have compressed the results for short rural and long rural feeders into a rural feeder category.
- **Willingness to pay and accept questions:** As discussed above, we introduced specific willingness to pay and accept questions for residential customers to test the willingness of customers to pay and accept different reliability outcomes. The inclusion of willingness to pay questions in the customer survey was raised in submissions from the Public Interest Advocacy Centre and the Major Energy Users on the NSW workstream issues paper.⁵² The results from these questions have been used to provide further information on customers' attitudes towards the value of reliability, rather than being used in the calculation of the NSW VCR. Questions of this nature have not been included in the Victorian survey.
- **Priorities for distribution investment:** We asked residential respondents to pick which priority DNSPs should invest in from the following: less supply interruptions; interruptions of shorter duration; or communications systems to tell you how long a supply interruption is likely to last. The issue of customer communication during and following a supply interruption was raised in submissions to the issues paper by Essential Energy, the Essential Energy Rural Advisory Group and the Customer Council of Essential Energy.⁵³ The Victorian survey has not included questions of this nature.
- **Customer hardship questions:** We also ensured the survey would capture the reasons underpinning do-nothing responses from residential respondents in

51 Small business customers were defined as business customers consuming 160 MWh or less a year, medium business customers were defined as those consuming over 160 MWh to 750 MWh a year, while large/industrial business customers were defined as consuming over 750 MWh a year.

52 Public Interest Advocacy Centre, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper, pg. 2; Major Energy Users, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper, pg. 23.

53 Essential Energy, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper, pg. 1; Customer Council of Essential Energy, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper; Essential Energy Rural Advisory Group, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper.

relation to interruptions (for example, due to customer hardship). Residential respondents were also asked whether they received any concessions on their electricity bill. Taking into account customer hardship was raised in discussions between the AEMC and consumer groups following the publication of the issues paper. The Victorian survey has not included similar questions relating to customer hardship.

- **Updates to the costs and possible actions used in residential surveys:** For the residential customer surveys, we updated the cost and possible actions in response to interruptions to reflect changes in technology and inflation.
- **Availability of more reliable power sources:** We inserted questions about the availability of back-up sources of power to assess respondents' ability and willingness to pay to improve their own reliability of supply. This may assist in determining a more optimal level of reliability, as it allows the AEMC to take into account any upward bias that may result from customers who place an above average value on their reliability. Considering opportunities for customers to improve their own reliability was raised by IPART in its submission to the issues paper.⁵⁴
- **Use of NMIs:** We introduced a requirement for survey respondents to provide their National Meter Identifier (NMI). This has been introduced for the NSW VCR to enable verification of the customer type and feeder type by the DNSP, and to confirm consumption data. In Victorian VCR survey, respondents have been requested to sign a waiver which is then used to obtain access to their account. Our approach avoided the need to obtain personal information regarding individual customers.

We consider that these amendments to the survey methodology address stakeholder concerns about the suitability of the VCR method to NSW. These amendments also facilitate the application of the AEMO VCR approach to electricity distribution networks and NSW consumers.

The surveys were conducted in several stages, including pilot testing the questionnaire to ensure suitability, recruitment of participants, distribution of the questionnaire itself, monitoring completions and collating the survey data. The surveys were administered by telephone for residential customers, and by telephone and online for business customers. Two different delivery methods were used as the residential survey was suitable for real-time completion, whilst the business survey was substantially more involved and may have required more time to complete.

Views of submissions on the AEMC's draft report

A number of submissions commented on the methodology that was used to calculate the VCR for the NSW DNSPs. Submissions generally supported the consideration of

⁵⁴ IPART, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper, pg. 2.

the views of NSW customers in assessing the costs and benefits of alternative distribution reliability outcomes, but differed on how the VCR should be calculated and how the results should be viewed.

Endeavour Energy suggested that the NSW VCRs may be understated, as the methodology used does not take into account the loss of convenience or other non-monetary impacts.⁵⁵ TransGrid noted that electricity customers are risk averse and are therefore willing to insure against high impact, low probability events.⁵⁶ As a result, TransGrid suggested that NSW customers may be willing to pay an 'insurance premium' if it minimises the risk of a widespread outage even where such events may be unlikely.⁵⁷

Ausgrid considered that as the NSW economy moves towards a global knowledge based economy future reliability needs may be greater than present.⁵⁸ Ausgrid also suggested that an 'agent' based simulation methodology could be used to better reflect the diversity of customer needs.⁵⁹

The VCR values used in our cost benefit assessment have not been indexed or inflated over the modelling period, as it is uncertain how the NSW VCR may change over time and how much it may change by. Therefore, the results of our cost benefit assessment over the first five years of our modelling period are likely to be more accurate than for the later years of the modelling period. As discussed in chapter 6, we also consider that VCR surveys must be performed regularly to ensure the VCR remains relevant and reflective of the value placed on reliability by customers.

While AEMO's survey methodology does not seek to quantify non-monetary impacts, by asking respondents to consider the cost of an outage at the worst possible time, the survey results are likely to be by nature on the higher end of a customer's value of reliability.

A number of submissions raised concern about the reliability of the NSW VCR results, particularly as the NSW VCR was significantly higher than the indexed 2007 Victorian VCR.⁶⁰

The Major Energy Users and the Public Interest Advocacy Centre suggested that a lower VCR should be used, with the Major Energy Users proposing the use of the Victorian VCR and the Public Interest Advocacy Centre proposing a re-weighting of the VCR by the number of customers within each customer type rather than by their

55 Endeavour Energy, Submission on the NSW workstream draft report, p. 2.

56 TransGrid, Submission on the NSW workstream draft report, p. 6.

57 TransGrid, Submission on the NSW workstream draft report, p. 5.

58 Ausgrid, Submission on the NSW workstream draft report, p. 3.

59 Ausgrid, Submission to the NSW workstream draft report, p. 3.

60 See submissions on the NSW workstream draft report from: TransGrid, pp. 2-4; Public Interest Advocacy Centre, pp. 5-6; Major Energy Users, p. 10; Ausgrid, p. 3; St Kitts Associates, p. 4; AEMO, p. 5.

consumption.⁶¹ St Kitts Associates suggested that a range of VCR values could be used.⁶²

The Commission's NSW VCR survey was based on a total of 1,288 survey responses, which is significantly larger than the sample size used in the Victorian 2007 VCR survey. The NSW VCR for small businesses, which was a particular concern for a number of submissions, was based on close to 500 survey respondents.

Historically, VCR surveys have also demonstrated a significant increase between surveys. For instance, in 2007/08 dollars, the 2002 Victorian VCR survey resulted in a VCR of \$29,600/MWh, while the 2007 Victorian VCR resulted in a VCR of \$47,850/MWh, which is an increase of around 60 per cent.⁶³ When indexed to 2010/11 dollars, the 2007 Victorian VCR is \$57,880/MWh, while the NSW VCR determined through the AEMC's survey was \$94,990/MWh in 2011/12 dollars, which is also an increase of around 60 per cent.⁶⁴

The survey methodology used in the AEMC's NSW VCR survey was based on the same methodology that was used for both the 2007 and 2002 Victorian VCR surveys.⁶⁵ As a result, it is difficult to assess the causes of the increase in VCRs with each survey that has been undertaken.

In regards to how the VCR is weighted, weighting the VCR by the consumption of each customer type rather than the number of customers provides a more accurate reflection of the impact that a supply interruption may have on different customer types. The approach we have taken is also consistent with the methodology used in the Victorian VCR surveys.

Willingness to pay and the value of customer reliability remain difficult concepts to quantify and there appears to be no universally accepted methodology to assess them. Under the timeframe for NSW workstream, we were unable to develop, test and run a survey which used an untried methodology. However, as part of the national workstream we will further consider how best to estimate the willingness of customers to pay and accept different distribution reliability outcomes. We also note that AEMO intend to commence work in late 2012 to develop more regional-specific VCRs following terms of reference from the SCER which should build on the work undertaken to date.⁶⁶

⁶¹ See submissions on the NSW workstream draft report from: Major Energy Users, p. 16; Public Interest Advocacy Centre, p. 6.

⁶² St Kitts Associates, Submission to the NSW workstream draft report, p. 4

⁶³ Charles River Associates International, 2008, *Assessment of the value of customer reliability (VCR)*, 12 August, p. 6.

⁶⁴ AEMO, 2011, *2011 Victorian annual planning report: Electricity and gas transmission network planning for Victoria*, 24 June, p. 15.

⁶⁵ Oakley Greenwood, 2012, *NSW value of customer reliability*, 30 May; Charles River Associates International, 2008, *Assessment of the value of customer reliability (VCR)*, 12 August, p. 14.

⁶⁶ AEMO, Submission to the NSW workstream draft report, p. 5.

3.3 Cost-benefit assessment

3.3.1 Comparison of the change in capital expenditure and the change in the value of unserved energy

Figure 3.3 below sets out a summary of how we have used the expenditure and reliability estimates provided by the NSW DNSPs and the NSW VCR we developed to undertake our cost-benefit assessment for each scenario.

The capital expenditure estimates provided by the DNSPs were converted into a net present value over a five year timeframe and a fifteen year timeframe. The net present value of the estimated capital expenditure was calculated so that the change in expenditure under each scenario could be compared in today's dollars.

The change in reliability outcomes that were modelled by the DNSPs were then quantified using the VCRs we developed. This was done for each scenario by multiplying the change in expected energy not served for each DNSP by the VCR for each DNSP. The VCRs for each DNSP rather than the NSW VCR were used to provide greater accuracy. The VCR was held constant over the modelling period, we did not provide for any indexation of the VCR over the period in undertaking our cost-benefit assessment, as it is uncertain how the VCR may change over the modelling period. The net present value of the change in expected energy not served was calculated for each scenario and DNSP over a five year timeframe and a fifteen year timeframe.

The net present value of the change in expenditure for each DNSP was then compared against the net present value of the cost of the change in reliability outcomes for each scenario.

In its submissions to the draft report, Endeavour Energy and Essential Energy suggested that it was appropriate to use the NSW DNSPs' weighted average cost of capital for the current regulatory control period as a discount rate to convert the change in expenditure and the value of the change in reliability outcomes to a net present value.⁶⁷ TransGrid noted that as the Commission used the current nominal weighted average cost of capital for the NSW DNSPs of 10.02 per cent, that it should have also expressed all cash flows in nominal terms.⁶⁸ TransGrid also raised concern that the Commission's approach may mean that the entire deferred cost of projects, such as Ausgrid's deferred \$200m Sydney CBD project in 2028/29, is counted as a benefit.⁶⁹

We agree that the discount rate that is used should be expressed in the same way as the forecast change in capital expenditure and the value of unserved energy. As a result, we have amended our analysis to use the current real vanilla weighted average cost of

⁶⁷ See submissions on the NSW workstream draft report from: Endeavour Energy, p. 1; Essential Energy, p. 1.

⁶⁸ TransGrid, Submission on the NSW workstream draft report, p. 5.

⁶⁹ Ibid.

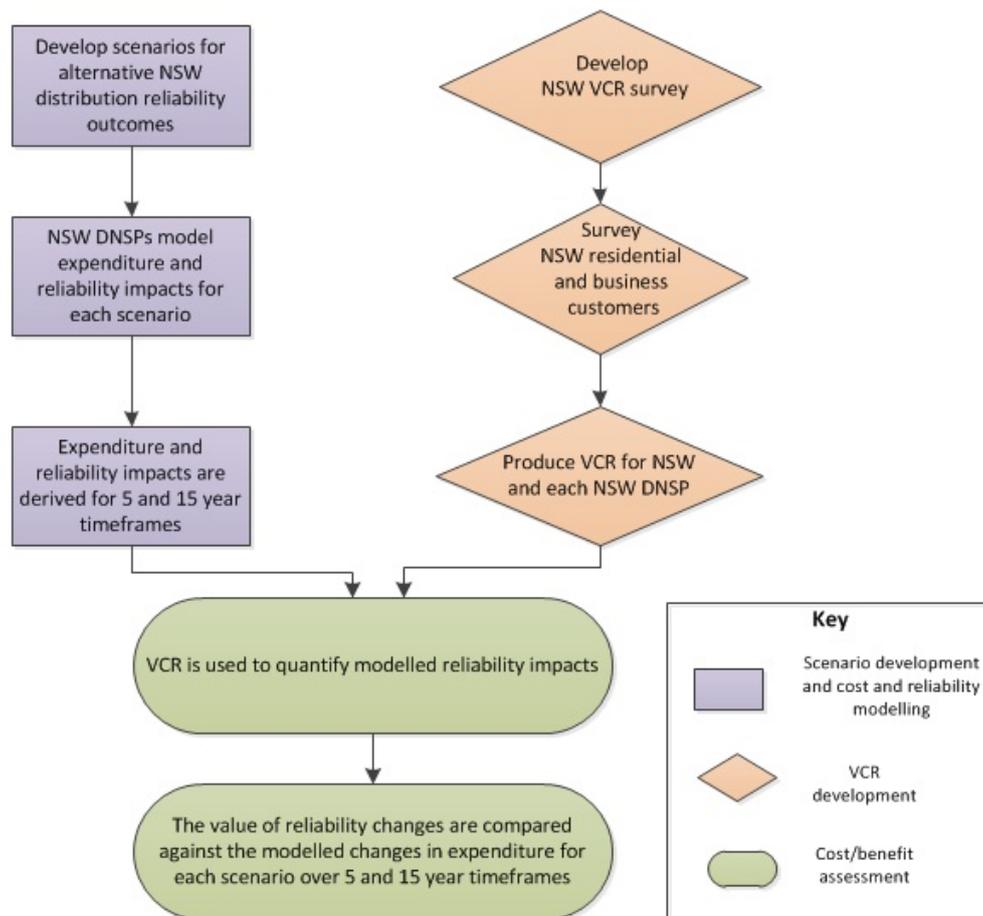
capital for the NSW DNSPs of 7.36 per cent, rather than the nominal vanilla weighted average cost of capital of 10.02 per cent that was used in our draft report.⁷⁰

The overall change in capital expenditure and value of unserved energy for each scenario has remained the same as that in our draft report. However, as the real vanilla weighted average cost of capital is lower than the nominal weighted average cost of capital we used in the draft report, the net present value of the change in capital expenditure and value of unserved energy are higher. This has occurred as the values have been discounted by a small amount.

By discounting the impact of changes in capital expenditure and the value of the change in unserved energy over the modelling period, projects which are deferred in the later years of the modelling period will only have a limited impact on the net present value.

The results of the cost-benefit assessment for each scenario and DNSP, and at a NSW level, are set out in chapter 5.

Figure 3.3 Summary of the AEMC's cost benefit assessment process



⁷⁰ The real vanilla weighted average cost of capital for the NSW DNSPs was obtained from the AER's current Post Tax Revenue Models for each DNSP. The AER's models are available on their website here: <http://www.aer.gov.au/node/482>.

3.3.2 Assessment of retail price impacts for residential customers

Residential retail price impacts were also estimated for each DNSP and scenario. Residential retail price impacts were determined by converting the modelled capital expenditure for each scenario into an annual revenue requirement. This was done by using some simplifying assumptions, to calculate a return on capital and depreciation.

The return on capital has been re-calculated to use the current real vanilla weighted average cost of capital for the NSW DNSPs of 7.36 per cent rather than the nominal vanilla weighted average cost of capital of 10.02 per cent that was used in the draft report, as the change in capital expenditure was also expressed in real terms. Using a lower return on capital has resulted in slightly lower retail price impacts than those contained in our draft report.

Depreciation was calculated using a 45 year asset life.

The annual revenue requirement has only based on the change in capital expenditure that has been forecast by the DNSPs from 1 July 2014 to 30 June 2029. It does not take into account the prior capital expenditure that has been or will be spent by the DNSPs to meet the existing licence conditions prior to 1 July 2014. The annual revenue requirement that has been calculated only takes into account expenditure needed to meet the licence conditions.

This annual revenue requirement for each DNSP was then divided by the forecast consumption for each DNSP, using the forecast demand in AEMO's 2011 Electricity Statement of Opportunities under a medium growth scenario. As AEMO's forecasts only extend to 2020/21, the average annual growth rate assumed by AEMO was used to forecast consumption out to 2028/29.

By dividing the annual revenue requirement by the forecast consumption for each DNSP we were able to derive a c/kWh impact for each DNSP and scenario. This c/kWh was then multiplied by 7,000 kWh, which IPART has suggested is the average annual consumption for NSW residential customers, to determine the average annual electricity bill impact for residential customers for each DNSP and scenario.⁷¹ The difference in the average annual electricity bill impact between the baseline and each scenario was then determined to assess the impact of each scenario. A weighted average NSW bill impact was also determined for each scenario by weighting the DNSP bill impacts by the number of customers in each DNSP's network.

3.3.3 Assessment of impacts on interruption duration

The impact on SAIDI for each DNSP and scenario was determined by converting the modelled expected energy not served into a SAIDI impact for each feeder type. This was then weighted by the average annual consumption on each feeder type to determine the weighted average SAIDI for each DNSP and scenario. A weighted

⁷¹ IPART, 2012, *Changes in regulated electricity retail prices from 1 July 2012-April 2012*, final report, June.

average NSW SAIDI impact for each scenario was also determined by weighting the DNSP SAIDIs for each scenario by the number of customers in each DNSP's network.

In its submission to the draft report, Endeavour Energy raised a concern that the SAIDI for the baseline scenario, which represents the continuation of the current licence conditions, shows a SAIDI which is substantially better than Endeavour Energy expects to achieve.⁷²

We agree that there is the potential that the SAIDIs that were derived from each DNSP's modelled unserved energy may differ from the likely performance of each DNSP. However, as each DNSP modelled SAIDI in a different way, it was considered that converting forecast unserved energy to SAIDI using the same method across the three DNSPs would provide for more consistent results and would also ensure that SAIDI impacts were consistent with our cost benefit assessment which is based on the value of changes in unserved energy. Using a consistent method to estimate SAIDI also allows the relative difference between the baseline and each scenario to be considered on a valid basis.

3.3.4 Sensitivities to our cost benefit assessment

In the draft report we included three different sensitivities to our cost benefit assessment which reflected the use of different discount rates to convert values to net present values and not converting the value of expected energy not served to a net present value. We asked for submissions on whether any further sensitivities should be undertaken. Submissions from Ausgrid, Essential Energy and Endeavour Energy did not support any further sensitivities being undertaken as they were unlikely to change the Commission's conclusions.⁷³

However, submissions from the Major Energy Users, St Kitts Associates and the Public Interest Advocacy Centre considered that sensitivities should be undertaken using alternative VCR values.⁷⁴In particular, the Major Energy Users and the Public Interest Advocacy Centre suggested that the impact of lower VCRs should be considered.⁷⁵

The Major Energy Users also suggested that sensitivities on the forecast capital expenditure for each scenario should be undertaken as historically network service providers have used less capital expenditure than is allowed in their regulatory determinations.⁷⁶ However, we note that whilst DNSPs may have used less capital expenditure than has been allowed historically, it may not necessarily be the case that

⁷² Endeavour Energy, Submission to the NSW workstream draft report, p. 5.

⁷³ See submissions on the NSW workstream draft report from: Ausgrid, p. 3; Essential Energy, p. 1; Endeavour Energy, p. 1

⁷⁴ See submissions on the NSW workstream draft report from: Major Energy Users, p. 6; St Kitts Associates, p. 4; Public Interest Advocacy Centre, pp. 5-6.

⁷⁵ See submissions on the NSW workstream draft report from: Major Energy Users, p. 16; Public Interest Advocacy Centre, p. 6.

⁷⁶ Major Energy Users, Submission on the NSW workstream draft report, p.16.

the estimates of capital expenditure they have provided for the scenario analysis will also be less.

Using lower levels of capital expenditure and lower VCRs (whether they are based on customer numbers, the Victorian VCR or any other basis) will only increase the relative size of the benefits of reducing reliability outcomes in NSW compared to the costs of doing so. The results of the cost benefit assessment in our draft report suggested there were clear net benefits from reducing the level of distribution reliability in NSW, with the quantum of benefits significantly larger than the costs of doing so. As a result, while using lower levels of capital expenditure and lower VCRs would increase the size of the net benefits of reducing the level of distribution reliability, it would not change the overall conclusions of our analysis. For this reason, we have not undertaken any further sensitivities which use lower levels of capital expenditure or a lower VCR.

As discussed in section 3.1.2 above, we have included some additional analysis on the impact on capital expenditure and reliability that may occur in Essential Energy's network under Scenarios 2 and 3, where the reliability impacts in Essential's network are reduced. This additional analysis was undertaken as modelling in our draft report highlighted that Scenarios 2 and 3 could lead to a significant increase in expected energy not served in Essential's network. This additional analysis is set in Chapter 5.

4 Customer survey results

Box 4.1: Summary box

- The NSW VCR that has been developed is \$94,990/MWh. This is based on a weighted average of the following VCRs for each NSW DNSP: Ausgrid, \$86,790/MWh; Endeavour Energy, \$110,710/MWh; and Essential Energy, \$90,710/MWh.⁷⁷ The VCRs for each DNSP have been used in our cost-benefit assessment of distribution reliability scenarios.
- The NSW VCR is significantly higher than the current Victorian VCR of \$57,880/MWh, which is based on indexed results from a 2007 survey. This difference appears to be mainly driven by a significantly higher VCR for NSW small businesses. While it is not possible to determine the reasons for this increase, a possible reason may include an increased reliance by small businesses on the internet and other electronic systems for their business functions since 2007.
- The amount that residential customers are willing to pay for improved reliability is relatively consistent with the residential VCR results for NSW. However, residential customers required a significantly higher level of compensation to accept a reduction in their reliability, compared to the residential VCR and the willingness of customers to pay for improved reliability.
- Close to 60 per cent of residential respondents prioritised investment to reduce the number of supply interruptions, while close to a quarter of respondents prioritised investment on communications systems to let them know how long a supply interruption would last for. Systems to reduce the length of a supply interruption was the least popular choice for investment. The results between the three DNSPs were relatively similar.
- The VCR for low income residential households is around 25 per cent lower than the VCR for average residential households in NSW. Low income households are also more likely to do nothing in response to longer interruptions of four hours or more compared to other households. This suggests that low income households have a more limited ability to deal with supply interruptions.

This Chapter sets out results from our survey of NSW customers. The main purpose of this survey was to develop a NSW VCR, which could be used to value reliability in our cost-benefit assessment of distribution reliability scenarios. However, we also used this survey to gain information on the willingness of NSW customers to pay for reliability improvements and accept reductions in reliability, customer preferences for distribution investment, and low income households.

⁷⁷ The NSW weighted average VCR is weighted by the consumption in each DNSP's network.

No further surveying has been done following the publication of our draft report.

Further details on the survey results, including a copy of the questions that were asked, are available in Oakley Greenwood's consultant report, which can be found on the AEMC website. Details on the survey methodology can be found in Chapter 3, while the results of our cost-benefit assessment are in Chapter 5.

4.1 Value of customer reliability

This section sets out results relating to the NSW VCR. As discussed in Chapter 3, the NSW VCR is based on the approach used by AEMO to calculate the Victorian VCR. The VCR estimates the costs associated with supply interruptions for consumers. The VCR can be considered as a proxy for willingness to pay, as consumers should be willing to pay at least the equivalent of the avoided cost of an interruption.

4.1.1 Sample size

In undertaking our customer survey, we had sought to achieve statistically significant sample sizes at a:

- NSW level;
- DNSP level;
- customer level, for residential, small businesses consuming less than 160 MWh a year, medium businesses consuming between 160 MWh and 750 MWh a year, and large businesses consuming over 750 MWh a year; and
- feeder level (ie CBD, urban, short rural, long rural feeders).

Achieving statistically significant results at DNSP and feeder levels for each customer type would have resulted in 40 individual VCR measures, in addition to weighted average VCRs at an overall DNSP and NSW level. This would have included, for example, a VCR for Ausgrid's medium sized businesses on short rural feeders.

However, the sample sizes we achieved through our survey for large businesses and long rural feeders were smaller than anticipated. As a result, to achieve statistically significant results, we were required to compress our medium and large business categories and our short rural and long rural feeder categories. This resulted in statistically significant sample sizes and VCRs at a:

- NSW level;
- DNSP level;
- customer level, for residential, small businesses consuming less than 160 MWh a year, and medium/large businesses consuming 160MWh a year and over; and
- feeder level, for CBD, urban, and rural feeders.

In total, usable survey responses were received from 1,288 NSW customers.⁷⁸ The breakdown of the usable sample size by DNSP and customer type is set out in Table 4.1 below. We have also set out the breakdown of the usable sample size by feeder and customer type.⁷⁹

Table 4.1 NSW 2012 VCR survey: Usable sample size by DNSP and customer type⁸⁰

Customer type	NSW	Ausgrid	Endeavour Energy	Essential Energy
Residential	718	251	232	236
Small business < 160 MWh pa	497	164	194	139
Medium/ large business ≥ 160 MWh pa	74	35	24	15
Total average sample	1,288	449	450	389

Table 4.2 NSW 2012 VCR survey: Usable sample size by feeder type and customer type⁸¹

Customer type	NSW	CBD feeders	Urban feeders	Rural feeders
Residential	718	30	383	306
Small business < 160 MWh pa	497	6	306	185
Medium/ large business ≥ 160 MWh pa	74	5	47	22
Total average sample	1,288	41	735	512

⁷⁸ Interviews were conducted with a significantly larger number of customers. However, some customers did not provide valid NMIs that could be matched with the DNSPs' records (which is necessary to calculate the VCR) or did not provide sufficiently complete answers to the questions.

⁷⁹ The sample sizes reported in Tables 4.1 and 4.2 are average sample sizes. For every interruption duration / customer type / feeder / DNSP combination there can be a different sample size, as some respondents did not answer every question in the survey. Therefore, when a weighted average VCR is created for a single customer type / feeder / DNSP combination it is potentially comprised of differently sized samples. As a result, the sample sizes shown for each such VCR are averages and therefore the column totals may have rounding errors.

⁸⁰ Ibid.

⁸¹ Ibid.

The useable sample size achieved is significantly larger than the sample size achieved for the most recent Victorian VCR survey in 2007, which had a total of 821 useable responses.⁸² However, a larger sample size was required in the NSW VCR survey to achieve statistically significant VCRs at a DNSP level and feeder level for each customer type. In contrast, the Victorian VCR only seeks to achieve statistically significant results at a state level for each customer type. The useable sample size that was achieved in Victoria in 2007 for each customer type is set out in Table 4.3.

Table 4.3 Victorian 2007 VCR survey: Usable sample size⁸³

Customer type	Victoria
Residential	268
Agriculture	134
Commercial	191
Large industrial	288
TOTAL	821

4.1.2 Value of customer reliability results

NSW level VCR results

Based on the useable sample sizes that were achieved, we were able to calculate the following VCRs at a NSW level, by customer type.

The standard error of each VCR result is also outlined, which sets out the range of values that each VCR may vary between based on our survey results and sample size. The standard errors assume that the value of customer reliability for each customer type is normally distributed and the sample that has been used is representative of the broader population for that customer type. As a result, the VCR results should be considered as providing a likely *indication* of the value placed on reliability by different customer types, rather than a definitive estimate of this value. VCRs are also likely to change over time, as customers' reliance on and use of electricity changes.

Some submissions to the draft report have raised concern over the relatively low standard errors we have reported.⁸⁴ The relatively low standard errors, particularly for the residential and the small business VCRs, reflect the results of a mathematical

⁸² Charles River Associates International, 2008, *Assessment of the value of customer reliability (VCR)*, 12 August, p. 21.

⁸³ Charles River Associates International, 2008, *Assessment of the value of customer reliability (VCR)*, 12 August, p. 21.

⁸⁴ See submissions to the NSW workstream draft report from: TransGrid, pp. 2-4; St Kitts Associates, p. 4.

calculation based on the sample size that was used and the relatively limited variance in customer responses compared to the average response in our survey. Further detail on how the standard errors were calculated is set out in Appendix D of Oakley Greenwood's consultant report, *NSW Value of Customer Reliability*, which can be found on the AEMC website.

In considering these results, it should be noted that respondents were asked to estimate the cost of interruptions at the *worst* possible time for each respondent. This is the same approach used in AEMO's Victorian VCR. As a result, the VCRs developed will be on the higher end of the value placed on reliability by consumers.

Table 4.4 NSW VCR by customer type

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$20,710	±\$1,080
Small business < 160 MWh pa	\$413,120	±\$26,930
Medium/ large business ≥ 160 MWh pa	\$53,300	±\$9,600
NSW weighted average	\$94,990	±\$5,910

These results are higher than the current Victorian VCRs which are being used. The current Victorian VCRs have been indexed from the 2007 Victorian VCR survey, and are set out in Table 4.5. Generally, when the Victorian VCR survey has been undertaken there has been a significant increase in the VCR, in part as the Victorian VCR survey has been undertaken every five years.

Table 4.5 Current Victorian VCR - Indexed from the Victorian VCR 2007 survey results⁸⁵

Customer type	VCR (\$/MWh)
Residential	\$23,800
Agricultural	\$130,260
Commercial	\$103,770
Industrial	\$41,240
Victorian weighted average	\$57,880

⁸⁵ AEMO, 2011, *2011 Victorian annual planning report: Electricity and gas transmission network planning for Victoria*, p. 15.

While the VCRs for residential and large business customers are similar between the NSW and Victorian surveys, the main difference between the NSW and Victorian state level VCRs appears due to the significantly higher small business VCR in NSW. The small business category in NSW is most similar to the agricultural and commercial customer types used in the Victorian survey.

A number of submissions to the draft report raised concern about the relatively high NSW VCR and small business VCR, with some submissions suggesting that the NSW VCR could be re-calculated using an alternative methodology or that the Victorian VCR could be used as a sensitivity to our results.⁸⁶

While we understand these concerns, it is not possible to determine from the customer survey the precise reasons for significant difference between the small business VCR in NSW and the agricultural and commercial VCRs in the Victorian survey. However, our consultants have suggested that a possible reason may be that small businesses have become more dependent on the internet and other electronic systems (for example, EFTPOS) for their business functions since 2007.

Other factors, such as differences in customer expectations and differences in survey methodology, would have affected the VCRs for all customer types rather than only small businesses.

Re-calculating the VCR using a different methodology would make our survey results less comparable to those done in Victoria, while the results from the 2007 Victorian VCR may not represent the value placed on a reliable electricity supply by NSW customers today. We also note that amendments to the NSW VCR results would also be unlikely to alter the results of our cost benefit assessment of alternative NSW distribution reliability outcomes, as the benefits of reducing reliability outcomes in NSW significantly outweighed the costs of doing so across both a five and fifteen year timeframe and all three of our lower reliability scenarios. Further details on the results of our cost benefit assessment are in Chapter 5.

Endeavour Energy suggested the VCR may be understated as it does not take into account non-monetary impacts, while Ausgrid noted that future reliability needs may be greater in the future.⁸⁷

As part of the national workstream, we will be further considering how best to calculate the willingness of customers to pay for reliability. We also note that AEMO intends to undertake work to develop more region specific VCRs in late 2012, which may assist in furthering our understanding of the VCR.⁸⁸

86 See submissions on the NSW workstream draft report from: TransGrid, pp. 2-4; Public Interest Advocacy Centre, pp. 5-6; Major Energy Users, p. 10 & 16; Ausgrid, p. 3; St Kitts Associates, pp. 3-4; AEMO, p. 5.

87 See submissions on the NSW workstream draft report from: Endeavour Energy, p. 2; Ausgrid, p. 3.

88 AEMO, Submission to the NSW workstream draft report, p. 5.

DNSP level and feeder level VCR results

VCR estimates by DNSP were also calculated, which are outlined in Table 4.6 to Table 4.8 below. These DNSP level VCRs, rather than the NSW level VCR, were used in our cost-benefit assessment to provide a more accurate value of the expected energy not served that was modelled by each DNSP.

Table 4.6 Ausgrid VCRs

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$22,770	±\$1,880
Small business < 160 MWh pa	\$408,480	±\$45,970
Medium/large business ≥ 160 MWh pa	\$34,830	±\$11,020
Ausgrid weighted average	\$86,790	±\$8,570

Table 4.7 Endeavour Energy VCRs

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$19,750	±\$1,680
Small business < 160 MWh pa	\$563,460	±\$47,460
Medium/large business ≥ 160 MWh pa	\$33,990	±\$9,800
Endeavour Energy weighted average	\$110,710	±\$8,650

Table 4.8 Essential Energy VCRs

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$17,820	±\$1,560
Small business < 160 MWh pa	\$202,820	±\$25,590
Medium/large business ≥ 160 MWh pa	\$130,570	±\$37,460
Essential Energy weighted average	\$90,710	±\$15,440

The overall VCRs for each DNSP and residential customers are relatively similar. For all DNSPs, the small business VCR is significantly larger than the other two customer types, with the residential VCRs the lowest of all customer types. Residential customers are likely to have a lower VCR than businesses, as the cost of a supply interruption would reflect the inconvenience of the interruption, and the cost of substitute actions that they may undertake to deal with the interruption. In contrast, for businesses, the VCR would generally represent the loss of sales, production, and stock.

Small businesses may have a higher VCR than medium and large businesses as they are more likely to be reliant on electricity at peak periods for a substantial proportion of their income. As a result, if the electricity supply of a small business was interrupted during the worst possible time, for example during the Friday lunch period of a Sydney CBD café, the business could lose a substantial proportion of the value of its normal day's trade.

In contrast, larger businesses are more energy intensive and are more likely to have an even level of consumption throughout a day. This may mean that the relative impact of a supply interruption, even during the worst possible time, is lower than for small businesses. Larger businesses may also have more extensive alternative power sources that they can use to minimise the impact of an interruption.

Larger businesses also require more energy to produce their products than small businesses. As a result, while the overall cost of a supply interruption would be higher for medium and large businesses than small businesses, as the VCR is a \$/MWh value, the higher level of consumption of larger businesses, is likely to lead to a lower VCR value.

An example of how consumption affects the VCR and supply interruption costs is set out in Table 4.9. This demonstrates that although a small business may have a significantly higher VCR than a medium/large business, the cost of a one hour interruption would still be greater for the large business due to their higher level of consumption. This higher level of consumption means that the total cost of an interruption overall is likely to be greater for large businesses than small businesses.

Table 4.9 Impact of consumption on the VCR and supply interruption costs⁸⁹

Customer type	Annual consumption (MWh per a year)	Consumption in one hour (kWh)	VCR	Cost of a one hour supply interruption (\$)
Residential	6	0.68	\$20,710/MWh	\$14
Small business	100	11.42	\$413,120/MWh	\$4,716
Medium/large business	1000	114.16	\$53,300/MWh	\$6,084

However, while the VCRs for small businesses are higher than medium/large businesses for all DNSPs, the VCRs for each business type are significantly different between the three DNSPs. The VCR for small businesses ranges from \$563,460/MWh in Endeavour Energy's network to \$202,820/MWh in Essential Energy's network, while the VCR for medium/large businesses ranges from \$130,570 in Essential Energy's network to \$34,830 in Ausgrid's network.

From the results of the VCR surveys we cannot determine why the results differ between customer types or why the same customer types in different distribution networks place such different values on the reliability of their electricity supply.

We also calculated VCR results by feeder type, for CBD, urban and the combined rural feeder categories. These results show similar patterns to the DNSP results discussed above. Despite some significant differences in small business and medium/large business VCRs between the feeder types, the overall VCRs for each feeder type are relatively similar.

The VCR for residential customers falls as customer density reduces. The CBD residential VCR is just over double the rural residential VCR. This indicates that the total cost of the substitute actions that rural residential customers would take in the event of a supply interruption are on average lower than the cost of actions that CBD residential customers would undertake.

⁸⁹ Oakley Greenwood, 2012, *NSW Value of Customer Reliability*, June.

Table 4.10 CBD feeder VCRs

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$32,270	±\$5,890
Small business < 160 MWh pa	\$295,870	±\$84,430
Medium/large business ≥ 160 MWh pa	\$80,540	±\$41,780
CBD feeder weighted average	\$120,520	±36,370

Table 4.11 Urban feeder VCRs

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$23,050	±\$1,470
Small business < 160 MWh pa	\$452,120	±\$34,640
Medium/large business ≥ 160 MWh pa	\$29,960	±\$7,360
Urban feeder weighted average	\$93,880	±\$6,400

Table 4.12 Rural feeder VCRs

Customer type	VCR (\$/MWh)	Standard error (\$/MWh)
Residential	\$15,110	±\$1,080
Small business < 160 MWh pa	\$302,490	±\$32,840
Medium/large business ≥ 160 MWh pa	\$128,500	±\$36,900
Rural feeder weighted average	\$93,860	±\$14,080

4.2 Willingness to pay and accept results

To complement the NSW VCR results, we also asked residential respondents a short set of questions to test their willingness to pay for distribution reliability and their willingness to accept lower levels of reliability for a discount on their electricity bill. The results from these questions also provide a check on the VCR results that were obtained. While these results provide an insight into the willingness of residential customers to pay and accept different levels of reliability, more extensive surveying would be required to obtain a more detailed assessment of customers' willingness to pay and accept.

Half of the residential respondents were asked whether they would be willing to pay at least 1 per cent more on their electricity bill to reduce the total duration of their interruptions by 60 minutes a year, while the other half were asked whether they were willing to accept increased interruptions totalling 60 minutes in a year for at least a 1 per cent discount on their electricity bill. The estimate of 1 per cent of each respondent's electricity bill was based on the mid point of an estimate provided by each respondent earlier in the survey of their annual electricity bill. This information was used to convert the 1 per cent impact into a dollar amount. This dollar amount was used in the survey questions rather than the percentage figure.

For respondents who were asked the willingness to pay question, if the respondent indicated agreement to pay 1 per cent more to reduce their interruptions, they were then asked if they were prepared to pay more than 1 per cent extra on their bill. In contrast, where respondents did not agree to accept increased interruptions for a 1 per cent discount on their bill, they were then asked how much more of a discount they would require to accept the increased level of interruptions.

The results are shown in Table 4.13 and Table 4.14 below. Regarding the willingness to pay question, over 60 per cent of residential customers responded that they were willing to pay at least 1 per cent more on their electricity bill to reduce their total interruptions by 60 minutes a year. Of those who responded that they would pay at least 1 per cent more, 29 per cent indicated that they were willing to pay more than 1 per cent, while 15 per cent indicated that they were willing to pay more than 2 per cent to reduce their interruptions.

Table 4.13 Willingness to pay results

Willing to pay at least 1% more a year on their bill to reduce total supply interruptions by 60 minutes a year	60.8%
Of those respondents who said yes:	
Willing to pay 1% more	29.0%
Willing to pay between 1% and 2% more	7.4%
Willing to pay 2% more	7.4%
Willing to pay more than 2% more	15.0%
Willing to pay at least 1% more, but could not quantify how much more they were willing to pay	2.0%

Regarding the willingness to accept question, close to 30 per cent of these respondents said that they were willing to accept the additional interruptions for a 1 per cent discount while 34 per cent said that they required more than a 2 per cent discount.

Of those asked the willingness to accept question, 34 per cent responded that they were willing to accept the additional interruptions for at least a 1 per cent discount, but were unable to quantify how much more of a discount would be required. This may indicate that some of these respondents would require significantly more than a 2 per cent discount in order accept the additional interruptions. Other respondents may have simply found it too difficult to quantify how much more of a discount they would require.

Table 4.14 Willingness to accept results

Willingness to accept at least a 1% discount for a total increase in supply interruptions of 60 minutes a year	
Willing to accept for a 1% discount	27.3%
Willing to accept for between 1% and 2% discount	0.9%
Willing to accept for a 2% discount	3.8%
Willing to accept for more than a 2% discount	34.1%
Willing to accept for at least a 1% discount, but could not quantify how much more of a discount would be required	33.9%

The willingness to pay and accept results suggest that residential customers place a relatively high value on the reliability of their electricity supply. However, Endeavour

Energy has suggested that it is likely that these results understate customer preferences since the survey did not seek information for amounts in excess of 2 per cent of a customer's bill.⁹⁰ We consider that this is possible, although it is difficult to determine how much higher the willingness to pay and accept results may have been if higher amounts had been included in the survey.

The Major Energy Users noted those who are currently receiving high levels of reliability are much less likely to be willing to pay more than those who are on feeders with poor reliability.⁹¹ We agree that this may be likely, but note that our survey included a relatively representative distribution of survey respondents between the different NSW distribution networks and feeder types. This should ensure that our survey respondents reflect the range of service being experienced by NSW customers.

As the willingness to pay and accept questions were included in our survey to complement the calculation of the NSW VCRs, we suggest that the inclusion of more detailed willingness to pay and accept questions in future customer surveys may be warranted to examine these issues further.

4.2.1 Comparison of willingness to pay and accept results to the VCR

The VCR and willingness to pay and accept results reflect the answers to different questions and are also measured differently. The VCR reflects the costs incurred by customers as a result of a supply interruption and is measured in dollars per kWh or MWh that was not provided. Willingness to pay and willingness to accept results in our survey measure the amount of money as a proportion of their electricity bill that customers would be willing to pay for improved reliability or would be willing to accept as compensation for a worsening of reliability.

The willingness to pay and accept results can be compared against the NSW VCR for residential customers to test the consistency of these results, bearing in mind that these results do reflect different preferences. This can be done by converting the results to a common base of the cost of 60 minutes of interruptions.

For the VCR, this would reflect the costs involved from a 60 minute supply interruption for average residential customers, for the willingness to pay it would reflect the average amount residential customers are willing to pay to experience a total of 60 minutes less interruptions a year, and for willingness to accept it would reflect the average amount of compensation that customers would require to accept a total of 60 minutes more interruptions a year.

⁹⁰ Endeavour Energy, Submission to the NSW workstream draft report, p.3.

⁹¹ Major Energy Users, Submission to the NSW workstream draft report, p.11.

Table 4.15 Comparison of the cost of a 60 minute supply interruption⁹²

Measure	What this measure represents	Cost of 60 minutes of interruptions
Residential VCR	Average NSW residential costs of a 60 minute supply interruption, based on the substitute actions customers would take in response to an interruption.	\$14.56
Willingness to pay	Average amount residential customers are willing to pay, based on the proportion of each respondent's estimated annual bill, to reduce interruptions by 60 minutes a year.	\$12.34
Willingness to accept	Average amount residential customers require as compensation, based on a proportion of each respondent's estimated annual bill, to accept additional interruptions of 60 minutes more a year	\$28.54

These results demonstrate there is a relatively high level of consistency between the residential VCR results and the willingness to pay results, as the cost of a 60 minute interruption for residential customers is similar to the amount residential customers are willing to pay to avoid total interruptions of 60 minutes more. This suggests that for residential customers at least, the NSW VCR may be a suitable alternative for willingness to pay.

The willingness to accept result is significantly higher than the residential VCR and the willingness to pay results. This is perhaps not unexpected as it indicates that customers are on average fairly resistant to reductions in the reliability of supply they are currently receiving. As a result, as discussed above, customers require higher levels of compensation to accept reductions in reliability than they are prepared to pay for improvements in reliability.

4.3 Residential customer preferences for distribution investment results

We also used the customer survey to obtain information on customer preferences for distribution investment. This question was only included in the residential survey. This question was included to obtain an indication as to whether more customer communication during and following an interruption could result in greater customer satisfaction and may assist in reducing overall network costs, as some network

⁹² Oakley Greenwood, 2012, *NSW Value of Customer Reliability*, June.

upgrades could be replaced with improved customer communication and engagement.⁹³

Residential customers were provided with three alternative options for distribution investment and were asked which option they would like a utility to invest in. These investment options were:

- Infrastructure to reduce the number of supply interruptions that occur;
- Systems to reduce how long supply interruptions last when they do occur; and
- Communications systems to tell you how long a supply interruption is likely to last.

As shown in Table 4.16, close to 60 per cent of all respondents prioritised investment to reduce the number of interruptions, while close to a quarter of respondents prioritised investment on communications systems. Systems to reduce the length of an interruption was the least popular choice for investment, with close to 20 per cent of respondents selecting this option. The results between the three DNSPs were relatively similar. These results suggest that DNSPs should consider consulting their customers when determining investment priorities to assess whether their proposed investments align with the services their customers are seeking.

However, Essential Energy has stated that if an approximate cost was given for each option the results would be expected to be different as communications systems costs are expected to be minor in comparison to the alternatives.⁹⁴ The Public Interest Advocacy Centre supported the use of more contemporary methods of communicating with customers about the expected time and duration of supply outages, and noted that automated SMS services are currently operated by a number of the Victorian DNSPs.⁹⁵

We did not include an estimate of the costs of each investment option as it would not have been possible to accurately determine the costs of undertaking each option. The cost of each investment option is likely to differ significantly between each NSW distribution network and would also depend on the scope of each investment option. The purpose of including this question in our survey was to obtain a high level indication of customer preferences and priorities, which could be considered in planning for future investments. Further work would be needed to accurately cost and compare each option for each distribution network.

⁹³ This issue was raised in the following submissions to the AEMC's issues paper: Essential Energy, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper, pg. 1; Customer Council of Essential Energy, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper; Essential Energy Rural Advisory Group, 2011, Submission to AEMC Review of Distribution Reliability Outcomes and Standards Issues Paper.

⁹⁴ Essential Energy, Submission to the NSW workstream draft report, pp.2-3.

⁹⁵ Public Interest Advocacy Centre, Submission to the NSW workstream draft report, pp. 7-8.

We also note that while the survey required each respondent to only select one option, in practice the NSW DNSPs undertake a range of investments to address each of three investment options presented.

Table 4.16 Residential customer preferences for distribution investment

Investment option	Total respondents	Ausgrid	Endeavour Energy	Essential Energy
Infrastructure to reduce the number of supply interruptions that occur	59.0%	61.4%	57.8%	57.7%
Systems to reduce the length of supply interruptions when they do occur	16.8%	16.9%	17.0%	16.2%
Communications systems telling you how long a supply interruption is likely to last	24.2%	22.0%	25.2%	26.2%

4.4 Low income household results

The residential survey also collected information on household income and whether respondents received concessions on their electricity bills. This information has been used to assess whether low income residential households have a different VCR to the average residential household.

Low income households have been defined as those with an annual household income of \$50,000 or less AND were in receipt of concessions on their electricity bill. 181 of the 718 residential respondents fell into the low income household category under this definition.

Table 4.17 below outlines the NSW residential VCR compared to the NSW residential VCR for low income households, and the VCRs for low income households on urban feeders and rural feeders. This demonstrates that the VCR for low income households is around 25 per cent lower than the VCR for average residential households in NSW. As the VCR for residential customers is based on the substitute actions that a respondent would take if a supply interruption occurred, this suggests that low income households may have a more limited ability to deal with a supply interruption compared to average residential households.

Table 4.17 Comparison of VCRs: Low income households vr average residential households

Residential household type	VCR (\$/MWh)	Standard error (\$/MWh)
Urban feeders low income	\$16,270	±\$2,630
Rural feeders low income	\$14,020	±\$1,830
NSW low income	\$15,620	±\$1,580
Average NSW residential	\$20,710	±\$1,080

The VCRs for low income households on urban feeders was slightly higher than the VCR for low income households on rural feeders. This pattern is consistent with the average residential VCR results for urban and rural feeders discussed above.

All residential respondents were also provided with the option of doing nothing in response to a supply interruption. We can compare the proportion of low income respondents who indicated that they would "do nothing" against the proportion of the other respondents who indicated that they would "do nothing", to test whether the ability of low income households to deal with interruptions is more limited than other households.

Table 4.18 below sets out the "do nothing" responses from the customer survey. The proportion of customers who indicated they would do nothing for short interruptions of one hour or less are similar for low income households and all other households. This is not unexpected as a short supply interruption would have limited impacts on all households, so households may be able to deal with a interruption without needing to take any substitute actions.

However, for longer interruptions, low income households are significantly more likely to do nothing in response to a supply interruption compared to other households. For interruption durations of four to eight hours and eight to 24 hours, the responses indicated that low income households were three times more likely to do nothing compared to other households. This suggests that low income households do have a more limited ability to deal with supply interruptions than other households.

Table 4.18 Proportion of respondents likely to "do nothing" during different supply interruption lengths

Residential household type	5 min to 1 hour	1 hour to 4 hours	4 hours to 8 hours	8 hours to 24 hours
Low income	53%	43%	30%	18%
All other households (ie household income > \$50,000 per a year and no bill concession)	56%	29%	9%	6%

5 Cost-benefit assessment of NSW distribution reliability scenarios

This Chapter sets out the AEMC's cost-benefit assessment of four scenarios for distribution reliability outcomes in NSW. This cost-benefit assessment has been undertaken in relation to a baseline of no change to the existing requirements for distribution reliability outcomes, as set out in the current NSW distribution licence conditions. The impact of each scenario has been modelled over a 15 year period, from 2014/15 to 2028/29.

The NSW DNSPs have not undertaken any additional modelling on the scenarios following the publication of our draft report. However, we have included some additional analysis which was undertaken by Essential Energy prior to the publication of the draft report to assess the impacts of changes to Schedule 3 of the NSW distribution licence conditions to reduce the level of expected unserved energy in Scenarios 2 and 3, due to the reliability impact these scenarios may have on rural feeders in Essential Energy's network that already have low levels of reliability. The impact of these changes have not been considered for Ausgrid's and Endeavour Energy's networks as changes to Schedule 3 of the licence conditions only had a limited impact in these networks.

5.1 Approach to our cost-benefit assessment

In developing our cost-benefit assessment, we have taken into account for each scenario and NSW DNSP:

- The change in capital expenditure compared to the baseline, which reflects the changes in investment that may occur.
- The change in the level of distribution reliability compared to the baseline, which has been considered in terms of expected energy not served. The level of expected energy not served relates to the average amount of energy that may not be supplied to customers each year as a result of supply interruptions.
- The value of customer reliability for each DNSP, which has been derived from our customer surveys. The value of customer reliability has been used to calculate the value of the change in expected energy not served.

Using these three inputs allows us to directly compare the value of the change in capital expenditure against the value of the change in distribution reliability for each scenario and DNSP. The change in capital expenditure and the value of the change in reliability have been converted into net present values to allow these changes to be compared in today's dollars. We have used a real discount rate of 7.36 per cent to

convert the values into net present values, which is the current real vanilla weighted average cost of capital for the NSW DNSPs.⁹⁶

Endeavour Energy expects that the AER will determine a new weighted average cost of capital for the NSW DNSPs for the 2014/15 to 2019/20 regulatory control period, which has the potential to be less than their current weighted average cost of capital due to current financial conditions.⁹⁷

The average impact on the distribution reliability component of residential electricity bills and the duration of supply interruptions has also been calculated for each DNSP for year five (2018/19) and year 15 (2028/29) of the modelling period, relative to a baseline of no change to the existing requirements for distribution reliability. The change in the duration of supply interruptions has been based on the modelled unserved energy that has been calculated by each DNSP. As a result, as suggested by Endeavour Energy, there is the potential that these modelled outcomes may differ from the actual reliability results that may be achieved by each NSW DNSP.⁹⁸

An average NSW impact on the distribution reliability component of residential electricity bills and the duration of interruptions has also been derived using a weighted average of the calculations for the three DNSPs. We have re-calculated the impact on residential electricity bills using the current real vanilla weighted average cost of capital for the NSW DNSPs of 7.36 per cent rather than the nominal vanilla weighted average cost of capital of 10.02 per cent that was used in the draft report. Using a lower return on capital has resulted in slightly lower retail price impacts than those contained in our final report.

However, it should be noted that the retail price impacts we have calculated do not take into account the prior capital expenditure that has been or will be spent by the NSW DNSPs to meet the existing licence conditions prior to 1 July 2014. Also, as noted by the Major Energy Users, as we have only calculated the residential retail price impact under each of our scenarios based on an average annual NSW residential consumption of 7,000 kWh, the price impact for customers who consume more than this, such as large residential households, small business customers and large businesses, would be larger.⁹⁹

⁹⁶ The real vanilla weighted average cost of capital for the NSW DNSPs was obtained from the AER's current Post Tax Revenue Models for each DNSP. The AER's models are available on their website here: <http://www.aer.gov.au/node/482>. As discussed in Chapter 3, in our draft report, we used a nominal discount rate of 10.02 per cent, which reflects the current nominal vanilla weighted average cost of capital for the NSW DNSPs. Using a lower discount rate has meant that the net present values are slightly higher than those contained in our draft report. However, the overall change in capital expenditure and value of unserved energy for each scenario has remained the same as that in our draft report.

⁹⁷ Endeavour Energy, Submission on the NSW workstream draft report, p.1.

⁹⁸ Endeavour Energy, Submission on the NSW workstream draft report, p. 5.

⁹⁹ Major Energy Users, Submission on the NSW workstream draft report, p. 3.

5.2 Factors to consider when reviewing our cost-benefit assessment

When reviewing the cost-benefit assessment for each scenario, the following factors should be considered:

- **Accuracy of modelled changes in capital expenditure:** The changes in capital expenditure for each scenario were modelled by the NSW DNSPs under a relatively tight timeframe.

The modelled capital expenditure has been independently reviewed by our consultants, Nuttall Consulting, who considers that the modelled capital expenditure is generally reasonable considering the time constraints it was prepared under. However, Nuttall Consulting has identified some issues with the capital expenditure modelled for Scenario 4, which is likely to understate the actual cost of improving reliability under this scenario. The DNSPs have also not modelled some aspects of the proposed scenarios which may mean the effects of the scenarios are understated.

Generally modelled changes in capital expenditure will be more accurate for the first five years of the modelling period than for the later years of the modelling period. Therefore, if any changes are made to the required level of distribution reliability in NSW, the impacts of these changes should be re-examined following their implementation.

Ausgrid has also noted that since the modelling was undertaken for the NSW workstream, its demand forecasts have been updated and are now notably lower.¹⁰⁰ It has suggested that this may mean that capital expenditure savings are likely to be overstated.¹⁰¹ However, we note that lower demand forecasts are likely to result in lower capital expenditure for both the baseline and each of the four scenarios that have been developed.

- **Accuracy of modelled changes in reliability:** The changes in reliability for each scenario were also modelled under the same tight timeframe by the NSW DNSPs as the capital expenditure modelling. Nuttall Consulting considers that the reliability modelling may overstate the impact on expected energy not served, particularly at the distribution feeder level. In other words, the impact on reliability may not be as significant as modelled. Similarly to the capital expenditure modelling, the DNSPs also have not modelled some aspects of the proposed scenarios. The modelled changes in reliability will also generally be more accurate over the first five years of the modelling period.

Reliability outcomes are generally more difficult to model accurately than capital expenditure changes, as models are unable to fully take into account low probability high impact events. These events may not occur very frequently, but may result in supply interruptions for a significant number of customers.

¹⁰⁰ Ausgrid, Submission on the NSW workstream draft report, p. 5.

¹⁰¹ Ibid.

Reliability outcomes are also dependant on factors over which the DNSPs have limited control and are difficult to model, such as weather and traffic accidents, which may damage network infrastructure and result in supply interruptions.

- **Accuracy of the NSW VCR:** As discussed in Chapters 3 and 4, assessing the willingness of customers to pay and the VCR is inherently difficult and there are no universally accepted methodologies to measure these concepts. The AEMC's NSW customer survey was based on a significantly larger sample size than has been used in previous Victorian VCR surveys, and also involved some willingness to pay and accept questions to complement the VCRs that were developed. Despite this, the VCR should be considered as providing an indication of how different NSW customers currently value a reliable electricity supply, rather than as a definitive and unchanging value.

However, even though there remain difficulties in accurately assessing willingness to pay and the VCR, we consider that there is still significant merit in taking into account the views of end use consumers in setting reliability levels as it assists in determining the appropriate trade off between the level of reliability that is provided by DNSPs and the costs that customers are willing to pay. In our national workstream, we will further assess how best to estimate the willingness of customers to pay and accept different distribution reliability outcomes.

Submissions to the draft report have raised some concern over the NSW VCR values that have arisen from our survey.¹⁰² While we note these concerns it remains difficult to fully assess the reasons for differences in VCRs between different customer types and distribution networks. We also note that with every VCR survey that has been undertaken, roughly at five year intervals, there has been a significant increase of around 60 per cent in the VCR.

We have not escalated the VCR over the modelling period in our cost benefit assessment, as it is not possible to determine how the VCR may change over time. However, we consider that an escalated VCR would not change the overall conclusions from our cost benefit assessment, as our analysis has suggested there are significant net benefits from reducing distribution reliability in NSW under all three of our scenarios for lower reliability under both a five and fifteen year timeframe.

- **Customer impact of changes in reliability:** The modelled changes in reliability would affect customers across NSW differently, depending on where they are located within each DNSP's network. The reliability impacts presented in this Chapter represent the *average* reliability impacts of each scenario for each DNSP. The actual reliability impacts for each customer of each scenario may be significantly better or worse than the impacts presented.

¹⁰² See submissions on the NSW workstream draft report from: TransGrid, pp. 2-4; Public Interest Advocacy Centre, pp. 5-6; Major Energy Users, p. 10; Ausgrid, p. 3; St Kitts Associates, p. 4; AEMO, p. 5.

- **Timing of capital expenditure and reliability changes:** The timing of changes in capital expenditure and reliability are difficult to forecast accurately. This is particularly difficult when modelling out over a number of years, as it is difficult to assess how factors such as changes in demand, regulatory requirements, and technology, may impact each DNSP's expenditure requirements and reliability performance. In addition, it would generally take some time before a change in investment would lead to a resulting change in reliability.

As a result, the modelled timing of changes in capital expenditure and reliability in this Chapter should be considered in terms of likely trends of how expenditure requirements and reliability performance may change under each scenario, rather than a definitive forecast of when these changes may occur.

5.3 Views of submissions on the NSW distribution reliability scenarios

5.3.1 Changes to the scenarios

In the draft report, we set out some additional changes that had been recommended by our consultants, Nuttall Consulting, to the scenarios that had been developed for stakeholder comment. The purpose of these additional changes was to reduce the potential increase in expected energy not served under our large and extreme reduction in reliability scenarios (ie Scenarios 2 and 3) and to provide greater consistency between the three schedules in the NSW distribution licence conditions. These changes included:

- Removing the proposed new break points in the design planning criteria in Schedule 1 of the licence conditions for when an N-1 level of redundancy must be provided for sub-transmission lines and zone substations in urban and non-urban areas. The current break point is 10 MVA for Ausgrid and Endeavour Energy, and 15 MVA for Essential Energy.

In Scenario 2 a 15 MVA break point was proposed for all DNSPs, while in Scenario 3 a 20 MVA break point was proposed. The effect of this change would be to increase the size of customer loads which are subject to an n level of redundancy. This means that if there is an outage on these system elements, the supply of a larger number of customers may be interrupted. For Scenarios 1 and 4, no changes to the current break point were proposed.

These changes were not modelled by the DNSPs for Scenarios 2 and 3. However, some indicative analysis undertaken by Nuttall Consulting based on information provided by the DNSPs has suggested that these changes may lead to a significant increase in expected energy not served for specific pockets of customers.¹⁰³

¹⁰³ Nuttall Consulting report, p. 80.

We also proposed to apply the new break points to zone substations in urban and non-urban areas in Scenarios 2 and 3, as they are currently not subject to any break points in the licence conditions. We suggested that it would be appropriate to apply the existing break points for sub-transmission lines and zone substations in urban and non-urban areas to sub-transmission substations in urban and non-urban areas for Scenarios 2 and 3.

- Removing the proposed limit in the individual feeder standards in Schedule 3 of the licence conditions on the number of underperforming feeders that the DNSPs can address each year for Scenarios 1 to 3. This change is proposed as modelling undertaken by Essential Energy suggests that including this restriction would lead to a higher than anticipated increase in expected energy not served.¹⁰⁴ While the removal of this proposed limit would reduce the forecast level of expected energy not served, it would also result in lower reductions in forecast capital expenditure.
- The inclusion of a requirement in the reliability standards in Schedule 2 of licence conditions which requires DNSPs to consider whether work required to comply with Schedule 2 is needed in the medium term, after considering the effects of future work needed to comply with the design planning criteria and the individual feeder standards in Schedules 1 and 3 of the conditions. Nuttall Consulting has suggested work undertaken to comply with Schedule 2 in the short term could be effectively stranded in the medium term by actions to ensure compliance with Schedules 1 and 3.¹⁰⁵

Submissions from Ausgrid and Endeavour Energy did not support undertaking any further modelling, and did not comment on the three proposed changes to the scenarios discussed above.¹⁰⁶

However, Essential Energy supported the proposed change regarding the removal of the cap on the work that NSW DNSPs could undertake each year on non-compliant feeders under the individual feeder standards in Schedule 3 of the licence conditions.¹⁰⁷ In particular, Essential Energy noted that the introduction of the cap could lead to decreased reliability for customers in the worst served areas of its network and that lower capital expenditure over the short term would lead to a large amount of catch up expenditure in the medium to long term as the performance of these non-compliant feeders deteriorated to unacceptable levels.¹⁰⁸

The cap on the work that can be done on non-compliant feeders has only a limited effect on Ausgrid's and Endeavour Energy's networks, and a significant effect on Essential Energy's network. Most of the impacts occur in Scenarios 2 and 3, with

104 Nuttall Consulting report, p. 84.

105 Nuttall Consulting report, p. 86.

106 See submissions on the NSW workstream draft report from: Ausgrid, p.4; Endeavour Energy, pp.2-3

107 Essential Energy, Submission on the NSW workstream draft report submission, p.3.

108 Ibid.

limited effects under Scenario 1. This cap was forecast to have a significant effect on the reliability levels experienced by customers on Essential Energy's rural feeders who already have the poorest reliability performance across NSW.

We have included some additional analysis that has been undertaken by Essential Energy on the change in reliability impacts and capital expenditure that may occur under Scenarios 2 and 3 if the cap was removed. This analysis is set out below in sections 5.5 and 5.6, in our discussion of Scenarios 2 and 3. This analysis has only been undertaken by Essential Energy. Ausgrid and Endeavour Energy have not been requested to undertake any additional analysis as the cap was forecast to only have a limited impact in their networks.

The Public Interest Advocacy Centre submitted that further modelling should be undertaken to assess the impact of more significant reductions in the reliability standards which would provide more meaningful reductions in customers' bills.¹⁰⁹ Due to the limited timeframe available for the NSW workstream, we were not able to request the DNSPs to undertake further modelling as this would have taken a number of months to prepare and review.

5.3.2 Additional impacts of the scenarios not captured in the modelling

In the draft report, we asked whether there were any additional impacts associated with the scenarios that should be taken into account. Essential Energy noted their modelling suggested that their customers would bear a disproportionate share of the total increase in expected unserved energy particularly in Scenarios 2 and 3, but would only receive a modest decrease in their electricity bills.¹¹⁰ As discussed above, to address this issue, we have included additional analysis on the impact of removing the cap on work that is done on non-compliant feeders in Scenarios 2 and 3. These results are set out below and show a significant reduction in expected unserved energy, but also result in less of a reduction in capital expenditure.

Ausgrid and Endeavour Energy raised concerns that the reliability impacts in the draft report only relate to average impacts, and do not take into account the increased potential for a substantial worsening of reliability for customers on the worst performing parts of the network or an increased likelihood of a high consequence, low risk event.¹¹¹ Ausgrid has also raised concerns regarding the potential for reduced time for planned outages if the design planning criteria in Schedule 1 of the licence conditions are relaxed.¹¹²

109 Public Interest Advocacy Centre, Submission on the NSW workstream draft report, p.5.

110 Essential Energy, Draft Report submission, 17 July 2012, pp.3-4.

111 See submissions on the NSW workstream draft report from: Ausgrid, p. 4; Endeavour Energy, p. 2.

112 Ausgrid, Submission on the NSW workstream draft report, p. 4.

5.3.3 Definition of a "major event day"

We also noted that the treatment of planned outages in the definition of a "major event day" is different under the licence conditions and the AER's reporting framework. Major event days refer to days with a major interruption to supply and are excluded from reported SAIDI and SAIFI figures. As major event days are defined differently under the NSW and AER reporting frameworks, this means that the NSW DNSPs are required to calculate alternative SAIDI and SAIFI figures when reporting to the NSW Energy Minister and the AER.¹¹³

In submissions to the draft report, all of the NSW DNSPs supported aligning the definition in the NSW distribution licence conditions to the AER's definition of a major event day.¹¹⁴ We suggest that this should be considered by the NSW Government to minimise the reporting burden on the NSW DNSPs.

5.4 Scenario 1: Modest reduction in distribution reliability

5.4.1 Overview of the scenario

This scenario is intended to result in a modest reduction in distribution reliability and capital expenditure, compared to the continuation of the current requirements for distribution reliability. The key features of this scenario are set out below.

Figure 5.1 Summary of Scenario 1 features

Licence condition	Issue	Scenario 1: Modest reduction of outcomes
Design planning criteria (Schedule 1)	CBD areas	- Some load at risk if there is an outage during peak periods
	Urban areas	- Some load at risk if there is an outage during peak periods - Reduced capacity buffer during normal operation
	Non-urban areas	- Reduced capacity buffer during normal operation
	Forecast demand used for planning (applies to all areas)	No change
Reliability standards (Schedule 2)	Average duration and frequency of outages for feeders	DNSP to be 75% confident that current standards will not be exceeded
Individual feeder standards (Schedule 3)	Individual duration and frequency of outages for each feeder	No change
	Work to be done on underperforming feeders	Work restricted to a maximum of 4% of total feeders each year

¹¹³ The DNSPs were requested to use the AER's definition of major event days when undertaking modelling for this review.

¹¹⁴ See submissions to the NSW workstream draft report from: Ausgrid, p.4; Endeavour Energy, p. 3; Essential Energy, p.4.

5.4.2 Impact on capital expenditure

Scenario 1 results in around \$500m in reductions in capital expenditure over 2014/15 to 2028/29 for the three DNSPs. 96 per cent of these reductions in expenditure arise from the changes in the design planning criteria in Schedule 1 of the licence conditions. However, just over \$200m of the \$500m in capital expenditure reductions is the result of the deferment of a sub-transmission project in the Sydney CBD in Ausgrid's network in 2028/29, as a result of the Schedule 1 changes.

As the proposed changes to the licence conditions would result in the deferment of capital expenditure, in most years there would be a reduction in capital expenditure. However, in some years there would be an increase in capital expenditure as the deferred expenditure would need to be undertaken as it can no longer be deferred. This can be seen particularly in relation to Ausgrid's forecast capital expenditure.

Over the first 10 years of the modelled period, there are more limited reductions in capital expenditure. Once the effect of Ausgrid's deferred Sydney CBD sub-transmission project is removed, most of the changes in capital expenditure over the short to medium term relate to changes in the design planning criteria for urban areas.

The reliability standards and individual feeder standards in Schedules 2 and 3 of the licence conditions only contribute very limited reductions in capital expenditure. Essential Energy is forecasting some small reductions in capital expenditure relating to the individual feeder standards. This reduction in capital expenditure occurs on its short rural feeders, as a result of changes to limit the work it can do on underperforming feeders.

In total, just over 60 per cent of the total reductions in capital expenditure are forecast to fall in Ausgrid's network, while Endeavour Energy and Essential Energy are forecast to contribute 25 per cent and 11 per cent respectively of total reductions.

Figure 5.2 Scenario 1: Total reduction in capital expenditure

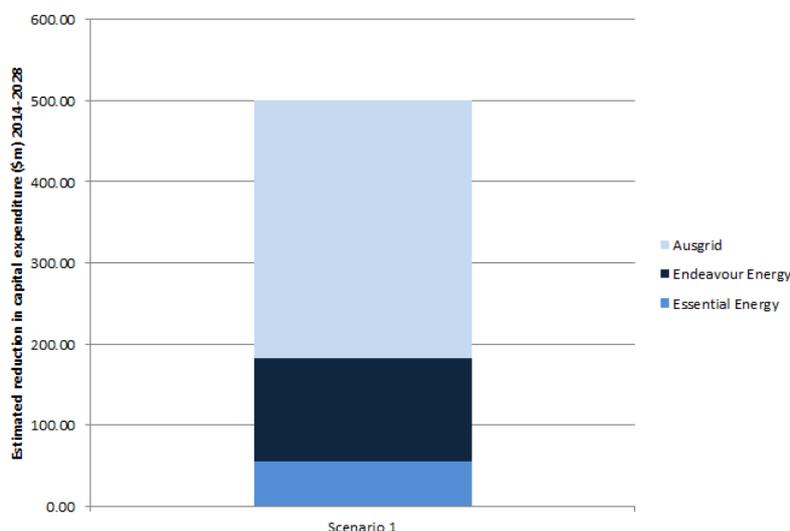


Figure 5.3 Scenario 1: Ausgrid reduction in capital expenditure

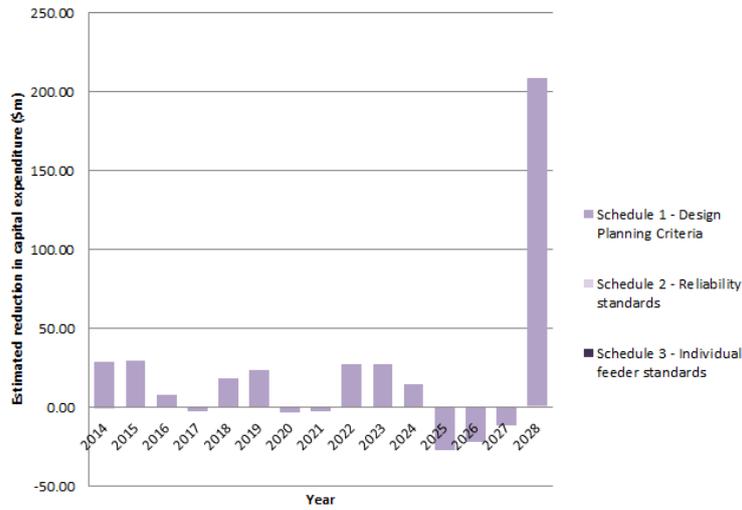


Figure 5.4 Scenario 1: Endeavour Energy reduction in capital expenditure

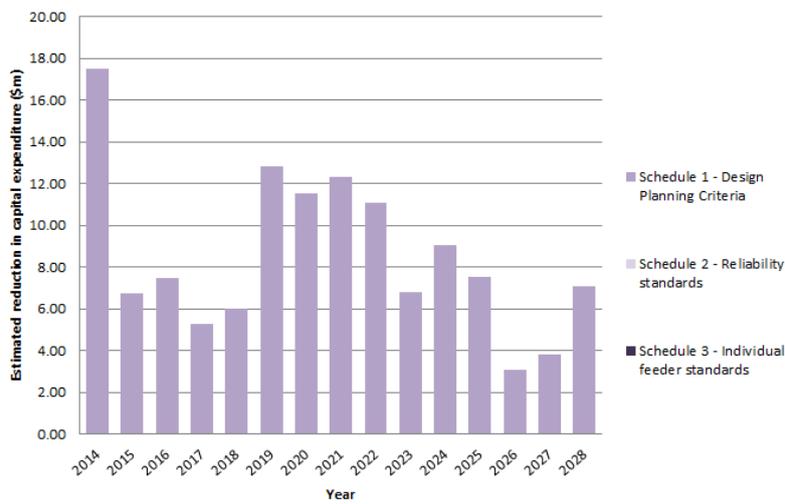
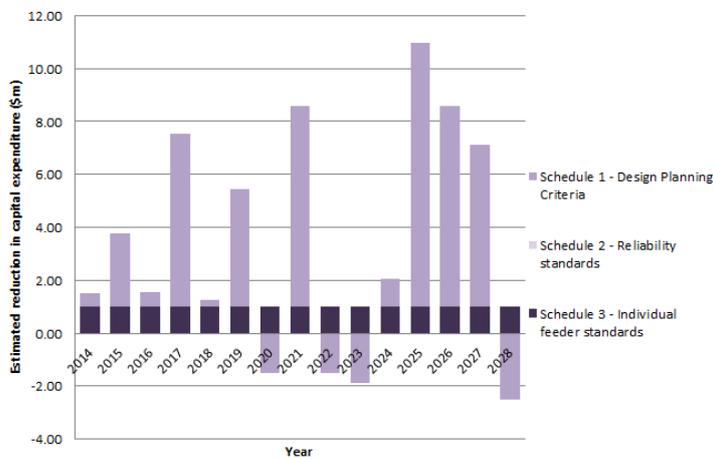


Figure 5.5 Scenario 1: Essential Energy reduction in capital expenditure¹¹⁵



5.4.3 Impact on distribution reliability

The total increase in expected energy not served under Scenario 1 is just over 1,000 MWh between 2014/15 and 2028/29 across the three DNSPs. Close to 60 per cent of the increase in expected energy not served falls in Ausgrid's network, with the majority of this increase on Ausgrid's urban feeders. However, in the last five years of the modelling period from around 2024/25 to 2028/29, there is some growth in expected energy not served on Ausgrid's short rural feeders.

Endeavour Energy is forecast to contribute around 20 per cent of the total increase in expected energy not served, which is expected to arise only as a result of a worsening performance on its urban feeders. The reliability performance for customers on Endeavour Energy's short rural feeders is not expected to be impacted under Scenario 1. As Endeavour Energy only has two long rural feeders, it has not modelled the impact on its long rural feeders.

Essential Energy would contribute the remaining 23 per cent of the total increase in expected energy not served. This appears to be mainly driven by poorer reliability performance on its urban and short rural feeders, with only a small increase in expected energy not served on its long rural feeders.

Around 70 per cent of the total increase in expected energy not served relates to the changes to Schedule 1 of the licence conditions, which is being mainly driven by the proposed changes for urban areas. The individual feeder standards in Schedule 3 of the conditions contribute around 20 per cent of the increase in expected energy not served. This increase is being solely driven by a worsening of performance in Essential Energy's individual feeders, particularly its short rural feeders.

The reliability standards in Schedule 2 of the conditions contribute the remaining 10 per cent of the forecast increase in expected energy not served. This is being driven by poorer performance on Ausgrid's short rural feeders.

115 The reduction in capital expenditure for Schedule 3 in this figure is based on the modelling provided by Essential Energy.

Figure 5.6 Scenario 1: Total increase in expected energy not served

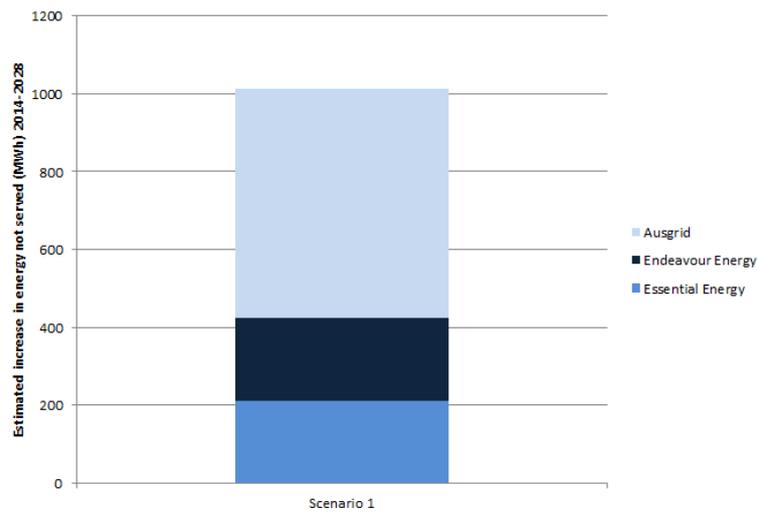


Figure 5.7 Scenario 1: Ausgrid increase in expected energy not served

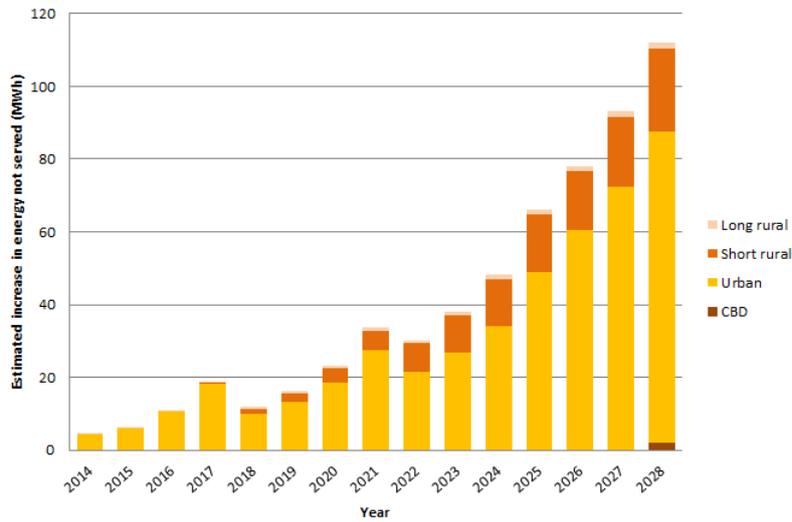


Figure 5.8 Scenario 1: Endeavour Energy increase in expected energy not served

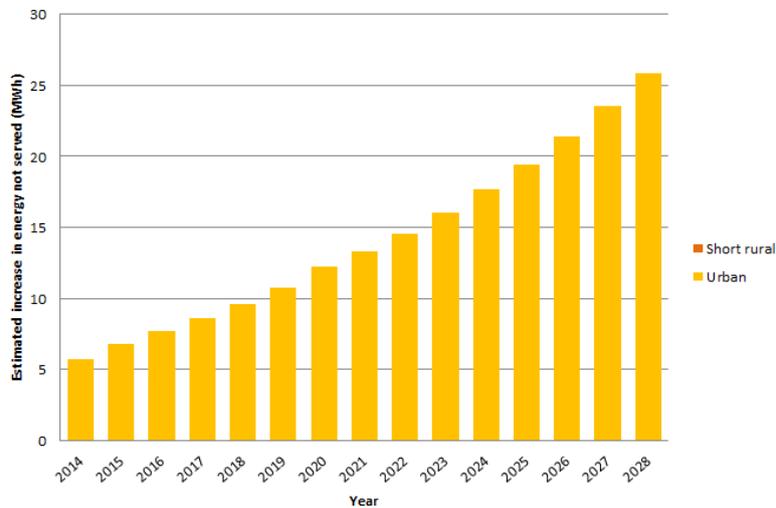
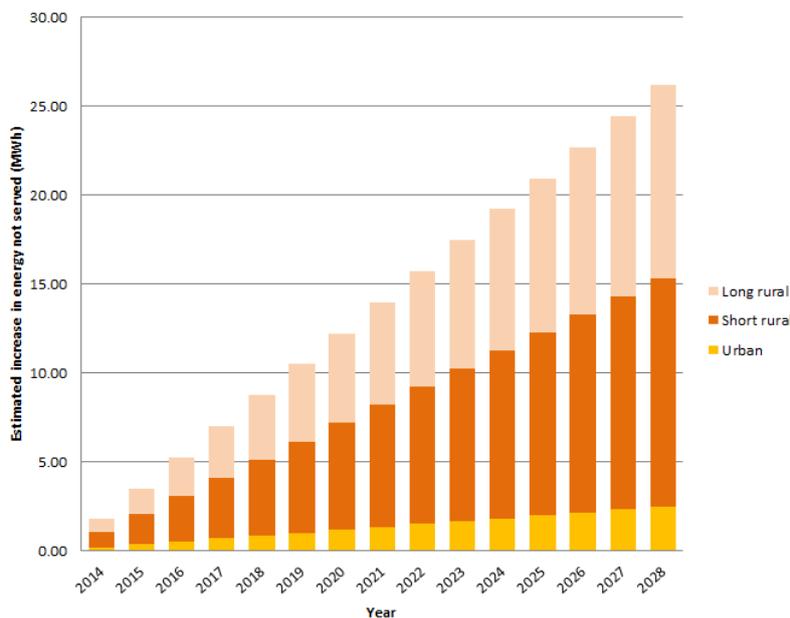


Figure 5.9 Scenario 1: Essential Energy increase in expected energy not served



When the modelled expected energy not served is converted into average SAIDI impacts for each DNSP, there is no material increase in the duration of supply interruptions for Essential Energy and Endeavour Energy over the modelling period and there is only a very small increase in the duration of interruptions for Ausgrid compared to the baseline of no change.

5.4.4 Summary of cost-benefit assessment

To undertake our cost-benefit assessment, we have converted the modelled reductions in capital expenditure to a net present value over a five year timeframe and a fifteen year timeframe. This conversion allows us to compare the change in capital expenditure in today's dollars.¹¹⁶

We have also converted the modelled expected energy not served into a dollar value, by multiplying the expected energy not served for each DNSP by the VCR for each DNSP. The VCR values for each DNSP are set out in Chapter 4. The value of the expected energy not served was also converted to a net present value over a five year timeframe and a fifteen year timeframe.

There are strong net benefits for Scenario 1 at both a NSW level and for each DNSP. There are net benefits under Scenario 1 over a five year timeframe and a fifteen year timeframe, with Scenario 1 offering significant reductions in capital expenditure for distribution reliability compared to the value of the additional expected energy not served that is forecast.

¹¹⁶ This results in a lower total capital expenditure value compared to where the capital expenditure has been simply totalled, as it has been in the figures above.

Over a five year timeframe, the benefits of Scenario 1 are particularly strong as the reductions in capital expenditure for distribution reliability are around fourteen times greater than the value of the increase in expected energy not served. By 2018/19, an increase of less than one minute in the duration of supply interruptions is expected under Scenario 1 compared to the current licence conditions, while the reduction in the distribution reliability component of the average NSW residential electricity bill is estimated to be \$1.

Over a fifteen year timeframe, the reductions in capital expenditure are around six times larger than the value of the increase in expected energy not served. The average increase in the duration of supply interruptions in 2028/29 would be around two minutes across NSW, while the reduction in the distribution reliability component of the average NSW residential electricity bill is estimated to be \$3.

Table 5.1 Impact of Scenario 1 over five years from 2014/15 to 2018/19

DNSP	Reduction in capital expenditure (NPV)	Average reduction in residential customer bills in 2018/19¹¹⁷	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Average increase in the duration of interruptions in 2018/19¹¹⁸	Result of cost-benefit assessment
Ausgrid	\$69m	\$1	53MWh	\$4m	Changes of less than one minute	Benefits exceed costs
Endeavour Energy	\$36m	\$1	38 MWh	\$3m	Changes of less than one minute	Benefits exceed costs
Essential Energy	\$12m	\$1	28 MWh	\$2m	Changes of less than one minute	Benefits exceed costs
NSW total	\$118m	\$1	119 MWh	\$9m	Changes of less than one minute	Benefits exceed costs

Note- Totals may not sum due to rounding.

¹¹⁷ This is based on an average annual residential consumption of 7,000 kWh.

¹¹⁸ This has been calculated by converting the modelled unserved energy by each DNSP into a SAIDI figure.

Table 5.2 Impact of Scenario 1 over fifteen years from 2014/15 to 2028/29

DNSP	Reduction in capital expenditure (NPV)	Average reduction in residential customer bills in 2028/29	Increase in expected energy not served	Value of the increase in expected energy not served	Average increase in the duration of interruptions in 2028/29	Result of cost-benefit assessment
Ausgrid	\$164m	\$3	591 MWh	\$24m	3 minutes	Benefits exceed costs
Endeavour Energy	\$80m	\$3	213 MWh	\$12m	1 minute	Benefits exceed costs
Essential Energy	\$31m	\$2	242 MWh	\$11m	1 minute	Benefits exceed costs
NSW total	\$275m	\$3	1,047 MWh	\$47m	2 minutes	Benefits exceed costs

5.5 Scenario 2: Large reduction in distribution reliability

5.5.1 Overview of the scenario

This scenario is intended to result in a large reduction in distribution reliability and capital expenditure, compared to the continuation of the current requirements for distribution reliability. The key features of this scenario are set out below.

Figure 5.10 Summary of Scenario 2 features

Licence condition	Issue	Scenario 2: Large reduction of outcomes
Design planning criteria (Schedule 1)	CBD areas	- Moderate levels of load at risk if there is an outage during peak periods
	Urban areas	- Moderate levels of load at risk if there is an outage during peak periods - Less network redundancy for medium loads (n-1 standard reduced to n) in some areas - Reduced capacity buffer for normal operations
	Non-urban areas	- Reduced capacity buffer for normal operations - Less network redundancy for medium loads (n-1 standard reduced to n) in some areas
	Forecast demand used for planning (applies to all areas)	No change
Reliability standards (Schedule 2)	Average duration and frequency of outages for feeders	DNSP to be 50% confident that current standards will not be exceeded
Individual feeder standards (Schedule 3)	Individual duration and frequency of outages for each feeder	Increase SAIDI and SAIFI standards by 10%
	Work to be done on underperforming feeders	Work restricted to a maximum of 2% of total feeders each year

We have also estimated the impact on capital expenditure and reliability where the cap on work on underperforming feeders is removed for Essential Energy. Essential Energy has raised concerns about the increase in expected energy not served that arises with this cap in its submission on the draft report.¹¹⁹

5.5.2 Impact on capital expenditure

Scenario 2 results in around \$2b in reductions in capital expenditure over 2014/15 to 2028/29 for the three DNSPs, which reflects a significant step change from the reduction of \$500m in capital expenditure forecast for Scenario 1. Similarly to Scenario 1, the majority (ie 80 per cent) of the reductions in capital expenditure are due to changes to the design planning criteria in Schedule 1 of the licence conditions. As discussed above in relation to Scenario 1, the forecast capital expenditure reductions also include a deferment of a \$200m sub-station project in the Sydney CBD in Ausgrid's network in the last year of the modelling period.

However, in contrast to Scenario 1 where Ausgrid contributes the majority of the reductions in capital expenditure, in Scenario 2 the total reductions in capital expenditure are more evenly split between the three DNSPs. In particular, the reductions arising in Endeavour Energy's network contribute almost half of the total reductions in capital expenditure.

While almost all of the capital expenditure reductions in Scenario 1 were due to the design planning criteria changes, in Scenario 2 some capital expenditure reductions also begin to arise from changes to the individual feeder standards in Schedule 3 of the licence conditions.

Schedule 3 of the licence conditions contributes the remaining 20 per cent of the total reductions in capital expenditure in Scenario 2, with the majority of this change due to Essential Energy. It appears this change in capital expenditure is being driven the cap on the work that can be done on underperforming individual feeders. This cap appears to result in a significant reduction in the number of non-compliant individual feeders that need to be addressed in Essential Energy's network.

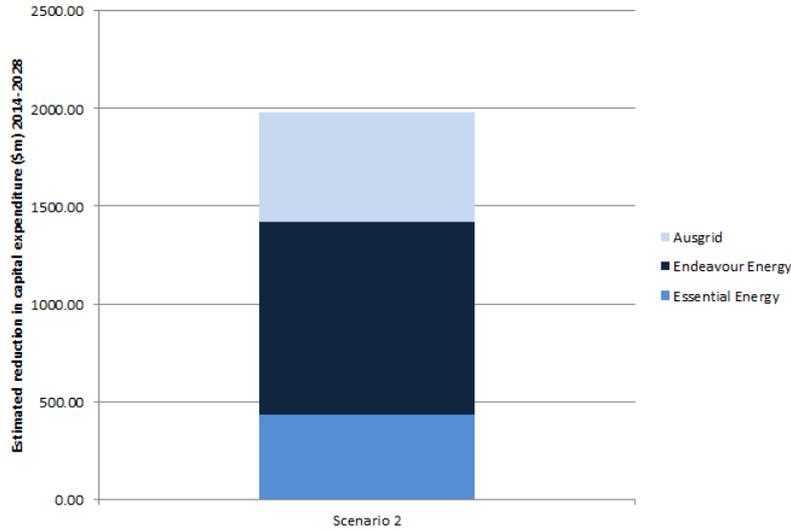
For Endeavour Energy and Ausgrid it appears that changes to Schedule 3 would only have a small impact on capital expenditure, which is mainly being driven by the increase in SAIDI and SAIFI standards, which would result in a reduction in the required level of performance. The cap on work for underperforming feeders does not appear to be driving capital expenditure reductions in Endeavour Energy and Ausgrid's networks, which is to be expected as these DNSPs are not currently spending significant amounts on underperforming individual feeders compared to Essential Energy.

Changes to Schedule 2 of the licence conditions appear to be effectively contributing almost no reductions in capital expenditure, as all of the DNSPs are already

¹¹⁹ Essential Energy, Submission on the NSW workstream draft report submission, p.3.

significantly below the current reliability standards. Therefore, applying a confidence level on their compliance only provides limited expenditure reductions.

Figure 5.11 Scenario 2: Total reduction in capital expenditure



Where the cap on work on underperforming feeders is removed for Essential Energy under Schedule 3 of the licence conditions, the total reduction in capital expenditure falls by around \$300m to \$1.7b over 2014/15 to 2028/29. With this change, only around 8 per cent of the total reduction in capital expenditure now falls in Essential Energy's network.

Figure 5.12 Scenario 2 with no cap on work on underperforming feeders: Total reduction in capital expenditure

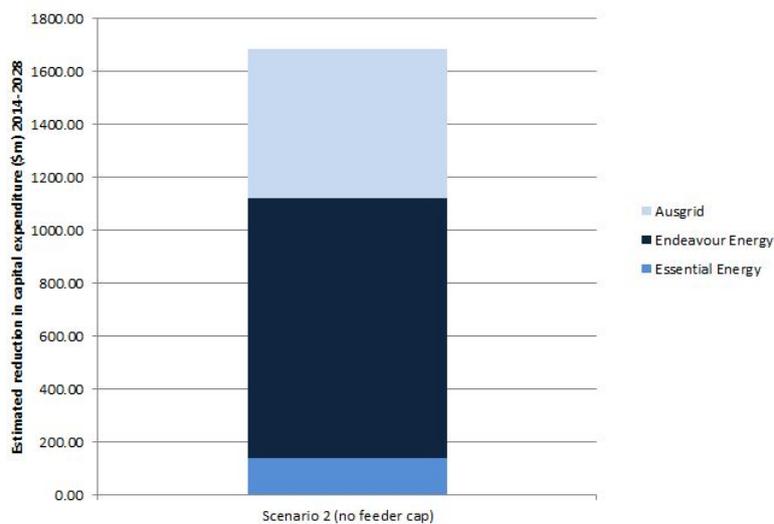


Figure 5.13 Scenario 2: Ausgrid reduction in capital expenditure

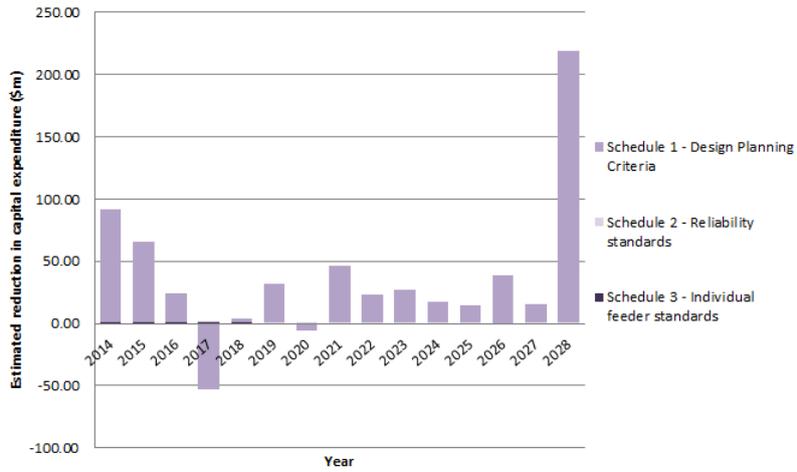


Figure 5.14 Scenario 2: Endeavour Energy reduction in capital expenditure

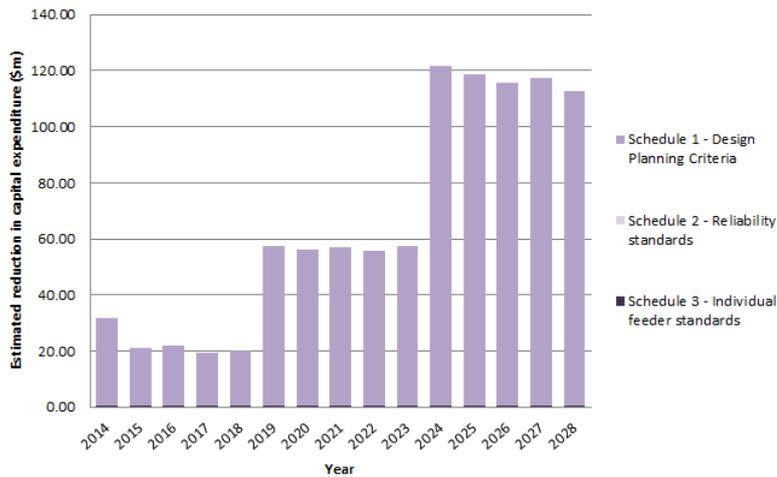


Figure 5.15 Scenario 2: Essential Energy reduction in capital expenditure

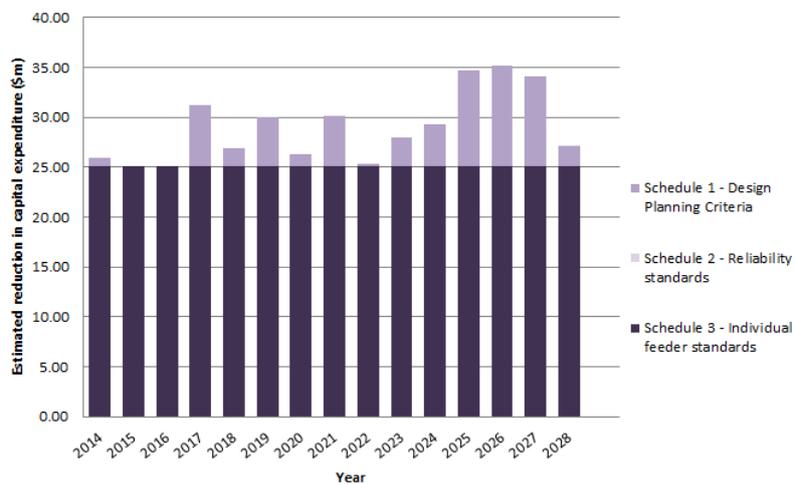
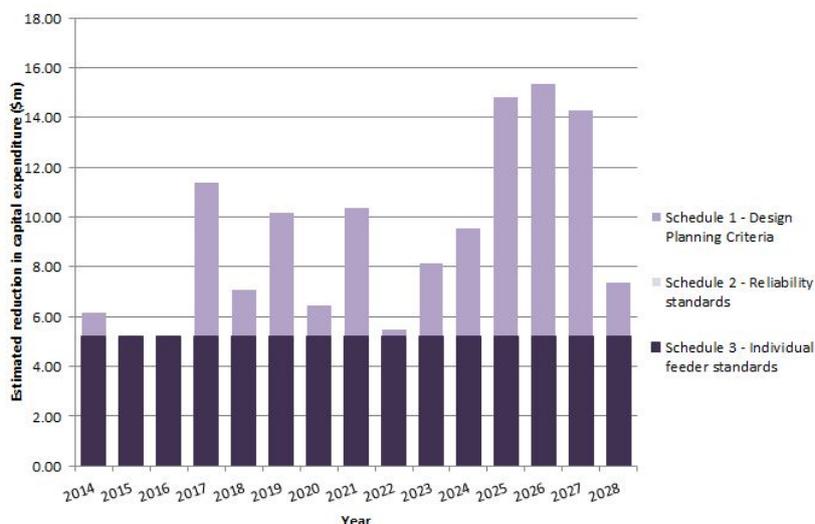


Figure 5.16 Scenario 2 with no cap on work on underperforming feeders: Essential Energy reduction in capital expenditure



5.5.3 Impact on distribution reliability

Under Scenario 2, the total increase in expected energy not served is close to 9,000 MWh between 2014/15 and 2028/29 across the three DNSPs. Similarly to the changes in capital expenditure discussed above, the increase in expected energy not served in Scenario 2 reflects a step change from Scenario 1 and is almost nine times greater in total.

While the majority of the increase in expected energy not served fell in Ausgrid's network in Scenario 1, in Scenario 2 close to 60 per cent of the total expected energy not served falls in Essential Energy's network. The majority of this increase appears to be due to a worsening in reliability performance on Essential Energy's short rural feeders, although there is also growth in the expected energy not served on Essential Energy's urban and long rural feeders.

Endeavour Energy and Ausgrid each contribute around 20 per cent of the total expected energy not served over the fifteen year modelling period.

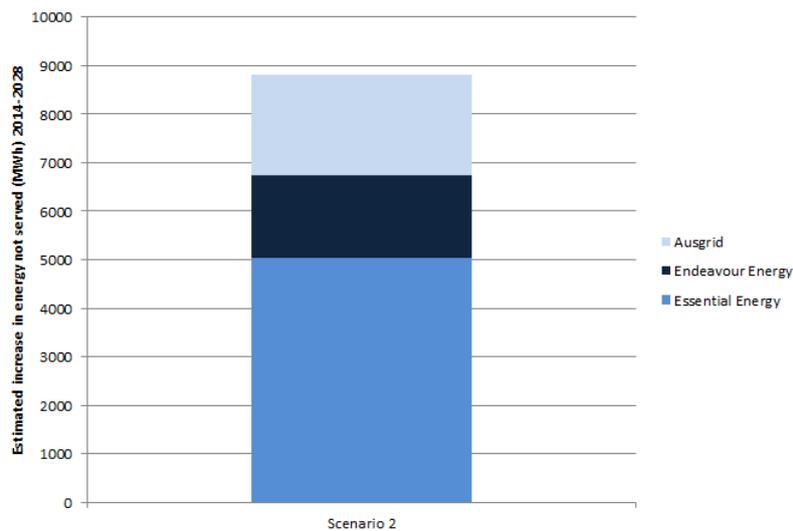
In Endeavour Energy's network, this increase is almost solely felt on Endeavour's urban feeders, with particularly large increases in expected energy not served from 2025/26 to 2028/29. The majority of the increases in expected energy not served are also on urban feeders in Ausgrid's network, although there is also some growth on Ausgrid's short rural feeders.

The significant growth in expected energy not served in Essential Energy's network is being driven by the changes to the individual feeder standards in Schedule 3 of the licence conditions. Largely as a result of Essential Energy, Schedule 3 of the licence conditions contributes over 60 per cent of the total increase in expected energy not served at a schedule level. The cap on the work that can be done on underperforming feeders appears to result in an escalating increase in expected energy not served on Essential Energy's network.

The design planning criteria in Schedule 1 of the licence conditions results in around 36 per cent of the total increase in expected energy not served. Similarly to Scenario 1, it appears that changes to the urban sub-transmission network are driving the majority of the increase in expected energy not served under Schedule 1.

The reliability standards in Schedule 2 of the conditions only contribute 1 per cent of the total increase in expected energy not served. Ausgrid is the only DNSP which is forecasting an increase in expected energy not served under Schedule 2.

Figure 5.17 Scenario 2: Total increase in expected energy not served



Where the cap on work on underperforming feeders is removed in Essential Energy's network, there is a significant reduction of almost 45 per cent in expected energy not served over 2014/15 to 2028/29. With this change, Essential Energy's share of the overall increase in expected energy not served falls from over 60 per cent to around 25 per cent. The increase in expected energy not served across Essential Energy's network is also relatively consistent across feeder types. In comparison, with the cap in place, the majority of the increase in expected energy not served was forecast to occur on Essential Energy's short rural feeders.

Figure 5.18 Scenario 2 with no cap on work on underperforming feeders: Total increase in expected energy not served

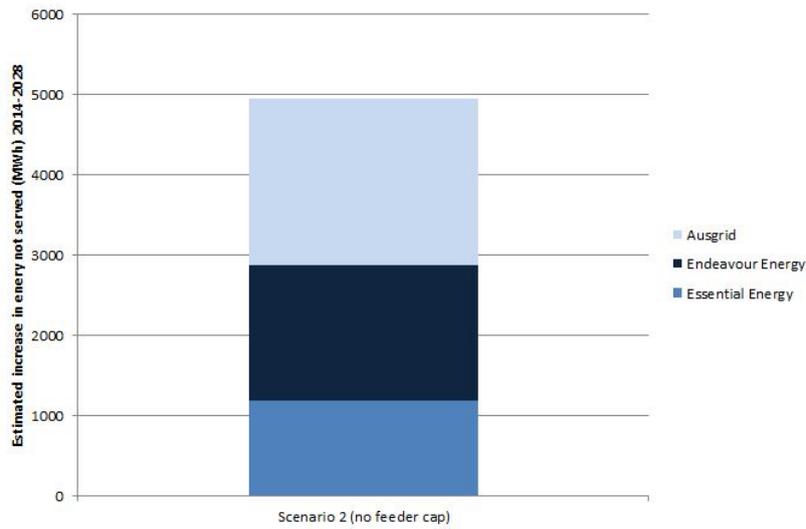


Figure 5.19 Scenario 2: Ausgrid increase in expected energy not served

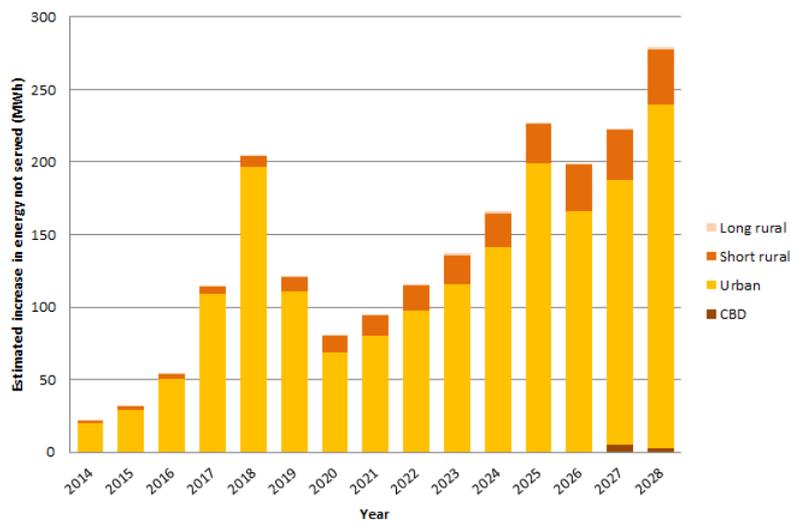


Figure 5.20 Scenario 2: Endeavour Energy increase in expected energy not served

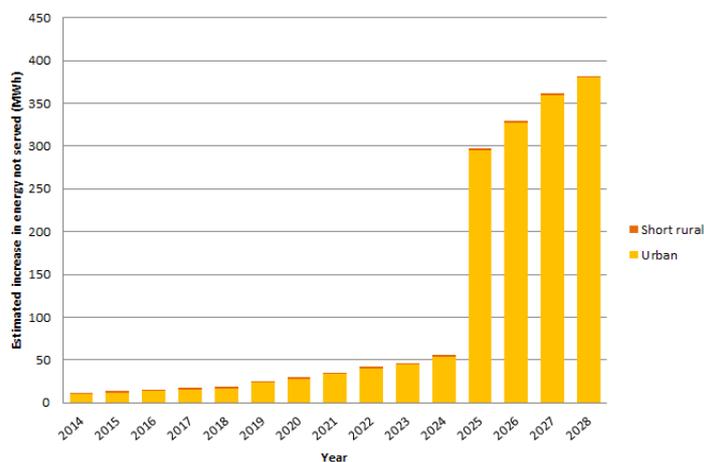


Figure 5.21 Scenario 2: Essential Energy increase in expected energy not served

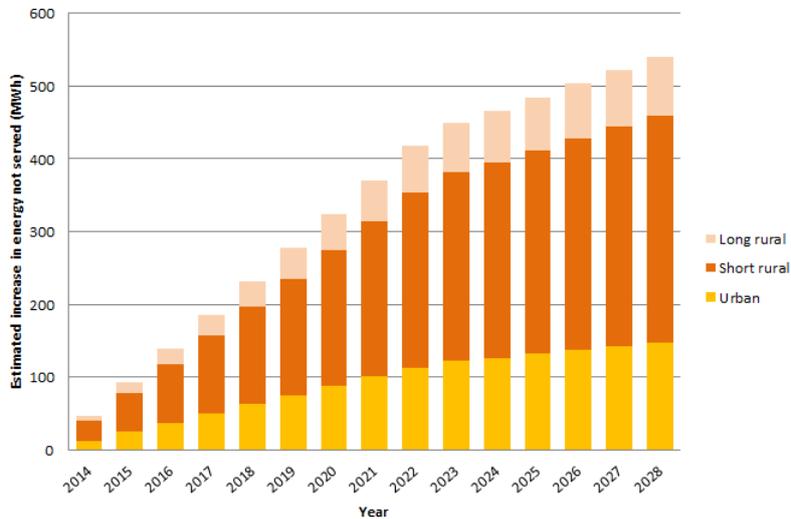
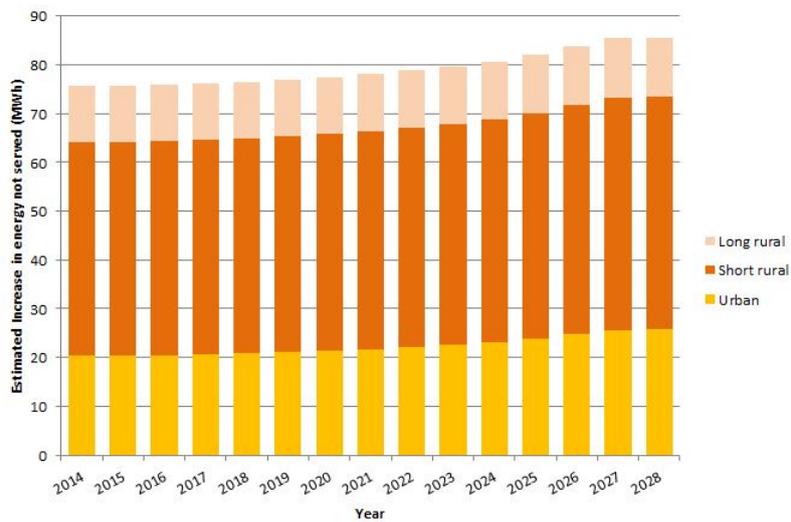
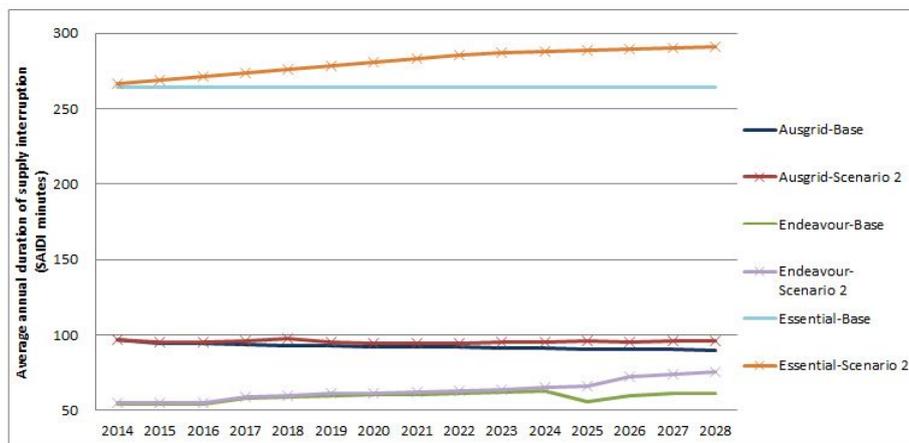


Figure 5.22 Scenario 2 with no cap on work on underperforming feeders: Essential Energy increase in expected energy not served



In terms of the SAIDI impacts for each DNSP, the increase in the duration of supply interruptions for Essential Energy is relatively large compared to the baseline. In comparison, the duration of supply interruptions for Endeavour Energy and Ausgrid only grows by a moderate amount, with the greatest increase occurring towards the end of the modelling period.

Figure 5.23 Scenario 2: Changes in the duration of supply interruptions compared to baseline



5.5.4 Summary of cost-benefit assessment

There are net benefits under Scenario 2 at both a NSW level and for each DNSP, over a five year timeframe and a fifteen year timeframe.

While the net benefits under Scenario 2 are not as large as those for Scenario 1, Scenario 2 still offers significant net benefits. Under a five year timeframe, the reductions in capital expenditure for distribution reliability are around four times greater than the value of the increase in expected energy not served. Over a fifteen year timeframe, the reductions in capital expenditure for distribution reliability are around three times larger than the value of the worsening in reliability.

The average increase in the duration of supply interruptions in 2018/19 would be around five minutes across NSW compared to the continuation of the current licence conditions, while the reduction in the distribution reliability component of the average residential customer's electricity bill is estimated to be \$4.

The average increase in the duration of supply interruptions in 2028/29 would be around thirteen minutes across NSW, while the reduction in the distribution reliability component of the average residential customer's electricity bill is estimated to be \$15. By 2028/29, the estimated bill impacts for each DNSP are quite different. This reflects the difference in both the forecast reduction in capital expenditure and energy consumption in each DNSP's network, as we have derived the annual bill impact using both of these inputs.

Table 5.3 Impact of Scenario 2 over five years from 2014/15 to 2018/19

DNSP	Reduction in capital expenditure (NPV)	Average reduction in residential customer bills in 2018/19	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Average increase in the duration of interruptions in 2018/19	Result of cost-benefit assessment
Ausgrid	\$125m	\$2	426 MWh	\$28m	5 minutes	Benefits exceed costs
Endeavour Energy	\$94m	\$3	78 MWh	\$7m	1 minute	Benefits exceed costs
Essential Energy	\$109m	\$5	693 MWh	\$49m	11 minutes	Benefits exceed costs
NSW total	\$328m	\$3	1,197 MWh	\$83m	5 minutes	Benefits exceed costs

Table 5.4 Impact of Scenario 2 over fifteen years from 2014/15 to 2028/29

DNSP	Reduction in capital expenditure (NPV)	Average reduction in residential customer bills in 2028/29	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Average increase in the duration of interruptions in 2028/29	Result of cost-benefit assessment
Ausgrid	\$306m	\$6	2,071 MWh	\$92m	6 minutes	Benefits exceed costs
Endeavour Energy	\$491m	\$21	1,684 MWh	\$79m	14 minutes	Benefits exceed costs
Essential Energy	\$253m	\$13	5,047 MWh	\$233m	27 minutes	Benefits exceed costs
NSW total	\$1,049m	\$12	8,802 MWh	\$404m	13 minutes	Benefits exceed costs

Where the cap on work on underperforming feeders is removed in Essential Energy's network, there are still net benefits across NSW under Scenario 2 under both a five year and fifteen year timeframe. The reductions in capital expenditure for distribution

reliability are around four times larger than the value of the worsening in reliability under a five and fifteen year timeframe.

However, under a five year timeframe in Essential Energy's network, the net present value of the reduction in capital expenditure is equal to the value of the increase in expected energy not served. This suggests that over a short timeframe there is the potential for net costs in implementing Scenario 2 in Essential Energy's network where there is no cap on underperforming feeders.

Table 5.5 Impact of Scenario 2 with no cap on work on underperforming feeders over five years from 2014/15 to 2018/19

DNSP	Reduction in capital expenditure (NPV)	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	\$125m	426 MWh	\$28m	Benefits exceed costs
Endeavour Energy	\$94m	78 MWh	\$7m	Benefits exceed costs
Essential Energy	\$28m	380 MWh	\$28m	Benefits equal costs
NSW total	\$247m	884 MWh	\$63m	Benefits exceed costs

Table 5.6 Impact of Scenario 2 with no cap on work on underperforming feeders over fifteen years from 2014/15 to 2028/29

DNSP	Reduction in capital expenditure (NPV)	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	\$306m	2,071 MWh	\$92m	Benefits exceed costs
Endeavour Energy	\$491m	1,684 MWh	\$79m	Benefits exceed costs
Essential Energy	\$76m	1,188 MWh	\$63m	Benefits exceed costs
NSW total	\$872m	4,943 MWh	\$234m	Benefits exceed costs

5.6 Scenario 3: Extreme reduction in distribution reliability

5.6.1 Overview of the scenario

This scenario is intended to result in a significant reduction in distribution reliability and capital expenditure, compared to the continuation of the current requirements for distribution reliability. The key features of this scenario are set out below.

Figure 5.24 Summary of Scenario 3 features

Licence condition	Issue	Scenario 3: Extreme reduction of outcomes
Design planning criteria (Schedule 1)	CBD areas	- Higher levels of load at risk if there is an outage during peak periods - Less network redundancy (n-2 standard reduced to n-1)
	Urban areas	- Higher levels of load at risk if there is an outage during peak periods - Removal of capacity buffer for normal operations (but buffer still applies for emergency operations) - Less network redundancy for large loads (n-1 standard reduced to n) in some areas
	Non-urban areas	- Removal of capacity buffer for normal operations (but buffer still applies for emergency operations) - Less network redundancy for large loads (n-1 standard reduced to n) in some areas
	Forecast demand used for planning (applies to all areas)	No change
Reliability standards (Schedule 2)	Average duration and frequency of outages for feeders	DNISP to be 50% confident that current standards will not be exceeded
Individual feeder standards (Schedule 3)	Individual duration and frequency of outages for each feeder	Increase SAIDI and SAIFI standards by 20%
	Work to be done on underperforming feeders	Work restricted to a maximum of 1% of total feeders each year

We have also outlined the impacts on capital expenditure and reliability that may occur where the cap on work that can be done on underperforming feeders in Schedule 3 of the licence conditions is removed in Essential Energy's network.

5.6.2 Impact on capital expenditure

Scenario 3 results in capital expenditure reductions of close to \$2.5b over 2014/15 to 2028/29 for the three DNSPs, which is around \$500m more than was forecast in Scenario 2. Similarly to Scenarios 1 and 2, the design planning criteria in Schedule 1 of the licence conditions is driving most of the forecast capital expenditure reductions.

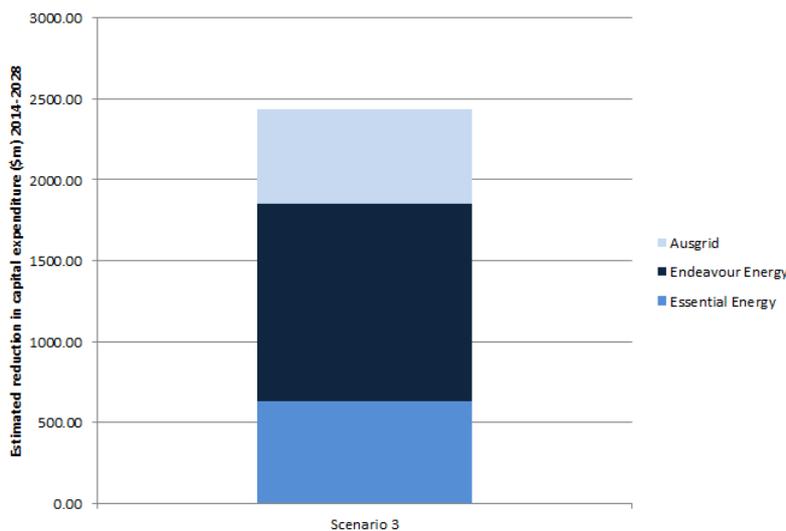
Endeavour Energy is responsible for half of the reductions in capital expenditure, with Essential Energy and Ausgrid each contributing around 25 per cent of the remaining reductions in capital expenditure. In particular, the majority of the reductions in capital expenditure in Endeavour Energy's network appear to relate to the changes to the urban sub-transmission network in Schedule 1 of the conditions.

The contribution of changes to the individual feeder standards in Schedule 3 of the licence conditions become more significant under Scenario 3, and drives around 25 per cent of the total changes in capital expenditure. In Scenario 2, the majority of capital expenditure reductions relating to Schedule 3 occur in Essential Energy's network, in relation to the cap on the work that can be done on underperforming feeders. The capital expenditure reductions that are achieved in Essential Energy's network as a result of this cap almost double from around \$25m a year in Scenario 2 to close to \$40m a year in Scenario 3.

Similarly to Scenario 2, the changes to the individual feeder standards only result in slight reductions in capital expenditure in Ausgrid and Endeavour Energy's networks. These reductions are being driven by changes in the SAIDI and SAIFI standards, rather than the cap on underperforming feeders.

Changes to the reliability standards in Schedule 2 of the licence conditions continue to result in limited reductions in capital expenditure.

Figure 5.25 Scenario 3: Total reduction in capital expenditure



When the cap on work on underperforming feeders in Schedule 3 of the licence conditions is removed in Essential Energy's network, the overall reduction in capital expenditure is forecast to fall by just over \$300m, from almost \$2.5b to \$2.1b. With this change, Essential's contribution to the total reduction in capital expenditure is around 14 per cent, compared to 25 per cent when the cap is in place. Despite this change, the majority of Essential Energy's reductions in capital expenditure remain driven by Schedule 3 of the licence conditions.

Figure 5.26 Scenario 3 with no cap on work on underperforming feeders: Total reduction in capital expenditure

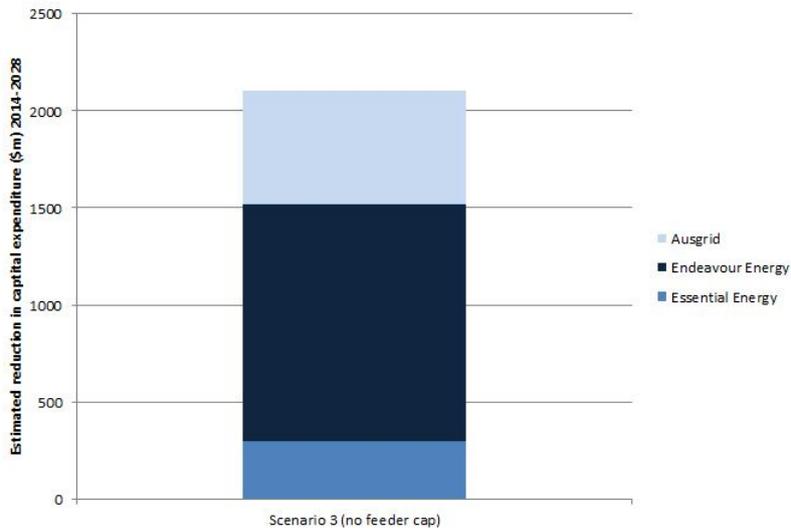


Figure 5.27 Scenario 3: Ausgrid reduction in capital expenditure

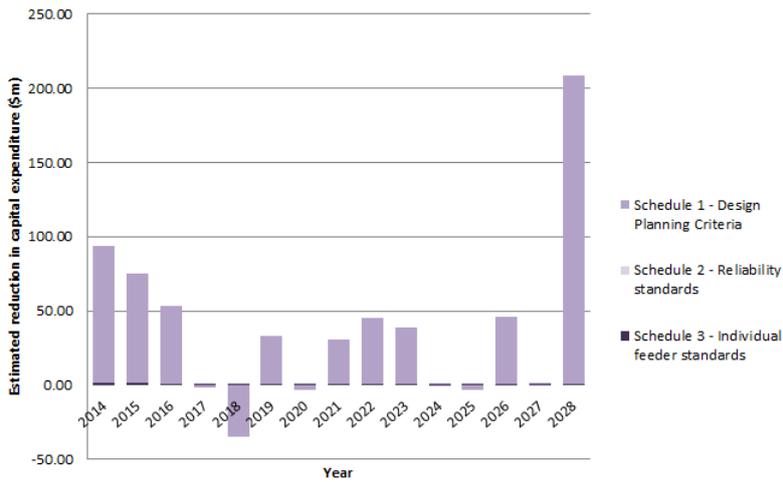


Figure 5.28 Scenario 3: Endeavour Energy reduction in capital expenditure

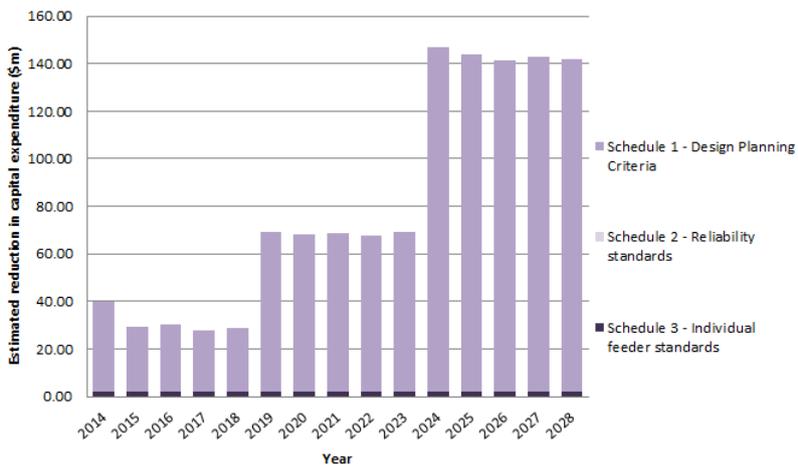


Figure 5.29 Scenario 3: Essential Energy reduction in capital expenditure

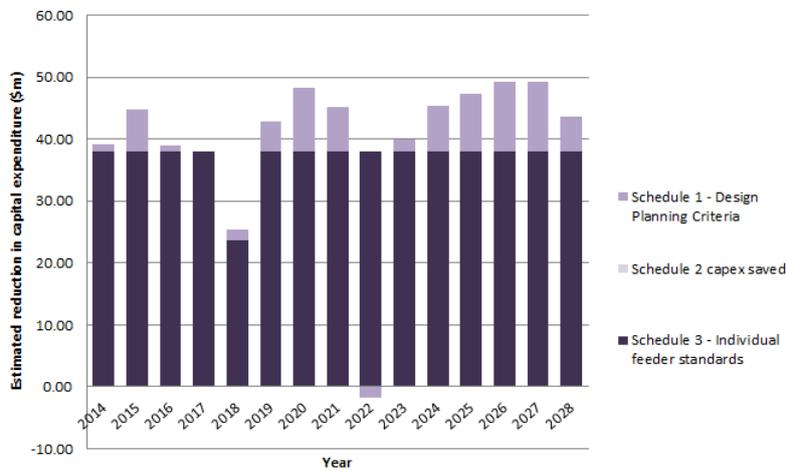
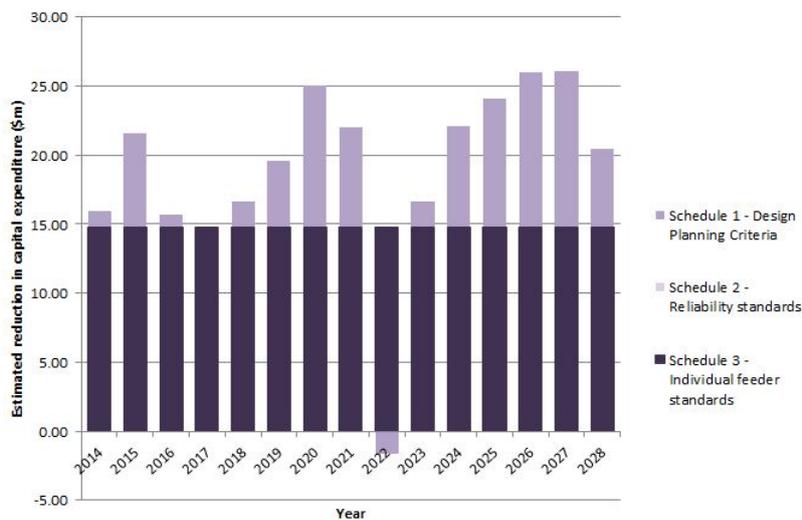


Figure 5.30 Scenario 3 with no cap on work on underperforming feeders: Essential Energy reduction in capital expenditure



5.6.3 Impact on distribution reliability

In Scenario 3, the total increase in expected energy not served is just over 11,000 MWh between 2014/15 and 2028/29 across the three DNSPs. This is around a 25 per cent increase compared to Scenario 2. The effects on the DNSPs are similar to those in Scenario 2, with Essential Energy bearing around 50 per cent of the total increase in expected energy not served. The majority of this impact is on Essential Energy's short rural feeders.

Ausgrid contributes just over 30 per cent of the total increase in expected energy not served, which is largely due to a worsening of reliability on its urban feeders. Endeavour Energy contributes the remaining 17 per cent of the increase in expected energy not served, which also falls almost exclusively on its urban feeders. Similarly to Scenario 2, there is a significant increase in expected energy not served on Endeavour Energy's urban feeders from 2025/26 onwards.

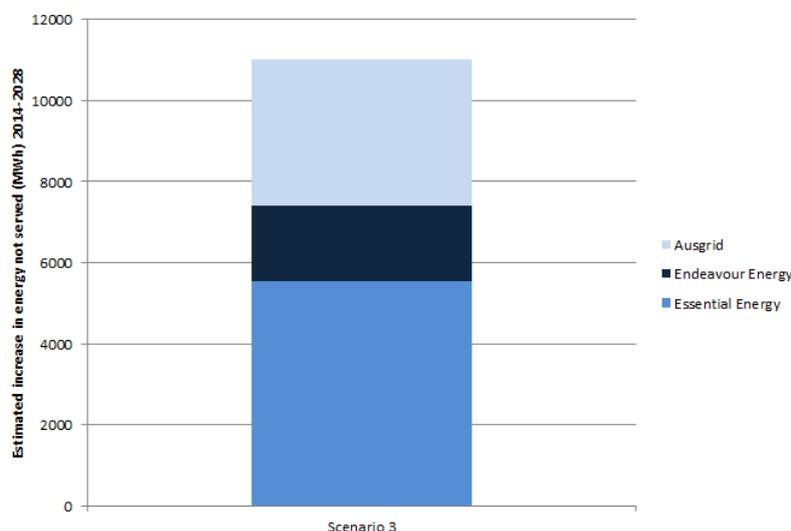
Interestingly, there is only a limited impact on the reliability of long rural feeders across NSW even under Scenario 3. This may be because the reliability performance requirements for long rural feeders are already significantly lower than the requirements for urban feeders, and to a lesser extent, short rural feeders.

The drivers for the increase in expected energy not served at a schedule level are almost identical to those for Scenario 2. The individual feeder standards in Schedule 3 of the licence conditions drive just over 60 per cent of the total increase in expected energy not served, which is largely the result of the effect of the cap on work that can be done on underperforming feeders in Essential Energy's network. The changes to Schedule 3 also result in additional expected energy not served on Ausgrid's network, and to a lesser degree, Endeavour Energy's network. However, the increase on these networks is being driven by the change in the individual feeder standards, rather than a cap on the work that can be done on poor performing feeders.

The design planning criteria in Schedule 1 of the licence conditions contribute close to 40 per cent of the total increase in expected energy not served. Similarly to Scenarios 1 and 2, this appears to be mainly driven by the change in requirements for the urban sub-transmission network.

The changes to the reliability standards in Schedule 2 of the conditions continue to only have a minimal impact on the increase in expected energy not served. This demonstrates the significant level of overperformance against the existing reliability standards by the NSW DNSPs.

Figure 5.31 Scenario 3: Total increase in expected energy not served



When the cap on work on underperforming feeders is removed in Essential Energy's network, the increase in expected energy not served falls by around 30 per cent from just over 11,000 MWh to around 7,500 MWh, Similarly to the pattern seen under Scenario 2, when the cap is removed there is a fairly consistent increase in expected energy not served across Essential Energy's feeders, while with the cap in place most of the reliability impacts are felt on Essential's short rural feeders.

Figure 5.32 Scenario 3 with no cap on work on underperforming feeders: Total increase in expected energy not served

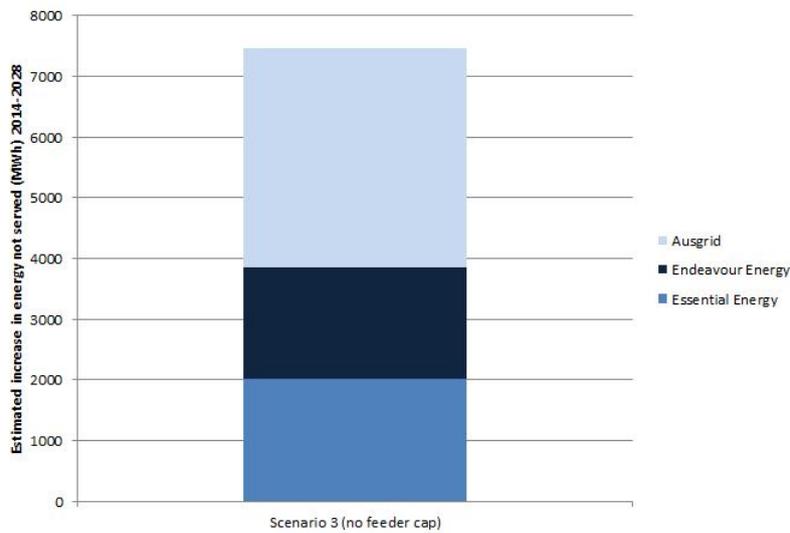


Figure 5.33 Scenario 3: Ausgrid increase in expected energy not served

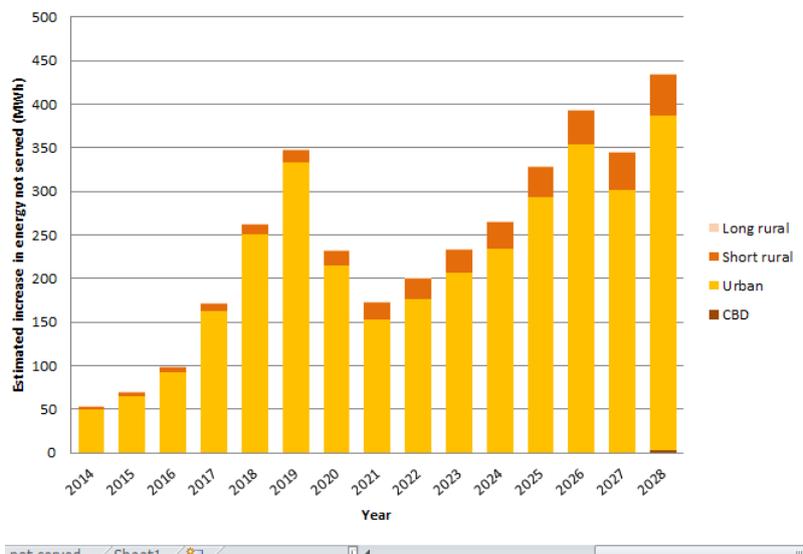


Figure 5.34 Scenario 3: Endeavour Energy increase in expected energy not served

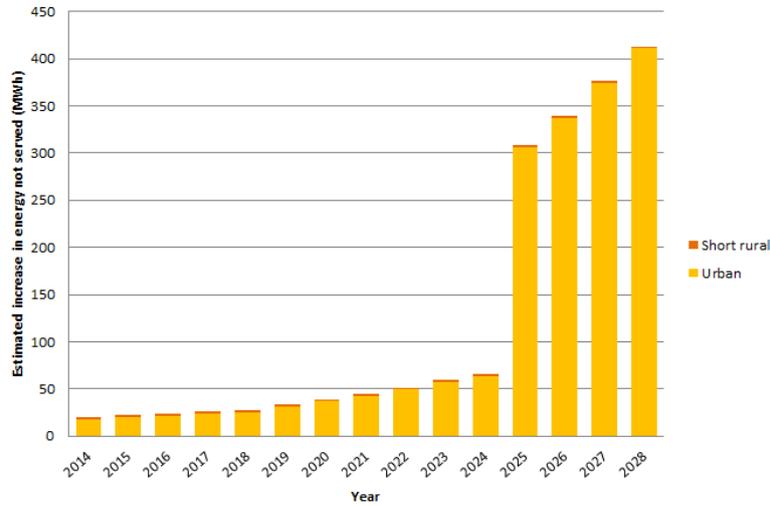


Figure 5.35 Scenario 3: Essential Energy increase in expected energy not served

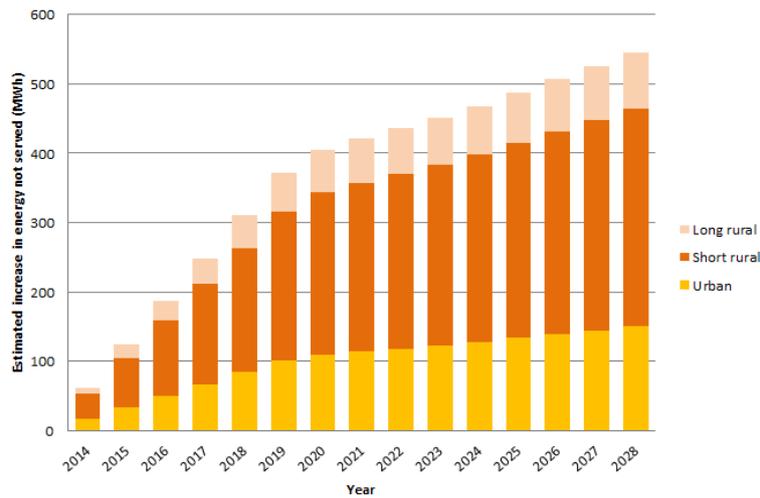
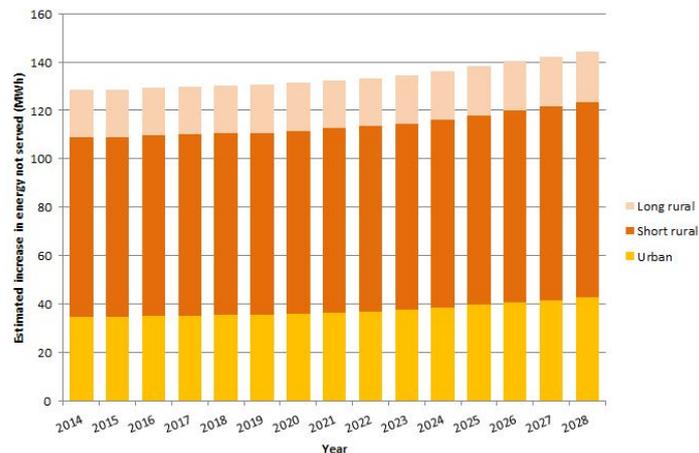
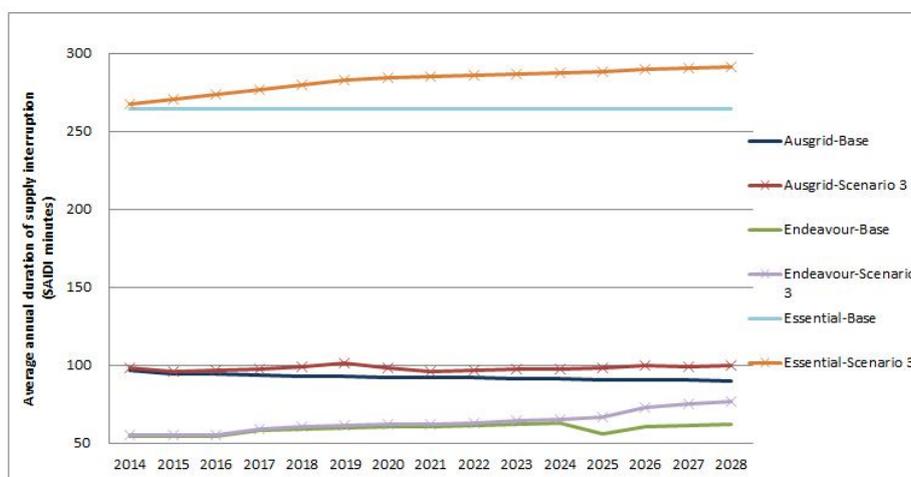


Figure 5.36 Scenario 3 with no cap on work on underperforming feeders: Essential Energy increase in expected energy not served



When the modelled expected energy not served is converted into average SAIDI impacts for each DNSP, the increase in the annual duration of supply interruptions compared to the baseline is significant for Essential Energy and grows over the modelling period. For Ausgrid and Endeavour Energy, the increase in the annual duration of interruptions is not as significant. However, over the last five years of the modelling period, the increase in interruptions compared to the baseline grows larger for Ausgrid and Endeavour Energy. The SAIDI results for Scenario 3 and their trajectory are relatively similar to those in Scenario 2.

Figure 5.37 Scenario 3: Changes in the duration of supply interruptions compared to baseline



5.6.4 Summary of cost-benefit assessment

There are net benefits under Scenario 3 at both a NSW level and for each DNSP, over a five year timeframe and a fifteen year timeframe.

The net benefits of Scenario 3 are similar to the magnitude of net benefits under Scenario 2. Like Scenario 2, the net benefits under Scenario 3 are not as large as those under Scenario 1.

Under a five and fifteen year timeframe, the net present value of the reductions in capital expenditure are around four times greater than the net present value of the increase in expected energy not served. However, as Scenario 3 provides for an extreme lowering in reliability performance, careful consideration of the possible impacts this scenario may have on consumers is required.

The average increase in the duration of supply interruptions in 2018/19 would be around seven minutes across NSW, while the reduction in the distribution reliability component of the average NSW residential electricity bill is estimated to be \$5.

The average increase in the duration of supply interruptions in 2028/29 would be around fifteen minutes across NSW, while the reduction in the distribution reliability component of the average NSW residential electricity bill is estimated to be \$18. The difference in bill impacts between the three DNSPs reflects those seen in Scenario 2.

Table 5.7 Impact of Scenario 3 over five years from 2014/15 to 2018/19

DNSP	Reduction in capital expenditure (NPV)	Average reduction in residential customer bills in 2018/19	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Average increase in the duration of interruptions in 2018/19	Result of cost-benefit assessment
Ausgrid	\$171m	\$3	653 MWh	\$44m	6 minutes	Benefits exceed costs
Endeavour Energy	\$128m	\$4	119 MWh	\$11m	1 minute	Benefits exceed costs
Essential Energy	\$153m	\$7	931 MWh	\$65m	15 minutes	Benefits exceed costs
NSW total	\$429m	\$4	1,704 MWh	\$110m	7 minutes	Benefits exceed costs

Table 5.8 Impact of Scenario 3 over fifteen years from 2014/15 to 2028/29

DNSP	Reduction in capital expenditure (NPV)	Average reduction in residential customer bills in 2028/29	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Average increase in the duration of interruptions in 2028/29	Result of cost-benefit assessment
Ausgrid	\$342m	\$6	3,608 MWh	\$164m	10 minutes	Benefits exceed costs
Endeavour Energy	\$611m	\$26	1,852 MWh	\$89m	15 minutes	Benefits exceed costs
Essential Energy	\$368m	\$19	5,550 MWh	\$264m	27 minutes	Benefits exceed costs
NSW total	\$1,321m	\$15	11,010 MWh	\$516m	15 minutes	Benefits exceed costs

Where the cap on work on underperforming feeders is removed in Essential Energy's network, there are still net benefits under Scenario 3 under both a five year and fifteen year timeframe. The reductions in capital expenditure for distribution reliability are

around three times larger than the value of the worsening in reliability under a five and fifteen year timeframe. There are also net benefits for Essential Energy under a five and fifteen year timeframe, which contrasts to Scenario 2 where benefits equalled costs in Essential's network under a five year timeframe where the cap was removed.

Table 5.9 Impact of Scenario 3 with no cap on work on underperforming feeders over five years from 2014/15 to 2018/19

DNSP	Reduction in capital expenditure (NPV)	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	\$171m	653 MWh	\$44m	Benefits exceed costs
Endeavour Energy	\$128m	119 MWh	\$11m	Benefits exceed costs
Essential Energy	\$69m	646 MWh	\$48m	Benefits exceed costs
NSW total	\$369m	1,419 MWh	\$102m	Benefits exceed costs

Table 5.10 Impact of Scenario 3 with no cap on work on underperforming feeders over fifteen years from 2014/15 to 2028/29

DNSP	Reduction in capital expenditure (NPV)	Increase in expected energy not served	Value of the increase in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	\$342m	3,608 MWh	\$164m	Benefits exceed costs
Endeavour Energy	\$611m	1,852 MWh	\$89m	Benefits exceed costs
Essential Energy	\$172m	2,009 MWh	\$107m	Benefits exceed costs
NSW total	\$1,125m	7,468 MWh	\$359m	Benefits exceed costs

5.7 Scenario 4: Improvement in distribution reliability

5.7.1 Overview of the scenario

This scenario is intended to result in an increase in the level of distribution reliability and capital expenditure, compared to the continuation of the current requirements for distribution reliability. The key features of this scenario are set out below.

Figure 5.38 Summary of Scenario 4 features

Licence condition	Issue	Scenario 4: Improvement in outcomes
Design planning criteria (Schedule 1)	CBD areas	No change
	Urban areas	No change
	Non-urban areas	No change
	Forecast demand used for planning (applies to all areas)	Demand forecasts expected to be exceeded no more than one year in ten (rather than one year in two)
Reliability standards (Schedule 2)	Average duration and frequency of outages for feeders	DNSP to be 99% confident that current standards will not be exceeded
Individual feeder standards (Schedule 3)	Individual duration and frequency of outages for each feeder	Reduce SAIDI and SAIFI standards by 20%
	Work to be done on underperforming feeders	Work restricted to a maximum of 10% of total feeders each year

5.7.2 Impact on capital expenditure

The capital expenditure forecasts for Scenario 4 should be interpreted with some care, as Nuttall Consulting has advised that:

- Endeavour Energy has not forecast capital expenditure impacts in relation to its distribution level assets for Schedule 1 of the licence conditions;
- Essential Energy has not forecast any capital expenditure impacts for Schedule 1 of the licence conditions; and
- Ausgrid has not included \$142 million in additional capital expenditure for urban sub-transmission assets, which would be required in 2014 to meet the requirements in Schedule 1 of the licence conditions. Ausgrid's assumed costs to meet the changes to the reliability standards in Schedule 2 of the licence conditions are also likely to be understated.

These issues mean that the capital expenditure increases forecast for Scenario 4 are likely to understate the actual cost of achieving this improved level of reliability.

While noting the issues identified above, Scenario 4 results in a \$1.7b increase in capital expenditure for distribution reliability over 2014/15 to 2028/29 across the three DNSPs, compared to the continuation of the current licence conditions.

Around 60 per cent of the overall increase in capital expenditure relates to the change to the design planning criteria in Schedule 1 of the conditions. This change requires the

DNSPs to plan to higher demand forecasts. As a result, planning is undertaken to meet demand on average in every nine in ten years rather than every five in ten years, as is the case under the current conditions and Scenarios 1 to 3. This requires DNSPs to bring forward investment, compared to the current conditions.

Around 60 per cent of the total capital expenditure required for Scenario 4 occurs in Endeavour Energy's network. The majority of Endeavour's increase in expenditure relates to the need for additional assets on their urban sub-transmission network to meet the requirements in Schedule 1 of the conditions. Ausgrid is only driving 7 per cent of the total increase in capital expenditure, which is the mainly the result of Schedule 1 changes.

Essential Energy is responsible for the remaining 32 per cent of the total capital expenditure increases for distribution reliability. The majority of this increase in capital expenditure relates to the changes to Schedule 3 of the licence conditions, which include reduced SAIDI and SAIFI standards for individual feeders which increase the performance required, and an increase in the amount of work that can be done on underperforming feeders.

Essential Energy's increase in capital expenditure for Schedule 3 appears to be related to the relatively high costs of meeting the higher requirements compared to the other two DNSPs, which is likely to reflect the rural nature of Essential's network. However, Endeavour Energy has forecast some increased capital expenditure to meet the Schedule 3 changes.

The reliability standards in Schedule 2 of the licence conditions only contribute around 4 per cent of the total change in capital expenditure, which is mainly being driven by expenditure increases in Ausgrid's network.

Figure 5.39 Scenario 4: Total increase in capital expenditure

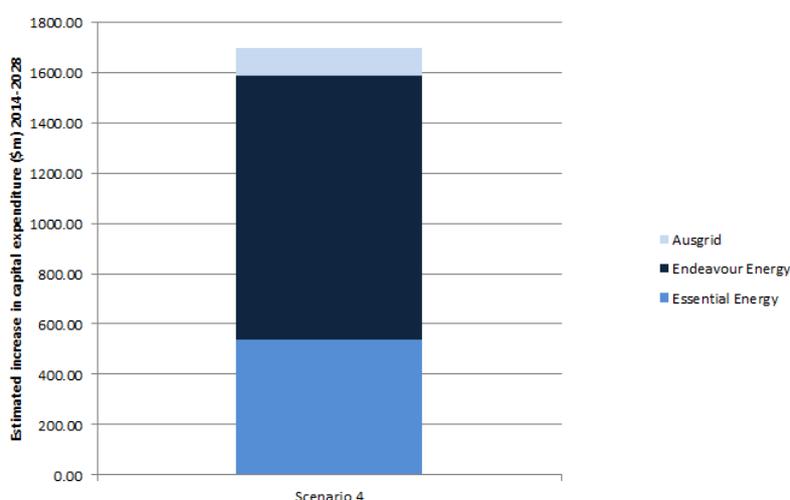


Figure 5.40 Scenario 4: Ausgrid increase in capital expenditure

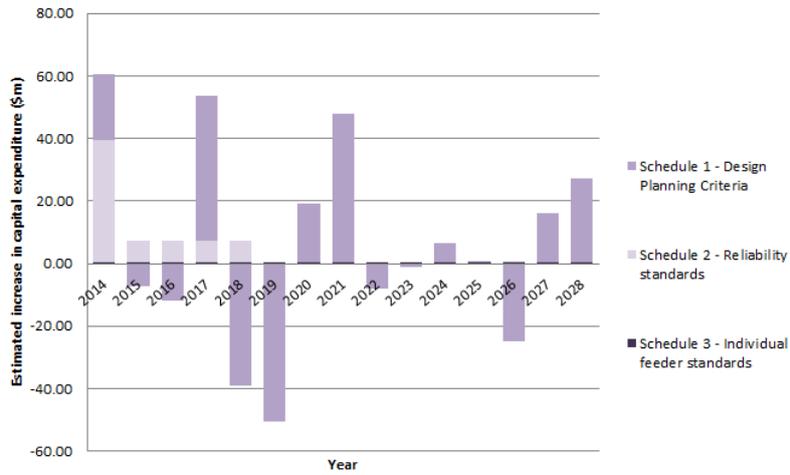


Figure 5.41 Scenario 4: Endeavour Energy increase in capital expenditure

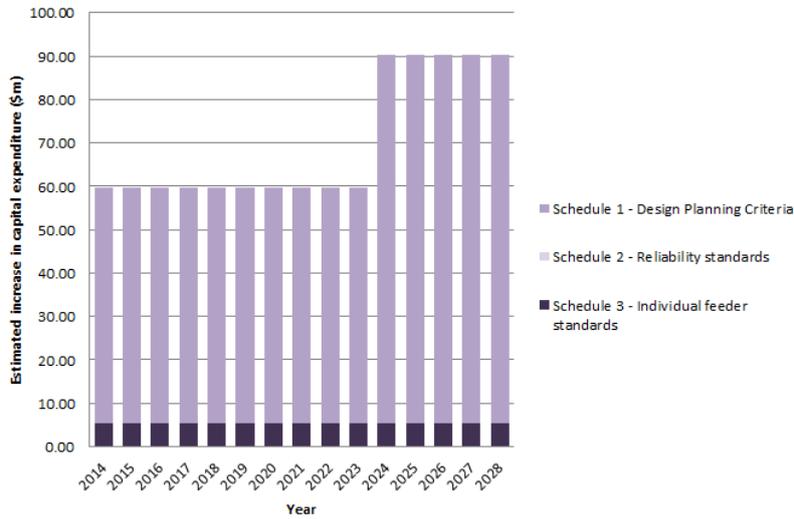
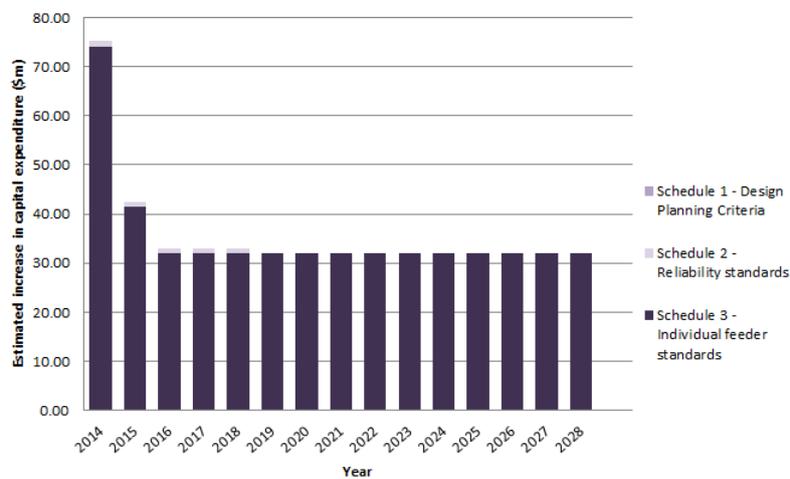


Figure 5.42 Scenario 4: Essential Energy increase in capital expenditure



5.7.3 Impact on distribution reliability

The issues identified above in section 5.7.2 relating to capital expenditure have also impacted the accuracy of the reliability forecasts provided by the DNSPs. Nuttall Consulting has advised that some of the specific impacts on the reliability forecasts for Scenario 4 include:

- Essential Energy appears to have understated reliability improvements by a relatively small amount of around 270 MWh; and
- The methodology that has been used by Endeavour Energy to calculate the reliability change associated with its sub-transmission network has resulted in a slight increase in expected energy not served over a fifteen year timeframe, when a reduction should occur.

These issues have occurred due to the limited time to prepare and finalise this modelling, and as the DNSPs have generally focussed on modelling Scenarios 1 to 3, as it is more likely that these scenarios may be implemented.

While noting the issues with the modelling methodologies used, under Scenario 4 total expected energy not served is forecast to reduce by just over 6,000 MWh between 2014/15 and 2028/29 across the three DNSPs compared to the continuation of the existing licence conditions.

Around 94 per cent of this improvement in reliability occurs on Ausgrid's network, while Essential Energy contributes around 9 per cent of the improvement.¹²⁰ The improvement is mainly felt on Ausgrid's urban and short rural feeders, while on Essential Energy's network there is a relatively even level of improvement across its three feeder types.

Endeavour Energy has forecast a 3 per cent reduction in expected energy not served over the modelling period, which mainly affects its urban feeders.

In contrast to Scenarios 1 to 3 above, over 80 per cent of the total improvement in reliability is due to the changes to the reliability standards in Schedule 2 of the licence conditions. This appears to be largely due to the additional improvement in reliability that Ausgrid considers it requires to meet a 99 per cent confidence interval of meeting the reliability standards. Essential Energy is also forecasting a small reliability improvement as a result of the Schedule 2 changes.

The changes to the individual feeder standards in Schedule 3 of the licence conditions comprise over 20 per cent of the total reduction in expected energy not served. This reduction is shared relatively equally amongst the three DNSPs. As a result, these changes would result in reliability improvements across the three networks.

¹²⁰ The total improvement in reliability adds up to over 100 per cent as Endeavour Energy is forecasting a 3 per cent reduction in reliability.

The changes to Schedule 1 of the licence conditions actually results in a net increase in the amount of expected energy not served. However, as discussed above this result is due to the modelling methodology that Endeavour Energy has used in relation to its sub-transmission network.

Figure 5.43 Scenario 4: Total decrease in expected energy not served

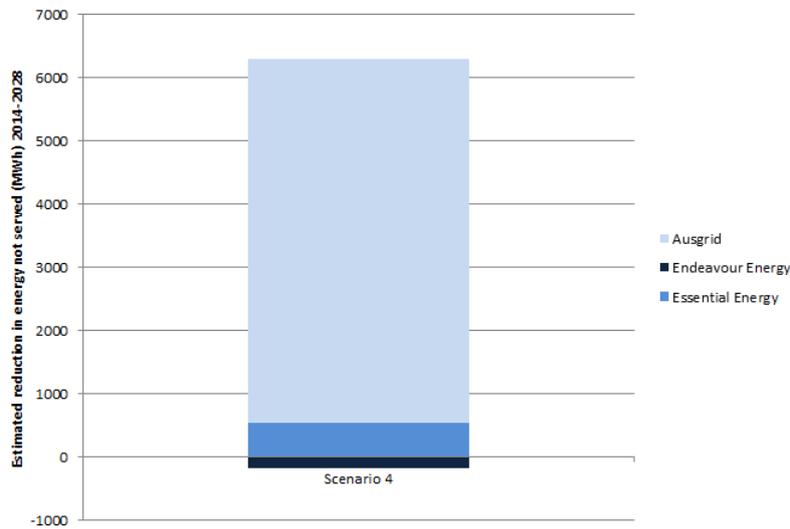


Figure 5.44 Scenario 4: Ausgrid decrease in expected energy not served

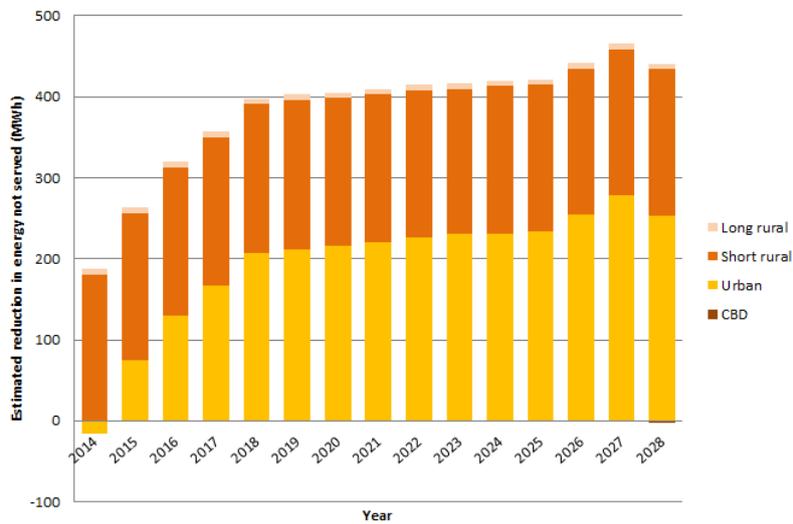


Figure 5.45 Scenario 4: Endeavour Energy decrease in expected energy not served

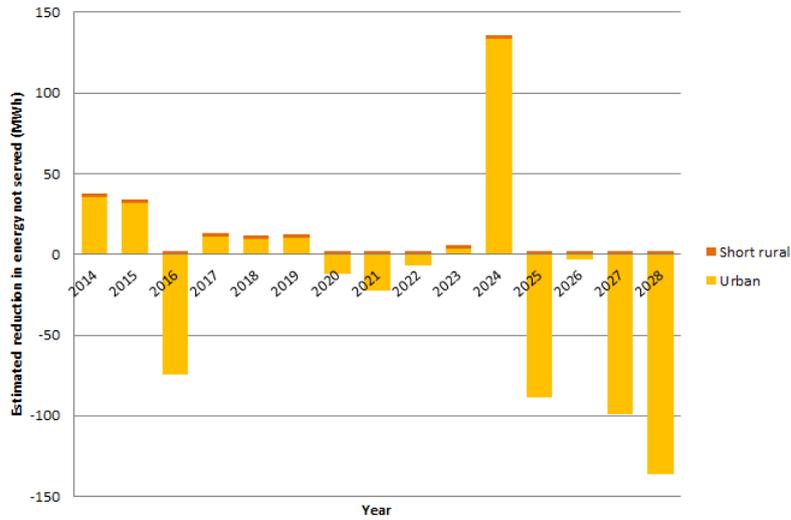
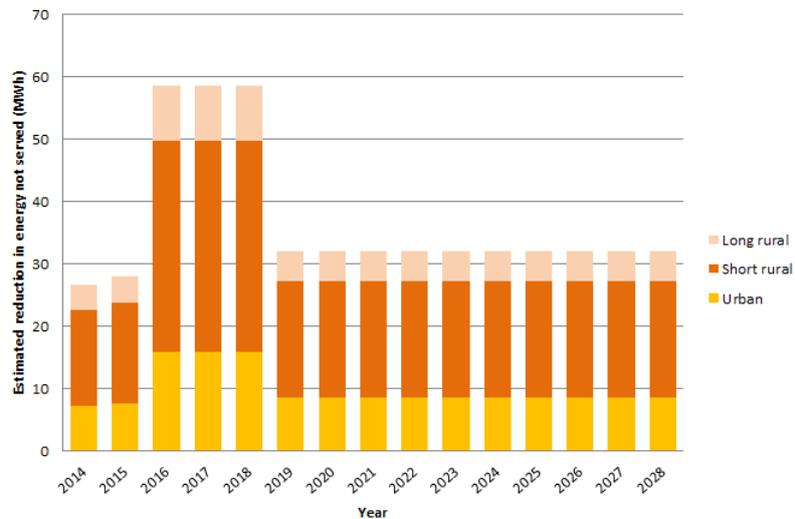
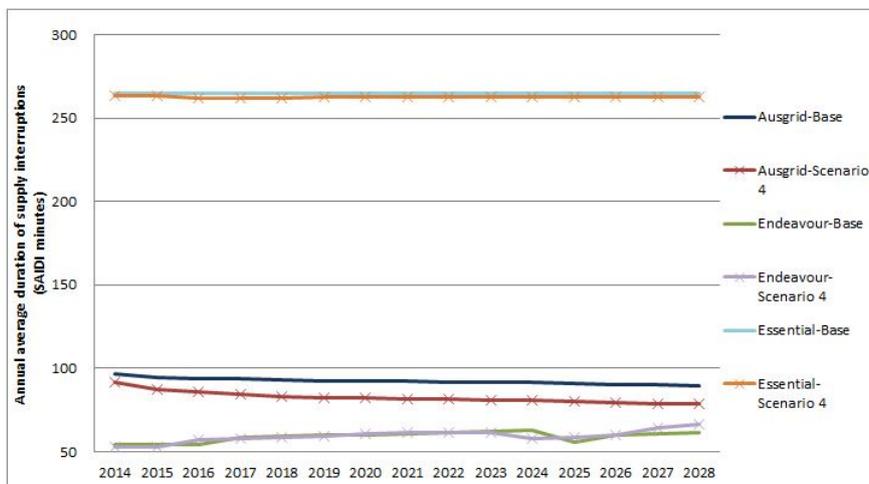


Figure 5.46 Scenario 4: Essential Energy decrease in expected energy not served



When the modelled expected energy not served is converted into average SAIDI impacts for each DNSP, there is only a small reduction in the duration of supply interruptions for Essential Energy and Endeavour Energy and a moderate reduction for Ausgrid, compared to the baseline of no change.

Figure 5.47 Scenario 4: Changes in the duration of supply interruptions compared to baseline



5.7.4 Summary of cost-benefit assessment

Under both a five year timeframe and a fifteen year timeframe, there are net costs under Scenario 4 on a NSW level and at a DNSP level for Endeavour Energy and Essential Energy. However, there are net benefits under Scenario 4 for Ausgrid under both timeframes.

The reason that there are net benefits for Ausgrid appears to be the significant reliability improvement that Ausgrid has forecast, compared to the other two DNSPs. The value of this reliability improvement is larger than the forecast cost of the reliability improvement for Ausgrid. However, as discussed above, Ausgrid's forecast capital expenditure appears to be understated by around \$142m. If this additional capital expenditure was taken into account in our cost-benefit assessment, Ausgrid would have failed the cost benefit-assessment over both a five year and a fifteen year timeframe, as this additional expenditure would be required in 2014.

In comparison, for Endeavour Energy and Essential Energy, the value of the reliability improvement is significantly smaller than the forecast cost increase of this improvement.

In the case of Endeavour Energy, by 2028/29, a small reduction in reliability is forecast. As discussed above, the reason for this unexpected outcome appears to be the modelling methodology used by Endeavour Energy, rather than any actual deterioration in reliability performance.

In terms of the impact on customers, over a five year timeframe the average reduction in the duration of supply interruptions would be five minutes in 2018/19, while the average NSW increase in the distribution reliability component of residential bills to achieve this improvement would be around \$6.

By 2028/29, the reduction in the duration of supply interruptions compared to the continuation of the existing conditions would be four minutes, while the average NSW increase in the distribution reliability component of residential bills is estimated to be \$13. The significantly higher bill impacts forecast in Endeavour Energy and Essential Energy's networks, compared to Ausgrid's network, reflects the higher level of capital expenditure forecast by Endeavour Energy and Essential Energy to meet the requirements of Scenario 4.

Table 5.11 Impact of Scenario 4 over five years from 2014/15 to 2018/19

DNSP	Increase in capital expenditure (NPV)	Average increase in residential customer bills in 2018/19	Reduction in expected energy not served	Value of the reduction in expected energy not served (NPV)	Average reduction in the duration of interruptions in 2018/19	Result of cost-benefit assessment
Ausgrid	\$71m	\$1	1,509 MWh	\$104m	10 minutes	Benefits exceed costs
Endeavour Energy	\$243m	\$8	25 MWh	\$3m	1 minute	Costs exceed benefits
Essential Energy	\$182m	\$8	230 MWh	\$16m	3 minutes	Costs exceed benefits
NSW total	\$495m	\$5	1,764 MWh	\$123m	5 minutes	Costs exceed benefits

Table 5.12 Impact of Scenario 4 over fifteen years from 2014/15 to 2028/29

DNSP	Increase in capital expenditure (NPV)	Average increase in residential customer bills in 2028/29	Reduction in expected energy not served	Value of the reduction in expected energy not served (NPV)	Average reduction in the duration of interruptions in 2028/29	Result of cost-benefit assessment
Ausgrid	\$82m	\$1	5,743 MWh	\$280m	11 minutes	Benefits exceed costs
Endeavour Energy	\$593m	\$22	-174 MWh	-\$5m	- 5 minutes	Costs exceed benefits
Essential Energy	\$336m	\$16	550 MWh	\$31m	2 minutes	Costs exceed benefits
NSW total	\$1,011m	\$11	6,120 MWh	\$306m	4 minutes	Costs exceed benefits

5.8 Conclusions

Table 5.13 below summaries the cost-benefit assessment for each scenario. The table sets out the total impact on capital expenditure and expected energy not served across the three NSW DNSPs over a five and fifteen year timeframe. The weighted average impact on residential electricity bills and the duration of supply interruptions for each scenario across NSW is also outlined. The table and figures below do not include the results from Scenarios 2 and 3 where the cap on work that can be done on underperforming feeders is removed in Essential Energy's network.

Table 5.13 Comparison of scenario impacts

Scenario	Timeframe	Total change in capital expenditure (NPV)	Average change in residential customer bills	Total change in expected energy not served	Average change in supply interruptions	Total value in the change in expected energy not served (NPV)	Result of cost-benefit assessment
1: Modest reduction in reliability	5 years	\$118m reduction	-\$1	119 MWh increase	No change in 2018/19	\$9m increase	Benefits exceed costs
	15 years	\$275m reduction	-\$3	1,047 MWh increase	2 minute increase in 2028/29	\$47m increase	Benefits exceed costs
2: Large reduction in reliability	5 years	\$328m reduction	-\$3	1,197 MWh increase	5 minute increase in 2018/19	\$83m increase	Benefits exceed costs
	15 years	\$1,049m reduction	-\$12	8,802 MWh increase	13 minute increase in 2028/29	\$404m increase	Benefits exceed costs
3: Extreme reduction in reliability	5 years	\$453m reduction	-\$4	1,704 MWh increase	7 minute increase in 2018/19	\$120m increase	Benefits exceed costs
	15 years	\$1,321m reduction	-\$15	11,010 MWh increase	15 minute increase in 2028/29	\$516m increase	Benefits exceed costs
4: Improvement in reliability	5 years	\$495m increase	+\$5	1,764 MWh reduction	5 minute reduction in 2018/19	\$123m reduction	Costs exceed benefits
	15 years	\$1,011m increase	+\$11	6,120 MWh reduction	4 minute reduction in 2028/29	\$306m reduction	Costs exceed benefits

Note- Totals may not sum due to rounding

There were significant net benefits under all three of the scenarios for lower distribution reliability, as the modelled reduction in capital expenditure exceeded the value of the worsening in reliability. Using a significantly lower VCR, for instance the current Victorian VCR of \$57,880/MWh, would not change the overall results under our cost-benefit assessment.

In contrast, the scenario for improved reliability outcomes resulted in net costs, as the additional costs of improving reliability were greater than the customer value of this improved reliability.

The cost-benefit assessment for Scenario 1, which provides for a modest reduction in reliability, generally indicated that there were proportionally greater benefits compared to costs than in Scenarios 2 and 3, which provide for large and extreme reductions in reliability. In other words, the relative reduction in capital expenditure under Scenario 1 was higher than the relative value of the worsened reliability, compared to Scenarios 2 and 3. However, the overall value of the forecast reductions in capital expenditure are significantly higher in Scenarios 2 and 3 than Scenario 1.

Under a five year timeframe, the total reduction in capital expenditure in Scenario 1 is around thirteen times greater than the total value of the worsened reliability, while in Scenarios 2 and 3 the reduction in capital expenditure is around four times greater than the value of the worsened reliability. Under a fifteen year timeframe, the total reduction in capital expenditure is around six times greater than the value of the worsened reliability in Scenario 1, and around three times larger in Scenarios 2 and 3.

These results indicate that there appears to be a step change between Scenario 1 and Scenario 2 in the capital expenditure reductions and reliability impacts that are forecast. This is demonstrated in the figures below, which compare by scenario: changes in capital expenditure, changes in expected energy not served, and the change in the distribution reliability component of average NSW annual residential bills and the duration of supply interruptions .

The forecast changes in the distribution component of annual electricity bills is modest. For example, if the current licence conditions remain unchanged, in 2018/19 the distribution component of the average NSW annual residential electricity bill is estimated to be \$29, with the estimated change under our scenarios ranging from a reduction of \$1 under Scenario 1 to a reduction of \$5 in Scenario 3. This reflects the relatively small component that costs relating to distribution reliability comprise of overall distribution prices which, in turn, form one component of total retail electricity prices.

It should also be noted that our forecast retail price impacts does not take into account the prior capital expenditure that has been or will be spent by the NSW DNSPs to meet the existing licence conditions prior to 1 July 2014, as the we have only considered changes that may be made to the licence conditions and the resulting impact on capital expenditure from 1 July 2014 onwards.

As a significant amount of capital expenditure has already been either spent or committed to assets to meet the licence conditions, NSW consumers will be required to continue to pay for a return and depreciation on these assets until the end of their asset lives which may be 45 to 50 years. Changes to the licence conditions from 1 July 2014 will not have any impact on the need for NSW consumers to continue to fund the costs of these assets. However, where reliability outcomes are reduced, these assets could still be used to meet growth in demand.

Figure 5.48 Change in capital expenditure by scenario 2014/15 to 2028/29

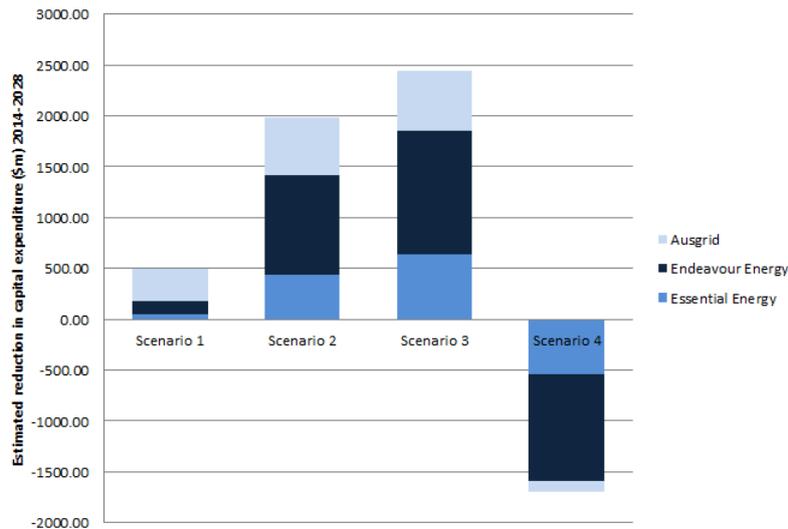


Figure 5.49 Change in expected energy not served by scenario 2014/15 to 2028/29

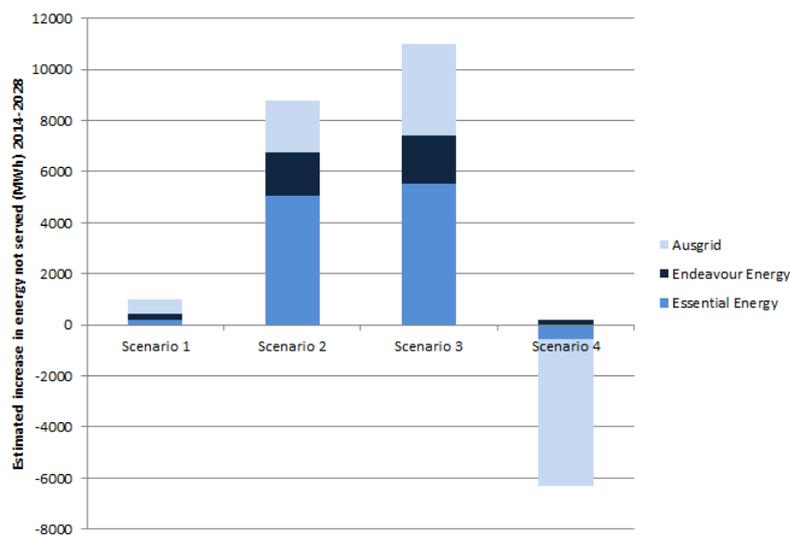


Figure 5.50 Comparison of the change in capital expenditure and expected energy not served by scenario: 2014/15 to 2028/29

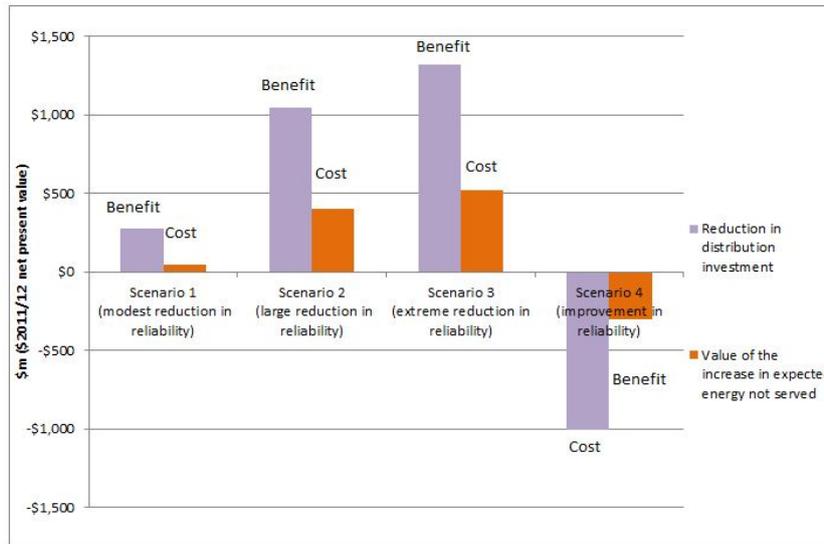


Figure 5.51 Trade off between cost and reliability by scenario: 2018/19

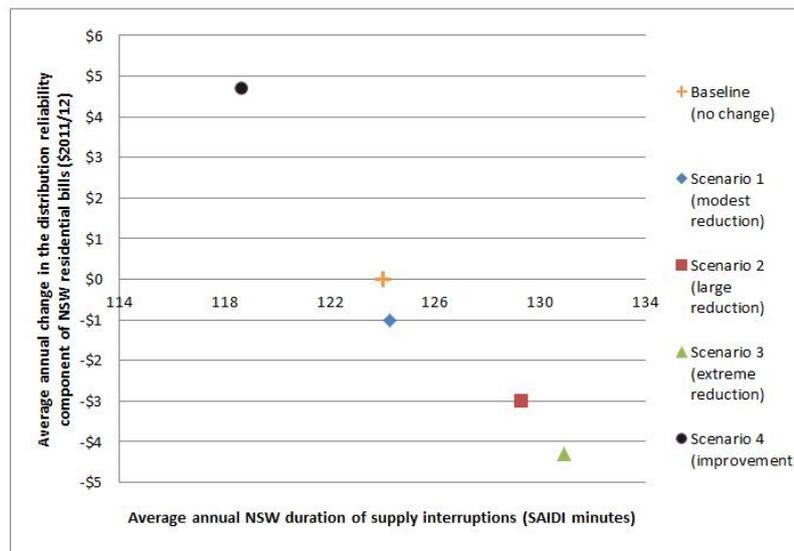
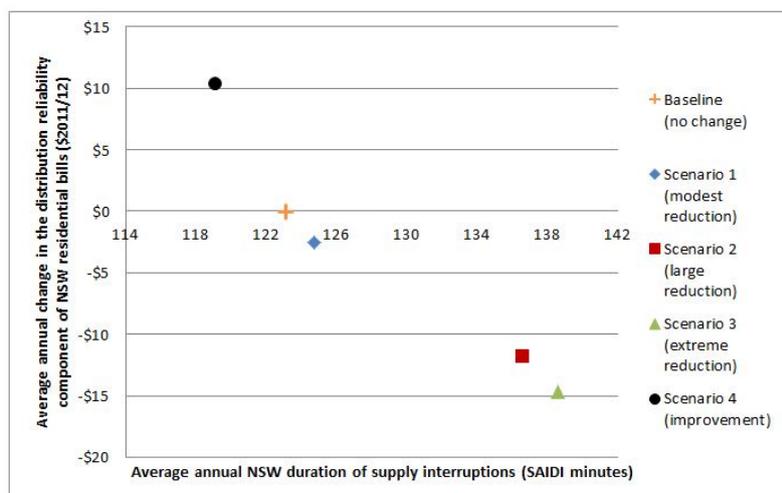


Figure 5.52 Trade off between cost and reliability by scenario: 2028/29



The majority of the changes in capital expenditure relating to distribution reliability and reliability impacts in Scenario 1 would be in Ausgrid's network. However, in Scenarios 2 and 3 most of the changes in capital expenditure relating to distribution reliability would be in Endeavour Energy's network, but the majority of the reliability impacts would be in Essential Energy's network.

In sections 5.5 and 5.6 above, we have set out the impact on capital expenditure and reliability that would occur under Scenarios 2 and 3, if there was no cap on the number of underperforming individual feeders on which work could be done. This change to Scenarios 2 and 3 has the most impact on Essential Energy's network, so only Essential Energy was requested to model this change. Under these amended scenarios, there are still overall net benefits across NSW for both Scenarios 2 and 3 over a five and fifteen year timeframe. These changes have also resulted in a significant reduction in both Essential Energy's overall share of the reduction in capital expenditure and the increase in expected energy not served.

Where the cap is removed under Scenario 2, over a five year timeframe the net present value of the reduction in capital expenditure is around 25 per cent lower compared to where the cap is in place, while the increase in expected energy not served is also around 25 per cent lower. Over a fifteen year timeframe, the net present value of the reduction in capital expenditure is around 15 per cent lower under Scenarios 2 without the cap, and the increase in expected energy not served is around 45 per cent lower.

A similar pattern is also seen under Scenario 3 where the cap on work on underperforming feeders is in place, although the change in expected energy not served is only around 30 per cent lower over a fifteen year timeframe compared to where the cap is in place.

This illustrates that the removal of the cap on work on underperforming feeders has a significant effect on the overall reductions in capital expenditure and increase in expected energy not served that may occur. However, even with this change which has only been modelled for Essential Energy's network, there would still be net benefits for NSW consumers from implementing Scenarios 2 and 3.

For Scenario 4, most of the forecast increase in capital expenditure would occur in Endeavour Energy's network, but most of the reliability improvements would be in Ausgrid's network.

Issues relating to the implementation of these four scenarios are set out in Chapter six. However, it is important to note that if any changes are made to the required level of distribution reliability in NSW, further analysis of the impacts of these changes on capital expenditure and reliability should be undertaken following their implementation. This is necessary to assess whether the expected impacts on capital expenditure and reliability have eventuated. The value of customer reliability may also vary over time, which may affect the balance between the costs and benefits of any new requirements for distribution reliability.

Additional analysis would assist in determining whether any further changes to the licence conditions are needed to ensure the potential benefits of any changes continue to exceed their potential costs.

6 Implementation considerations

Box 6.1: Summary box

- If the NSW Government decides to amend the licence conditions, the NSW Government should communicate its policy intent to all affected parties and make the required changes to the conditions as quickly as possible to enable the DNSPs to incorporate these changes in their regulatory proposals to the AER in May 2013 for their next distribution determination.
- The process for amending the distribution licence conditions in NSW is set out in the *Electricity Supply Act 1995* (NSW) and requires consultation with the Minister responsible for administering the *Protection of the Environment Administration Act 1991* (NSW) and the NSW DNSPs, before changes to the conditions can be made.
- Currently the capital and operating expenditure objectives in the NER allow DNSPs to seek the expenditure that they consider is required, amongst other things, to maintain historic levels of reliability from one regulatory control period to the next. The current NER provisions could compromise the impact of any amendments to the licence conditions. There is a risk that the DNSPs' expenditure forecasts, and therefore the prices paid by consumers, may not be reduced if the DNSPs' expenditure forecasts are based on maintaining historic levels of reliability, as opposed to meeting any new (lower) levels of reliability.
- To complement a lower level of distribution reliability under the licence conditions, a rule change request should be submitted to the AEMC to amend the capital and operating expenditure objectives in the National Electricity Rules (NER). This should be submitted as soon as possible, after the NSW Government has decided to amend the licence conditions.
- However, as the NSW DNSPs are state owned corporations, the NSW Government as shareholder of these corporations has a degree of control over how they are operated and the content of their regulatory proposals. This may allow the NSW Government to take additional steps to ensure their policy intent is implemented even if changes to the NER are not finalised before the DNSPs' regulatory proposals are submitted.

For example, if changes to the licence conditions and/or the NER are not finalised in time to allow these changes to be incorporated in the DNSPs' regulatory proposals, the NSW Government could take steps to ensure that the NSW DNSPs include an alternative set of expenditure forecasts in their regulatory proposals to reflect the future requirements if the NSW Government's policy intent has been communicated to them.

Provided that the necessary amendments are implemented before the AER

makes its draft determination, we consider that the AER should be able to take the alternative set of expenditure forecasts into account.

- Changes to the licence conditions may have implications for the performance targets that are set by the AER for the Service Target Performance Incentive Scheme for the NSW DNSPs. Changes could also be made to the incentive payments under this scheme to take into account the NSW VCR that has been developed.
- We have also set out a range of additional implementation considerations that could be explored further by the NSW Government relating to the NSW VCR and differences in network operation and reliability performance between the NSW DNSPs.

This Chapter sets out a range of implementation issues which would need to be considered if the NSW Government intends to amend the NSW distribution licence conditions. Some of the issues outlined in this Chapter could also be explored further, even if a decision is made not to change the conditions.

6.1 Interactions with the national workstream and the potential for broader changes to the NSW distribution reliability standards

Submissions on the draft report from the NSW DNSPs suggested that there was limited value in substantially amending aspects of the NSW distribution licence conditions due to the limited timeframe to finalise their regulatory proposals for the next regulatory control period and as the AEMC's national workstream may recommend that broader changes be made to the structure and expression of the NSW reliability standards.¹²¹

As discussed in Chapter 1, we are currently undertaking the national workstream of our Review of distribution reliability standards and outcomes. An issues paper on the national workstream was published for public consultation in late June 2012, and the next stage of the national workstream will be to publish a draft report which sets out our views on whether there is merit in a nationally consistent framework for distribution reliability outcomes in the NEM.¹²² This draft report is expected to be published in November 2012.

The publication of a draft report on whether there is merit in a nationally consistent framework remains at present the only defined next step for the national workstream. If we consider that there is merit in a nationally consistent framework, the SCER will consider our draft report and then decide whether it would like the AEMC to develop a best practice framework for distribution reliability that could be used as a reference

¹²¹ See submissions on the NSW workstream draft report from: Ausgrid, p. 5; Endeavour Energy, p.4; Essential Energy, p.5.

¹²² Further details on the national workstream, including a copy of the issues paper and submissions received on this paper, can be found on the AEMC website.

or voluntarily adopted by jurisdictional governments in the NEM.¹²³ The AEMC has not yet reached a view on whether there is merit in a nationally consistent framework. It is also possible that the AEMC may not be requested to develop a best practice framework.

Even if SCER requests the AEMC to develop a best practice framework, the timing of when this request may be made is uncertain. It is also possible that jurisdictional governments may choose not to adopt the AEMC's best practice framework or only adopt certain elements of it, as the adoption of any best practice framework that is developed is voluntary. The implementation of any changes to jurisdictional frameworks for distribution reliability would also require changes to jurisdictional legislation or Codes.

It should also be noted that the AEMC will not be recommending any changes to the *level* of distribution reliability standards in any jurisdiction as part of the national workstream, as the national workstream will only be considering the potential for changes to the *frameworks* for expressing, delivering and reporting on distribution reliability outcomes.

As a result, under the national workstream it is currently uncertain:

- whether the AEMC will conclude there is merit in a nationally consistent framework for distribution reliability;
- whether the AEMC will be requested to develop a best practice framework for distribution reliability in the NEM;
- if any changes would be made to jurisdictional frameworks for distribution reliability and the potential scope of these changes; and
- the timing of when any changes may be made to jurisdictional frameworks.

For these reasons, it is not possible to determine at this time whether broader changes to jurisdictional frameworks may be made as a result of the AEMC's national workstream.

As discussed in Chapter 2, submissions from the Major Energy Users, IPART, the Public Interest Advocacy Centre and AEMO suggested that reliability standards in NSW should be expressed on an outcomes basis.¹²⁴

AEMO has suggested that the adoption of a probabilistic approach in NSW over the remainder of the current NSW distribution regulatory control period (ie 2012/13 and 2013/14) could lead to up to a \$50 reduction in the average NSW customer's annual

¹²³ Ministerial Council on Energy, 2011, Australian Energy Market Commission Review of Distribution Reliability Standards- Terms of reference, p. 3.

¹²⁴ See submissions on the NSW workstream draft report from: Major Energy Users, p. 4; IPART, p. 2; the Public Interest Advocacy Centre, p.4; AEMO, p. 1.

electricity bill in 2015 with limited effects on current reliability levels.¹²⁵ This saving has been based on extrapolating analysis that AEMO has undertaken on two zone substation projects in Ausgrid's network, which it has assessed could be deferred for a number of years under a probabilistic approach.¹²⁶

Based on this analysis, AEMO has then extrapolated that Ausgrid would undertake no augmentation capital expenditure over 2012/13 and 2013/14 if a probabilistic approach was adopted, saving \$1 billion in capital expenditure which it suggested would then lead to up to a \$50 saving in the average NSW customer's annual electricity bill in 2015.¹²⁷ Under a probabilistic approach, investments are only undertaken where the value of the reduction in expected energy not served, which is derived using a VCR, is greater than the cost of undertaking the investment. However, it should be noted that AEMO has suggested that further work would be required to assess the likely impact on customer bills and reliability levels of the adoption of a probabilistic approach.¹²⁸ We also note that AEMO has not assessed any projects in Endeavour Energy's or Essential Energy's networks.

The Major Energy Users suggested that the NSW distribution licence conditions should be removed entirely, as the AER's STPIS should be sufficient to provide incentives to improve reliability performance.¹²⁹

Under SCER's timetable for the NSW workstream, the AEMC was not able to consider a "fundamental re-design" of the way in which distribution reliability standards in NSW are expressed.¹³⁰ As a result, broader changes to the current expression and structure of the NSW distribution reliability standards, which we consider would include a move to a completely outputs based approach or a probabilistic approach, could not be considered. We were also requested to only take into account the implementation of any changes to the NSW distribution reliability standards from the start of the next NSW distribution regulatory control period, which commences on 1 July 2014.¹³¹ Therefore, we have not assessed the impact of the implementation of any of our scenarios over the current and next financial year.

From the modelling undertaken by the NSW DNSPs for the NSW workstream, it has not been possible to assess the impact that a move to a completely outputs based or probabilistic based approach may have on reliability levels or capital expenditure. However, as discussed in Chapter 5, there are clear trade-offs between expenditure and reliability and therefore any significant reductions in capital expenditure are likely to result in lower reliability levels. We also consider that any move to an outputs based or probabilistic approach may take some time to implement in practice by the NSW

125 AEMO, Submission on the NSW workstream draft report, p. 1.

126 AEMO, Submission on the NSW workstream draft report, p. 8.

127 AEMO, Submission on the NSW workstream draft report, p. 3.

128 AEMO, Submission on the NSW workstream draft report, p. 1.

129 Major Energy Users, Submission to the NSW workstream draft report, p. 5.

130 SCER, Terms of reference- Review of distribution reliability standards and outcomes, p. 4.

131 Ibid.

DNSPs, as it would require substantial changes to the way they currently plan their networks and assess investment options.

6.2 Process for changes to the NSW distribution licence conditions

We have prepared marked up versions of the existing NSW distribution licence conditions for each of the four scenarios we have considered. The marked up versions of the licence conditions were provided to the NSW DNSPs to assist them in modelling the expenditure and reliability impacts of each scenario and to enable the NSW Government to implement the scenarios, should it decide to change the conditions. The marked up licence conditions preserve the existing structure of the conditions, as required under the MCE's terms of reference for the NSW workstream.¹³²

The NSW Government will determine whether changes to the existing licence conditions should be made after considering the AEMC's advice. Licence conditions can be amended by the NSW Energy Minister issuing varied licence conditions under the *Electricity Supply Act 1995* (NSW). Prior to varying licence conditions, the NSW Energy Minister is required to:

- consult with the Minister responsible for administering the *Protection of the Environment Administration Act 1991* (NSW);
- provide notice of the proposed changes to the NSW DNSPs and provide them with a reasonable opportunity to make submissions on the proposed changes; and
- give due consideration to any submissions which are made.¹³³

It is unclear how the NSW Government's recently announced merger of the NSW DNSPs will affect the current licence conditions, as limited details of the merger have been publicly released. As a result, the marked up versions of the licence conditions we have prepared have been based on the current structure which specify different requirements for each NSW DNSP.

The current licence conditions also apply in the components of Essential Energy's network in Queensland. As a result, it is anticipated that if any changes are made to the licence conditions, the amended conditions would also similarly apply across Essential Energy's entire network.

¹³² SCER, 2010, 'Terms of reference: Review of distribution reliability outcomes and standards', 30 August, pg. 4.

¹³³ Sections 7 and 9 of Schedule 2 of the *Electricity Supply Act 1995* (NSW).

6.3 Compliance timeframes for the scenarios for NSW distribution reliability

We understand that, if the licence conditions are amended by the NSW Government, the intention is that the amended conditions would apply from the beginning of the next NSW distribution regulatory control period on 1 July 2014.¹³⁴

A large amount of capital expenditure has been undertaken by the NSW DNSPs in the current regulatory control period to ensure they are reasonably compliant with the current licence conditions by 30 June 2014, as required under the existing conditions.¹³⁵ As a result, if the licence conditions are amended to adopt one of the scenarios for lower distribution reliability outcomes, the DNSPs would be able to comply immediately with the amended conditions.

However, it should be noted that:

- the amendment to the licence conditions would not reduce the significant amount of expenditure that has been and will be incurred prior to 1 July 2014, which has already largely been incorporated into the prices paid by customers; and
- it may take several years before significant changes in capital expenditure and reliability performance arising from the amendments to the licence conditions flow through to end use customers.

The estimated expenditure reductions would not result in customers' future electricity bills decreasing overall compared with current levels. Instead, the implementation of any of the scenarios for lower distribution reliability would only slow the rate of increase in bills.

In relation to the scenario for improved distribution reliability outcomes, we requested the NSW DNSPs provide advice on when they may achieve compliance under this scenario. The NSW DNSPs generally considered that they would be able to achieve compliance within one regulatory control period, that is by 30 June 2019 if the amended licence conditions began on 1 July 2014. We suggest the NSW Government provide the NSW DNSPs five years to transition to this higher level of reliability if this scenario is implemented. This transitional period has not been included in the current version of our marked up licence conditions and should be added if this scenario is adopted.

¹³⁴ MCE, 2010, 'Terms of reference: Review of distribution reliability outcomes and standards', 30 August, pg. 4.

¹³⁵ The NSW DNSPs are required to be "as compliant as reasonably practicable" with the design planning criteria in schedule 1 of the distribution licence conditions by 1 July 2014 and fully compliant by 1 July 2019. For the reliability standards in schedule 2 of the licence conditions, the NSW DNSPs have been required to be compliant with the current standards since 1 July 2010. For the individual feeder standards in schedule 3 of the licence conditions, the NSW DNSPs have been required to be compliant since 1 January 2008.

6.4 Interactions with the AER's NSW distribution determination process

If the NSW DNSPs are required to comply with new licence conditions, this would have implications for the AER's distribution determination process for the NSW DNSPs. These implications are discussed below.

6.4.1 Submission of NSW DNSP regulatory proposals for the next regulatory control period

The NSW DNSPs are required to submit their regulatory proposals to the AER for the next distribution regulatory control period by 31 May 2013, thirteen months prior to the end of the current regulatory control period on 30 June 2014.¹³⁶ Under the capital expenditure objectives and the operating expenditure objectives in the NER, DNSPs are required to include the total forecast expenditure they consider is necessary to comply with all applicable regulatory obligations or requirements over the next regulatory control period in their regulatory proposal.¹³⁷ This would include any capital and operating expenditure required to comply with the NSW distribution licence conditions.

If the NSW Government decides to amend the licence conditions, it should communicate its policy intent and make the required changes to the conditions as quickly as possible to enable the DNSPs to incorporate these changes in their regulatory proposals. Submissions from the NSW DNSPs have noted that they consider it would be difficult to incorporate substantial changes to the NSW licence conditions in their regulatory proposals, due to the long lead times needed to finalise their investment programs.¹³⁸

If changes to the licence conditions are not finalised before the NSW DNSPs are required to submit their regulatory proposal, the DNSPs could include an alternative set of expenditure forecasts in their proposals to reflect the future requirements, if the NSW Government's policy intent is clear. This would allow the AER to consider expenditure forecasts to meet the current conditions and the likely change in expenditure under the future conditions. We consider that this approach would allow the AER to take those changes into account when making its draft determination, provided that the licence condition amendments are implemented before that determination is made.

The NSW DNSPs are state owned corporations, which means that the NSW Government has a degree of control over how they are operated and the content of their regulatory proposals. The NSW Government could take steps to ensure that the DNSPs include these alternative forecasts in their regulatory proposals, for example, by issuing a direction requiring them to do so. There may also be other

¹³⁶ Clause 6.8.2(b)(1) of the NER.

¹³⁷ Clauses 6.5.6(a)(2) and 6.5.7(a)(2) of the NER.

¹³⁸ See submissions on the NSW workstream draft report from: Endeavour Energy, p. 4; Ausgrid, p. 4; Essential Energy, p. 5.

governance-related steps that the NSW Government could take to achieve a similar result.

Ausgrid has raised concern about whether an alternative expenditure forecast could be developed to the necessary standard.¹³⁹ However, Essential Energy has noted that there are regulatory mechanisms, such as the cost pass through provisions, which could be used if there was insufficient time to incorporate any changes to the licence conditions.¹⁴⁰

6.4.2 Interactions with the capital and operating expenditure objectives in the NER

As discussed above, DNSPs are required to include the total forecast expenditure in their regulatory proposal they consider is necessary to comply with the capital expenditure objectives and the operating expenditure objectives in the NER (capital and operating expenditure objectives).

The capital and operating expenditure objectives require DNSPs to include the total forecast expenditure in their regulatory proposals they consider is necessary for the next regulatory control period to:

- meet or manage the expected demand for standard control services;
- comply with all applicable regulatory obligations and requirements associated with the provision of standard control services;
- maintain the quality, reliability and security of supply of standard control services; and
- maintain the reliability, safety and security of the distribution system through the supply of standard control services.¹⁴¹

The AER is required to accept a DNSP's forecast expenditure where it is satisfied that the expenditure reasonably reflects the efficient, prudent and realistic costs of achieving the capital and operating expenditure objectives.¹⁴²

A summary of the assessment process for capital and operating expenditure under the distribution determination process is set out in Figure 6.1 below.

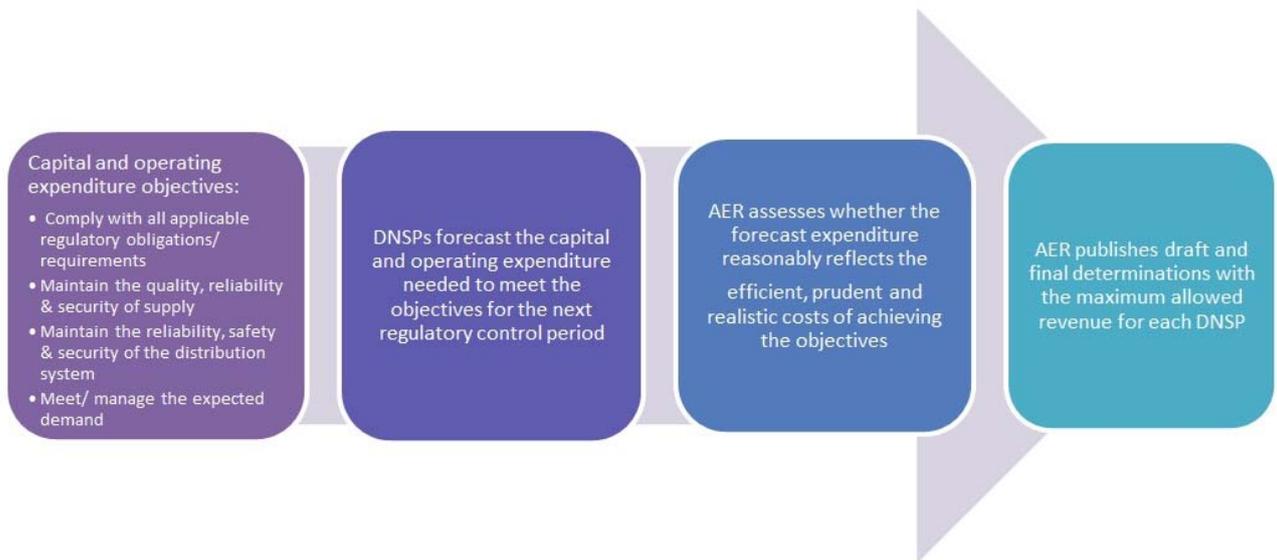
139 Ausgrid, Submission on the NSW workstream draft report, p. 4.

140 Essential Energy, Submission on the NSW workstream draft report, p. 6.

141 Clauses 6.5.6(a) and 6.5.7(a) of the NER.

142 Clauses 6.5.6© and 6.5.7© of the NER.

Figure 6.1 Assessment process for capital and operating expenditure under the NER distribution determination process

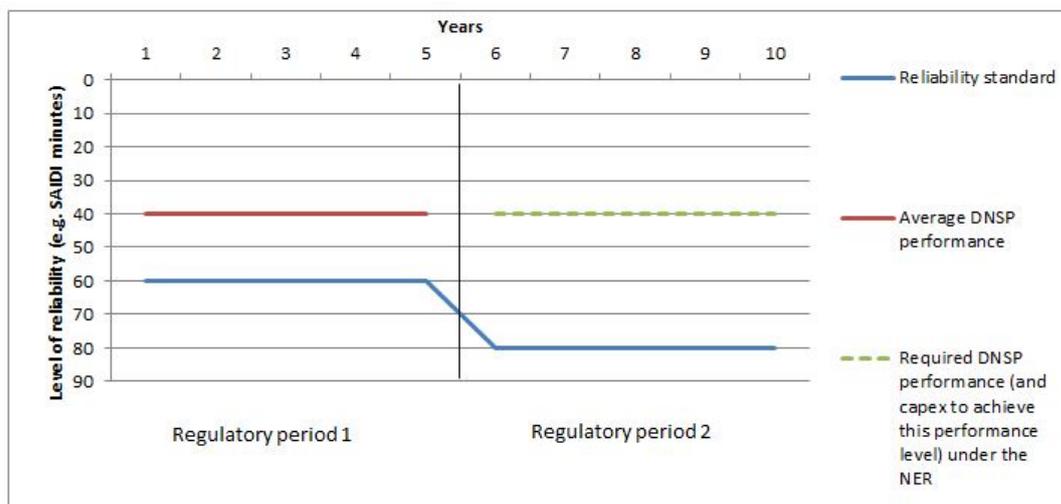


Under the current wording in the capital and operating expenditure objectives, the need to "maintain" the reliability of standard control services and the distribution system has implications where jurisdictional requirements are amended to require DNSPs to provide a lower level of reliability compared to the previous regulatory control period. The current wording in the NER would allow DNSPs to include the total expenditure they consider necessary to maintain the level of reliability they achieved in the previous regulatory control period, despite changes to the licence conditions to provide for lower reliability outcomes.

This interpretation of the NER reflects a strict application of the NER. In practice, the NSW DNSPs would be able to include an alternative set of expenditure forecasts in their regulatory proposals, if the NSW Government's policy intent regarding changes to the licence conditions has been communicated and is expected to be implemented during the determination process.

Figure 6.2 below sets out an example of how a lowering in distribution reliability standards may affect the level of reliability that a DNSP would need to achieve in the following regulatory control period and the expenditure they consider is required to achieve this. In the example below the reliability standard changes from 60 SAIDI minutes to 80 minutes from the first regulatory period to the second. However, under the NER, the DNSP is still able to seek a level of expenditure it considers is required to maintain the same level of reliability that was provided in the first regulatory period, despite a change in Government policy

Figure 6.2 Example of the implications of a lowering of distribution reliability standards under the NER



Such an application of the NER would defeat the purpose of any change to the licence conditions arising from this review. Changes to the licence conditions would have been made with the express objective of reducing reliability levels and achieving a corresponding saving in expenditure. However, under the current capital and operating expenditures in the NER, if the DNSPs included sufficient expenditure to maintain existing levels of reliability in their regulatory proposals, the AER would be required to allow the DNSPs to recover this expenditure.

This issue may also arise even where no changes are made to the licence conditions. If a DNSP is significantly out-performing against the level of reliability it is currently required to provide under its licence conditions, the capital and operating expenditure objectives would require the DNSP to maintain that high level in future regulatory control periods even where a lower level of reliability (and lower level of expenditure) would be sufficient to comply with the licence conditions. This is because under the objectives a DNSPs can seek the expenditure it considers is necessary to "maintain" the level of reliability provided in the previous regulatory control period.

In Chapter 2, we noted that some of the NSW DNSPs are currently significantly out-performing against the reliability standards in schedule 2 of the licence conditions. Cost savings could potentially be achieved if the DNSPs reduced their current levels of expenditure and reliability to limit this over-compliance, even without any change to the licence conditions. However, that outcome may not be possible if the DNSPs continue to seek expenditure to maintain their current over-performance over the next regulatory control period.

Changes to the Rules necessary to address issues with the current capital and operating expenditure objectives

The intent of the current capital and operating expenditure objectives was identified by the AER as an issue in its *Economic Regulation of Network Service Providers rule change*

proposal, which is currently being considered by the AEMC.¹⁴³ We released a directions paper on this rule change proposal in March 2012, which asked for comment on this issue.¹⁴⁴

Submissions from the Energy Networks Association and the AER on the directions paper have supported changes to the NER to clarify the intent of the objectives, so that expenditure forecasts target compliance with mandated service and reliability standards rather than maintaining historic levels of reliability.¹⁴⁵ Jemena also supported clarifying the intent of the objectives, but noted that prudently incurred capital expenditure that is required to meet jurisdictional standards should not be stranded if those standards are later relaxed.¹⁴⁶

On further reflection, we consider that this issue should be resolved through a separate rule change process. Although this issue was raised by the AER in its rule change proposal, the AER did not propose any changes to the NER to address this issue through its proposal.

There is also merit in clarifying the intent of the capital and operating expenditure objectives as this issue may arise even if changes to the licence conditions are not made. There is also the potential that other jurisdictions may require their DNSPs to provide lower reliability outcomes in the future.

The AEMC's standard rule change process takes at least six months to be completed from the submission of a rule change proposal.¹⁴⁷ There is a risk that if a rule change request is submitted to clarify this issue that the AEMC's final determination on the request may not be published until after the NSW DNSPs have submitted their regulatory proposals in May 2013.

If this occurs, as discussed above in section 6.4.1, each DNSP could include an alternative set of expenditure forecasts in its proposal which reflect the expenditure required to meet the future licence conditions, if the NSW Government's policy intent is clear regarding its proposed changes to the licence conditions and the NER. As owner of the DNSPs, the NSW Government could take steps to ensure that they adopt this approach.

¹⁴³ AER, 2011, *Economic Regulation of transmission and distribution Network Service Providers rule change proposal*, September, pg. 33.

¹⁴⁴ AEMC, 2012, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, directions paper, AEMC, March, pg. 30.

¹⁴⁵ Energy Networks Association, Submission to AEMC directions paper: Economic regulation of transmission and distribution Network Service Providers rule change proposal, April, p. 24; AER, Submission to AEMC directions paper: Economic regulation of transmission and distribution Network Service Providers rule change proposal, April, p.17.

¹⁴⁶ Jemena, Submission to AEMC directions paper: Economic regulation of transmission and distribution Network Service Providers rule change proposal, April, p.14

¹⁴⁷ Note, this assumes the rule change proposal is not expedited or fast tracked under sections 96 or 96A of the National Electricity Law.

It is likely that any changes to the NER would be finalised in time for the AER to take these changes into account before it publishes its draft determination. This would allow the impact of any reductions in the required level of distribution reliability and associated expenditure changes to be passed through to consumers from the beginning of the next regulatory control period.

These issues mean that if the NSW Government wishes to amend the licence conditions to lower the required level of reliability and associated expenditure by the DNSPs, and be certain that those amended conditions would apply for the next regulatory control period, it should:

- amend the licence conditions as soon as possible, or at least clearly communicate its policy intent, so that the NSW DNSPs have sufficient time to account for these changes in their regulatory proposals; and
- submit a rule change request to the AEMC in relation to the capital and operating expenditure objectives as soon as possible once it has decided to amend the licence conditions.

6.4.3 Service Target Performance Incentive Scheme

NSW DNSPs are expected to be subject to the Service Target Performance Incentive Scheme (STPIS) from the beginning of the next regulatory control period. The scheme is intended to provide NSW DNSPs with a financial incentive to improve their reliability performance relative to the previous regulatory control period. Where DNSPs do not meet their STPIS targets they may be subject to financial penalties.

The section below sets out some potential implications for the application of the STPIS for the NSW DNSPs. Some of these implications may only arise where the licence conditions are amended, but others may still be relevant even without changes to the conditions.

NSW performance targets for the next regulatory control period

Under the STPIS, performance targets for the NSW DNSPs are likely to be set for the average duration and frequency of unplanned supply interruptions (SAIDI and SAIFI), and average frequency of momentary interruptions of one minute or less (Momentary Average Interruption Frequency Index or MAIFI).¹⁴⁸ Performance targets are generally based on the average performance of the DNSP over the previous five regulatory years.¹⁴⁹ However, performance targets may be modified by a number of factors, including any factors that are expected to "materially affect" reliability performance.¹⁵⁰

¹⁴⁸ The AER's STPIS currently includes reliability of supply parameters for unplanned SAIDI, SAIFI and MAIFI. The STPIS indicates that each of these parameters will apply to DNSPs except where the AER determines otherwise in its distribution determination for a DNSP.

¹⁴⁹ Clause 3.2.1(a) of the AER's Service target performance incentive scheme.

¹⁵⁰ Clause 3.2.1(a)(2) of the AER's Service target performance incentive scheme.

If the NSW Government decides to implement lower distribution reliability outcomes for the next regulatory control period, it may not be appropriate to set STPIS performance targets for the NSW DNSPs based on the average reliability performance of the current period, as the targets may be set too high. This could result in DNSPs falling short of the performance targets and being required to pay financial penalties, despite complying with the amended licence conditions.

Potentially, this issue could be accommodated under the existing scheme as changes to the licence conditions could be considered as a factor which would "materially affect" reliability performance. However, if the AER considers it is not able to set lower performance targets compared to historic performance levels under the STPIS, the AER is able to amend the STPIS under the distribution consultation procedures in the NER.¹⁵¹

In its submission to the draft report, Endeavour Energy has raised concern about the use of modelling it has undertaken for the AEMC's review in setting future STPIS targets. We agree that further work should be undertaken by the AER to determine appropriate STPIS targets for the next regulatory control period if the NSW Government decides to lower the NSW distribution reliability standards.¹⁵² In addition, as noted by Endeavour Energy, the setting of STPIS targets will be set through the distribution determination process, and each DNSP will have an opportunity to outline how it considers the STPIS should apply to it as part of its regulatory proposal.¹⁵³

If the NSW Government decides to implement higher distribution reliability outcomes for the next regulatory control period, the NSW DNSPs are more likely to outperform STPIS performance targets where they are based on the average performance for the current period. This may result in DNSPs receiving financial rewards for their improved performance, where the cause of this improvement has been (at least in part) an increase in expenditure to meet the amended conditions rather than any additional actions by the DNSPs.

If this occurs, it may be appropriate for the AER to set higher performance targets than the five year average to take into account the performance benefits from the need to meet higher reliability outcomes. This issue appears to be acknowledged in the STPIS, which indicates the AER would take into account any planned reliability improvements in setting performance targets where the improvements are included in the DNSP's proposed expenditure program and these improvements are expected to be material.¹⁵⁴

¹⁵¹ The distribution consultation procedures are set out in Part G of Chapter 6 of the NER.

¹⁵² Endeavour Energy, Submission on the NSW workstream draft report, p. 2.

¹⁵³ Ibid.

¹⁵⁴ Clause 3.2.1(a)(1A) of the AER's Service target performance incentive scheme.

Incentive payments

Under the STPIS incentive payments for the STPIS are currently based on AEMO's Victorian VCR. The values which are currently used are \$95,700/MWh for the CBD and \$47,850/MWh for other areas.¹⁵⁵ The VCR is used to quantify the value of supply interruptions, which is then used in determining the level of financial reward or penalty for each DNSP. These values were set in September 2008, so need to be inflated by the Consumer Price Index (CPI) from September 2008 to the start of the relevant regulatory control period.¹⁵⁶

The AER is currently using the Victorian VCR as no other Australian VCRs currently exist. However, as the AEMC has developed a NSW VCR through this review, we suggest that it may be more appropriate for the AER to apply the NSW VCR we have developed in setting incentive rates for NSW DNSPs under the STPIS. This would allow the incentive rates to more accurately reflect the value placed on reliability by NSW customers. We have also developed separate VCRs for each NSW DNSP which could be used to provide an even closer relationship between incentive payments and the value of customer reliability in each DNSP's network.

The AER can apply different incentive rates to those set out in its STPIS by making a decision to do so in its distribution determination.¹⁵⁷ However, if the AER wanted to use the NSW VCR in setting incentive rates on an ongoing basis for other DNSPs, it could amend the STPIS under the distribution consultation procedures in the NER.¹⁵⁸ For example, it may be appropriate to use an average of the Victorian and NSW VCRs in other jurisdictions rather than relying solely on the Victorian VCR.

In its submission to the draft report, the AER noted that it would take into account the AEMC's NSW VCR values in the STPIS in the future, where these VCR rates are shown to be more reflective of VCR rates across the NEM.¹⁵⁹

6.5 Additional implementation considerations

This section sets out a range of additional implementation considerations which could be explored further by the NSW Government. A number of these considerations could still be examined by the NSW Government even where no changes are made to the licence conditions.

6.5.1 Updates to the NSW VCR

A NSW VCR has been developed for the NSW workstream to assess the value placed on reliability by NSW consumers. However, we understand that there is the potential

¹⁵⁵ Clause 3.2.2(b) of the AER's Service target performance incentive scheme.

¹⁵⁶ Ibid.

¹⁵⁷ Clause 3.2.2(a) of the AER's Service target performance incentive scheme.

¹⁵⁸ The distribution consultation procedures are set out in Part G of Chapter 6 of the NER.

¹⁵⁹ AER, Submission to the NSW workstream draft report, p. 1.

for the NSW VCR to be used more broadly beyond the AEMC's review. As discussed above, it could be used by the AER in setting incentive payments under the STPIS for NSW DNSPs or other DNSPs. It could also be used by NSW DNSPs or other DNSPs in undertaking cost/benefit assessments of potential projects, particularly once the Regulatory Investment Test for Distribution is implemented.¹⁶⁰

To ensure the NSW VCR remains relevant and reflective of the customer value placed on distribution reliability in NSW, it needs to be regularly updated and also indexed each year. In its submission to the draft report, Ausgrid noted that future reliability needs may become greater as NSW moves towards a knowledge based economy.¹⁶¹ AEMO has recently recommended that VCRs be indexed using the CPI and surveys should only be repeated once there is general stakeholder consensus that the VCR should be updated.¹⁶² However, historically, AEMO (formerly VenCorp) has undertaken surveys every five years to update the Victorian VCR.

We suggest the NSW Government consider whether there is merit in indexing and updating the NSW VCR over time. We also note that AEMO will commence work in late 2012 to develop more region specific VCRs, which may provide an opportunity to consider further how VCRs may be indexed and updated into the future.¹⁶³ As part of the national workstream, we will be further considering how best to calculate the willingness of customers to pay for reliability.

6.5.2 Differences in network operation and reliability performance between the NSW DNSPs

As discussed in chapters 3 and 5, the NSW DNSPs were requested to model the expenditure and reliability impacts of the four scenarios for distribution reliability outcomes we considered. During this process we held a number of discussions with each of the three NSW DNSPs to discuss how they currently plan their network.

These discussions and the modelling the DNSPs provided revealed significant differences between how each of the DNSPs both interpreted the current licence conditions and operated their networks. These discussions and the recent reliability performance information in Chapter 2 also indicated that the DNSPs are currently targeting and achieving significantly different reliability outcomes for customers, and in some cases are significantly out-performing the current licence condition requirements.

¹⁶⁰ The AEMC is currently considering the *Distribution Network Planning and Expansion Framework rule change proposal* by the MCE, which includes a proposal to implement a Regulatory Investment Test for Distribution. Further details on this rule change proposal can be found on the AEMC website at: <http://www.aemc.gov.au/Electricity/Rule-changes/Open/distribution-network-planning-and-expansion-framework.html>

¹⁶¹ Ausgrid, Submission to the NSW workstream draft report, p. 3.

¹⁶² AEMO, 2011, 'Value of customer reliability', Issues paper, June, pg. 20.

¹⁶³ AEMO, Submission to the NSW workstream draft report, p. 5

While it is expected there would be some differences between the planning and operational processes used by the three DNSPs and their reliability performance, the differences that emerged were large. For instance, as discussed in Chapter 2 while the current licence conditions require the NSW DNSPs to achieve 100 per cent compliance with the average SAIDI and SAIFI targets in schedule 2 each year, only Endeavour Energy appears to be seeking to achieve 100 per cent compliance.¹⁶⁴ In comparison, during the AER's distribution determination process for the current regulatory control period, Ausgrid suggested it was seeking to achieve a 95 per cent probability of compliance, while Essential Energy was seeking to achieve an 80 per cent probability of compliance.¹⁶⁵ The AER considered that the NSW DNSPs had targeted appropriate levels of compliance, given the costs and benefits of the alternatives.¹⁶⁶

Actual reliability performance has generally reflected the difference in compliance targets between the NSW DNSPs. For instance, the current SAIDI target for short rural feeders in schedule 2 of the licence conditions for all three NSW DNSPs is 300 minutes a year. The NSW DNSPs were all below this target for 2010/11, but Endeavour Energy's SAIDI performance was 149 minutes, Ausgrid's was 235 minutes, and Essential Energy's was 245 minutes.¹⁶⁷ From discussions we have held with Endeavour Energy we also understand that it is continuing to seek to improve its reliability performance, despite currently significantly exceeding the reliability standards in schedule 2 of the licence conditions.

Endeavour Energy noted that its performance is as much due to its improvement in asset management practices, as it is its level of capital expenditure.¹⁶⁸ It also suggested that a significant proportion of its improvement in network reliability is due to the connection of new customers to new and inherently more reliable sections of its network.¹⁶⁹

Essential Energy indicated that as it has performed better than expected against the reliability standards in Schedule 2 of the licence conditions, it has ceased specific investment to comply with Schedule 2.¹⁷⁰ Ausgrid observed that prior to the introduction of the licence conditions in 2005, the performance of the NSW DNSPs was already improving, and that all three DNSPs have introduced more accurate reporting systems to correct both over and under reporting.¹⁷¹

Some of the DNSPs also appear to apply design planning criteria that exceed the requirements of schedule 1 of the licence conditions, as they consider that higher levels

164 AER, 2008, *New South Wales draft distribution determination 2009-10 to 2013-14*, November, pg. 144.

165 Ibid.

166 Ibid.

167 Source: Endeavour Energy, *Electricity Network Performance Report 2010-2011*; Ausgrid, *Electricity Network Performance Report 2010-2011*; Country Energy, *Electricity Network Performance Report 2010-2011*.

168 Endeavour Energy, *Submission to the NSW workstream draft report*, p. 4.

169 Ibid.

170 Essential Energy, *Submission to the NSW workstream draft report*, p. 6.

171 Ausgrid, *Submission to the NSW workstream draft report*, p. 5.

of reliability are prudent and necessary to deliver acceptable levels of customer service. For example, from discussions we have had with Essential Energy we understand that it provides a -1 level of redundancy for zone substations where the customer load exceeds 5MVA, despite the licence conditions only requiring a -1 level of redundancy for loads which are larger than 15MVA.¹⁷²

In its submission to the draft report, Essential Energy noted that it provides a higher level of redundancy to some smaller remote towns, beyond that required in its licence conditions, as in the event of a transformer failure it could take several days to reconnect customers.¹⁷³

These differences in the approaches used by the NSW DNSPs to meet the existing licence conditions may be due to a range of factors, such as corporate culture, the incentives created within that culture, and local conditions. These differences have the potential to affect the reliability outcomes and expenditure of the NSW DNSPs. This in turn would affect the reliability outcomes and the electricity prices paid by end users.

While the AEMC has not been able to investigate these issues further through this review, we consider that these issues could be further explored by the NSW Government to obtain a fuller understanding of how distribution reliability outcomes in NSW are currently being provided.

Differences in approach between the NSW DNSPs may also affect the AER's consideration of whether the forecast expenditure by the DNSPs is required to comply with the distribution licence conditions and achieve the capital and operating expenditure objectives in the NER.

¹⁷² Under clause 14.5 of the licence conditions, Essential Energy's zone substations have a 15 MVA threshold for a -1 level of redundancy, while a 10 MVA threshold applies for Ausgrid and Endeavour Energy.

¹⁷³ Essential Energy, Submission to the NSW workstream draft report, p. 6.

Abbreviations

AEMC)	Australian Energy Market Commission
AEMO's	Australian Energy Market Operator's
CBD	Central Business District
CPI	Consumer Price Index
DNSPs	distribution network service providers
IPART	Independent Pricing and Regulatory Authority
MCE	Ministerial Council on Energy
MVA	megavolt amperes
NEM	National Electricity Market
NMI	National Meter Identifier
POE	probability of exceedance
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
STPIS	Service Target Performance Incentive Scheme
VCR	value of customer reliability

A Detail on the AEMC's scenarios for NSW distribution reliability

This appendix provides further detail on the scenarios for distribution reliability in NSW that were developed by Nuttall Consulting and the AEMC and modelled by the NSW DNSPs. Further detail on the scenarios and the expenditure and reliability impacts that were modelled for each scenario can be found in chapter 5 and Nuttall Consulting's consultant report.

A.1 Proposed changes to schedule 1 of the licence conditions: Design planning criteria

This section sets out the proposed changes to schedule 1 for each scenario in relation to the Sydney CBD, urban and non urban loads.

Figure A.1 Proposed changes for Sydney CBD loads

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
Sub-transmission (including zone substations)	Worst case security level	N-2	No change	No change	N-1	No change
	N-2 load at risk	None	0.5% of time or no greater than 40 MVA of forecast demand	1% of time or no greater than 50 MVA of forecast demand	Not applicable	No change
Distribution feeders and substations	N-1 load at risk	None	0.5% of time (no forecast demand limit)	1% of time (no forecast demand limit)	2% of time (no forecast demand limit)	No change
All network types	forecast demand definition	50% PoE peak demand forecast	No change	No change	No change	10% PoE peak demand forecast

Figure A.2 Proposed changes for urban loads

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
Sub-transmission substations and UG lines	N-1 load at risk	None	0.5% of time or no greater than 40 MVA of forecast demand	1.5% of time or no greater than 50 MVA of forecast demand	2% of time (no forecast demand limit)	No change
Sub-transmission OH lines and zone substations	N-1 load at risk	1% time or 20% above thermal capacity	No change	1.5% of time or no greater than 50 MVA of	2% of time (no forecast demand limit)	No change

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
				forecast demand		
Sub-transmission substations, OH and UG lines and zone substations	N load at risk	Thermal capacity at 115% of forecast demand	Thermal capacity to meet 10% PoE forecast peak demand, but capped at 115% of the 50% PoE maximum demand	Thermal capacity to meet 10% PoE forecast peak demand, but capped at 115% of the 50% PoE maximum demand	Thermal capacity at 100% of forecast demand	No change
	Categorisation defining when the N-1 security level is applicable for urban and non-urban sub-transmission and zone substation network types	10 MVA break point for sub-transmission lines and zone substations (15 MVA break point for Essential Energy). Sub-transmission substations are all N-1	No change	15 MVA (for all asset types) No distinction for Essential Energy	20 MVA (for all asset types) No distinction for Essential Energy	No change
Distribution feeders	N-1 load at risk	None	0.5% of time (no forecast demand limit)	1% of time (no forecast demand limit)	2% of time (no forecast demand limit)	No change
	N load at risk (footnote 4)	Expected demand no more than 80% (2014) and 75% (2019)	Remove 75% for 2019	Remove clause	Remove clause	No change
All network types	forecast demand definition	50% PoE peak demand forecast	No change	No change	No change	10% PoE peak demand forecast

Figure A.3 Proposed changes for non urban loads

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
Sub-transmission substations	Security level for sub-transmission substations	N-1 for all sub-transmission substations	No change	Sub-transmission substations with demand below urban break-point given N security level	Sub-transmission substations with demand below urban break-point given N security level	No change
All sub-transmission and zone substation	N load at risk	Thermal capacity at 115% of forecast demand	Thermal capacity to meet 10% PoE forecast peak demand, but	Thermal capacity to meet 10% PoE forecast peak demand, but capped at 115% of the 50% PoE maximum	Thermal capacity at 100% of forecast demand	No change

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
			capped at 115% of the 50% PoE maximum demand	demand		
All network types	forecast demand definition	50% PoE peak demand forecast	No change	No change	No change	10% PoE peak demand forecast

A.2 Proposed changes to schedule 2 of the licence conditions: Reliability standards

This section sets out proposed changes to schedule 2 of the licence conditions for each scenario. These changes include applying confidence intervals to the achievement of the existing reliability standards, rather than amending the values of the actual standards.

Figure A.4 Proposed changes to the reliability standards

Change	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Confidence not exceeded	75%	50%	50%	99%

A.3 Proposed changes to schedule 3 of the licence conditions: Individual feeder standards

This section sets out proposed changes to schedule 3 of the licence conditions for each scenario. These changes include amending the values in the individual feeder standards and imposing a limit on the number of underperforming feeders that can be worked on each year.

Figure A.5 Proposed changes to the individual feeder standards

Change	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Percentage increase in standards	No change	10%	20%	-10%
Limit (as percentage of the total number of feeders)	4%	2%	1%	10%

B Summary of submissions on the NSW workstream draft report

This appendix sets out a summary of the issues raised in submissions on the NSW workstream draft report and the AEMC's response to the issues raised.

Table B.1 Summary of submissions on NSW workstream draft report

Issue raised	Stakeholder	AEMC response
Chapter 2: Current framework for NSW distribution reliability and recent performance		
<p>Greater attention is needed to fix the less reliable elements of the networks. It is inappropriate for reliability standards to be set independently of the costs associated with achieving them. The Commission should have related the actual performance of the NSW DNSPs to the amount of capital and operating expenditure they have used over the current regulatory control period.</p>	<p>Major Energy Users, pp. 7-9.</p>	<p>The NSW distribution licence conditions currently include minimum SAIDI and SAIFI standards for individual feeders in Schedule 3, which seek to improve the performance of the worst performing areas in NSW. The setting of distribution reliability standards continue to remain a jurisdictional responsibility, while the determination of network revenues is the responsibility of the AER.</p> <p>The consideration of current and historical expenditure on distribution reliability and reliability performance is outside the scope of the SCER's terms of reference for the NSW workstream, as the Commission was requested to consider the costs and benefits of future changes to distribution reliability in NSW from the start of the next regulatory control period.</p>
Chapter 3: Methodology- Scenario modelling		
<p>The cap on the number of non-compliant feeders under Schedule 3 of the licence conditions should be removed, as it would result in lower reliability for customers on rural feeders in the worst served areas of Essential Energy's network and lead to a large amount of catch up expenditure in the long to medium</p>	<p>Essential Energy, p. 3.</p>	<p>Essential Energy has forecast that there would be a significant increase in expected energy not served on the rural feeders in its network under Scenarios 2 and 3. As a result, we have included additional analysis on the reliability and capital investment impacts that may occur in Essential Energy's network where the cap on work that can be done on</p>

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term when the performance of these feeders deteriorates.		underperforming feeders in Schedule 3 is removed for Scenarios 2 and 3.
The costs and benefits of scenarios with significantly larger reductions in reliability should be examined.	Public Interest Advocacy Centre, p. 5.	Due to the timeframe for the AEMC's final report on the NSW workstream, we have been unable to examine any further scenarios with larger reductions in reliability.
Chapter 3: Methodology- VCR survey		
Supports the study of consumer willingness to pay for reliability, as it is important that consumers make the decision on what level of reliability they are prepared to fund.	AER, p. 1	We agree that the willingness of customers to pay should be considered in setting distribution reliability standards.
A range of VCR values could be used due to the diversity of results between customer classes.	St Kitts Associates, pp. 3-4; Major Energy Users, pp. 10-11.	As the use of different NSW VCR values was unlikely to alter the results of our cost-benefit assessment, we have not undertaken any further sensitivities using a range of VCR values.
The customer survey does not appear to include any estimate of the loss of convenience or other non-monetary benefit, which means the NSW VCR values are likely to be underestimated.	Endeavour Energy, p. 2.	AEMO's VCR survey methodology does not seek to quantify non-monetary impacts. However, by asking respondents to consider the cost of an outage at the worst possible time, the survey results are likely to be by nature on the higher end of a customer's value of reliability.
An 'agent' based simulation methodology could be used to better reflect the diversity of customer needs,. As the NSW economy moves towards a global knowledge based economy future reliability needs may be greater than present, which may warrant a more strategic insight into the VCR.	Ausgrid, p. 2.	Willingness to pay and the VCR remain difficult concepts to quantify and there appears to be no universally accepted methodology to assess them. Under the timeframe for NSW workstream, we were unable to develop, test and run a survey which used an untried methodology. However, as part of the national workstream we will further consider how best to estimate the willingness of customers to pay and accept different distribution reliability outcomes.
The NSW VCR should be weighted by the number of account holders for each customer type rather than by consumption.	Public Interest Advocacy Centre, pp.	We have weighted the NSW VCR by consumption for each customer type as this is consistent with the methodology used for the Victorian VCRs. This allows for greater consistency in the VCRs that have been

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	5-7.	developed.
Electricity customers are risk adverse and are therefore willing to insure against high impact, low probability events. NSW customers may be willing to pay an 'insurance premium' if it minimises the risk of a widespread outage even where such events may be unlikely.	TransGrid, pp. 4-5.	The AEMC's final report sets out the costs and benefits of the four scenarios we considered, based on an extensive survey of NSW consumers and modelling undertaken by the NSW DNSPs. The NSW Government will consider this information and determine whether any changes to the NSW distribution licence conditions are required.
Supports the used of the VCR in distribution reliability planning, but considers that further investigation of the NSW VCR results is required. AEMO will commence work in late 2012 to develop more regional-specific VCRs.	AEMO, pp. 5-6.	It is difficult to assess the reasons for the differences in VCR values between the NSW VCR survey and the 2007 Victorian VCR survey. However, we note that with each VCR survey that has been undertaken, which has generally occurred every five years, there has been an increase of around 60% in the VCR. We will further consider how best to assess the willingness of customers to pay in the national workstream. We also welcome further work by AEMO to develop more regional-specific VCRs.
Chapter 3: Methodology- Cost benefit assessment		
Supports the use of economic benefit-cost analysis when balancing cost and reliability, but notes that differences in customer preferences and network costs across jurisdictions may lead to differences in optimum reliability levels. Notes that studies in the Australian Capital Territory suggest that customers may be willing to pay more for improved reliability.	ActewAGL, p. 1	We agree that there are likely to be differences in customer preferences and network costs across jurisdictions. This highlights the importance of surveying customers in each region to assess customer preferences.
Suggests that greater analysis of SAIFI rather than SAIDI is warranted based on the results of the customer survey.	St Kitts Associates, p. 5	We requested the NSW DNSPs to model the impact on SAIFI that may occur under each of our scenarios. While Essential Energy was able to model SAIFI impacts, Endeavour Energy and Ausgrid suggested that they were unable to model SAIFI under the timeframes for the NSW workstream. As we did not have complete SAIFI forecasts for all of the NSW DNSPs, we have not included this modelling in our report.

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Agrees that the current weighted average cost of capital for the NSW DNSPs should be used to determine net present values of capital expenditure and expected energy not served, but notes that in the next regulatory control period the weighted average cost of capital is likely to be lower due to prevailing financial conditions.	Endeavour Energy, p. 1; Essential Energy, p. 1.	Noted.
Further sensitivities should not be undertaken as further analysis is unlikely to change the AEMC's conclusions.	Endeavour Energy, p. 1; Essential Energy, pp. 1-2; Ausgrid, p. 3.	Agreed, we have not requested the NSW DNSPs to undertake any further modelling.
Suggests that the SAIDI graphs in Chapter 5 of the report appear to overstate Endeavour Energy's reliability performance, as they show the results from a theoretical model.	Endeavour Energy, p. 5.	We agree that there is the potential that the SAIDIs that were derived from each DNSP's modelled unserved energy may differ from the likely performance of each DNSP.
The AEMC's cost-benefit assessment suggests a level of precision that is not justified as there are a number of input parameters which are uncertain (eg the level of the NSW VCR and the consequences of changing the NSW reliability standards).	TransGrid, pp. 3-4.	We agree that there are a number of uncertainties in our cost-benefit assessment, particularly as our modelling period covers a fifteen year timeframe. As a result, we suggest that our cost-benefit assessment should be considered in terms of the overall balance of costs and benefits under each scenario, rather than as a definitive forecast of the change in capital investment and reliability impacts that may occur.
As a nominal discount rate was used in the draft report, the VCR estimate would decline in real terms over time.	TransGrid, pp. 5-6.	We agree that the discount rate should be expressed in the same way as the change in capital expenditure and the value of unserved energy. As a result, in the final report we have amended our cost-benefit assessment to use a real discount rate rather than a nominal discount rate, as the change in capital expenditure and the value of unserved energy are also expressed in real terms.
The Commission's approach to the cost-benefit assessment	TransGrid, pp.	We have discounted the impact of changes in capital expenditure and the

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may mean that the entire deferred cost of projects, such as Ausgrid's deferred \$200m Sydney CBD project in 2028/29, is counted as a benefit.	5-6.	value of the change in unserved energy over the modelling period. As a result, projects which are deferred in the later years of the modelling period will only have a limited impact on the net present value.
Sensitivities on the forecast capital expenditure for each scenario should be undertaken as historically network service providers have used less capital expenditure than is allowed in their regulatory determinations.	Major Energy Users, p. 16.	Using lower levels of capital expenditure in our cost-benefit assessment than those modelled by the NSW DNSPs would only increase the relative size of the benefits of reducing reliability outcomes in NSW compared to the costs of doing so. The results of the cost benefit assessment in our draft report suggested there were clear net benefits from reducing the level of distribution reliability in NSW, with the quantum of benefits significantly larger than the costs of doing so. As using lower levels of capital expenditure would not change the overall conclusions of our analysis we have not undertaken any further sensitivities of this kind.
Chapter 4: Customer survey results		
Disappointed that an approximate cost was not given for the preferences on network investment. Survey results are unsurprising when cost not a consideration, believe that results would be different where costs had been included in the survey as communication cost are expected to be minor when compared to other investment alternatives.	Essential Energy, pp. 2-3.	We did not include an estimate of the costs of each investment option as it would not have been possible to accurately determine the costs of undertaking each option. We also note that while the survey required each respondent to only select one investment preference, in practice the NSW DNSPs undertake a range of investments to address each of three investment options presented.
Would like to see more use of modern technology (eg SMS) to inform customers of outages, but suggests community consultation is required to ensure communication strategies are appropriate. Also notes that trade-offs between different kinds of investment options is not necessary.	Public Interest Advocacy Centre, pp. 7-8.	Noted, see comments above. We also note that a number of Victorian DNSPs are currently offering SMS services to their customers regarding outages, so there is the potential for similar initiatives to be undertaken by other DNSPs if considered appropriate and desired by the community.
Willingness to pay and accept results are likely to be understated as the survey did not seek information for amounts in excess of 2 per cent of a customer's annual electricity bill.	Endeavour Energy. p. 2.	We consider that this is possible, although it is difficult to determine how much higher the willingness to pay and accept results may have been if higher amounts had been included in the survey.
Those who are currently receiving high levels of reliability are	Major Energy	We agree that this may be likely, but note that our survey included a

Issue raised	Stakeholder	AEMC response
much less likely to be willing to pay more than those who are on feeders with poor reliability	Users, p. 11.	relatively representative distribution of survey respondents between the different NSW distribution networks and feeder types. This should ensure that our survey respondents reflect the range of service being experienced by NSW customers.
Chapter 5: Cost-benefit assessment of NSW distribution reliability scenarios		
Support the lowering of the reliability standards given the work undertaken by the AEMC.	IPART, p. 4	The cost-benefit assessment for the three scenarios we considered for lower reliability outcomes in NSW all indicated that there net benefits in reducing distribution reliability in NSW. The NSW Government will now consider the AEMC's analysis and determine whether any changes should be made to the NSW distribution licence conditions.
The relatively modest annual cost savings per customer from a reduction in reliability standards is likely to be due to the majority of expenditure to meet the higher standards already being committed. This should not be used as a reason for not adopting a revised standard, as reliability standards will have a longer term importance for future levels of network investment.	AER, pp. 1- 2	Noted, see comments above.
Questions whether the forecast impact on reliability could be considered disproportionate to the modelled cost savings under the lower reliability scenarios.	Endeavour Energy, p. 4.	Noted, see comments above.
Supports the alignment of the definition for a "major event day" in the NSW distribution licence conditions to the AER's definition of a major event day.	Ausgrid, p.4; Endeavour Energy, p. 3; Essential Energy, p.4.	We suggest that this should be considered by the NSW Government to minimise the reporting burden on the NSW DNSPs.
The modelled savings in capital expenditure are likely to be overstated, as demand is likely to be lower than forecast in the modelling.	Ausgrid, p. 5.	Noted. We also note that lower demand forecasts are likely to result in lower capital expenditure for both the baseline and each of the four scenarios that have been developed.

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Chapter 6: Implementation considerations		
<p>Recommends that reliability standards in NSW should be expressed on an outcomes basis and that lowering the reliability standards in NSW provides net benefits to society. Also notes that setting reliability standards too high may discourage competition and future innovation in services for customers.</p>	<p>IPART, p. 2</p>	<p>Under SCER's timetable and terms of reference for the NSW workstream, the AEMC was not able to consider a "fundamental re-design" of the way in which distribution reliability standards in NSW are expressed. As a result, we consider that we could not have considered a move to a completely outputs based approach.</p>
<p>The NSW distribution licence conditions should be removed in their entirety, as the AER's STPIS will provide incentives for reliability performance.</p>	<p>Major Energy Users, p. 4.</p>	<p>Noted, see comments above.</p>
<p>The AEMC should examine whether DNSPs could more cost effectively meet distribution reliability standards if these were expressed in a more outcomes based manner.</p>	<p>Public Interest Advocacy Centre, p. 4.</p>	<p>Noted, see comments above.</p>
<p>The adoption of a probabilistic approach in NSW over the remainder of the current NSW distribution regulatory control period (ie 2012/13 and 2013/14) could lead to up to a \$50 reduction in the average NSW customer's annual electricity bill in 2015 with limited effects on current reliability levels.</p>	<p>AEMO</p>	<p>As noted above, under the SCER's terms of reference, the AEMC was not able to consider a "fundamental re-design" of the way in which distribution reliability standards in NSW are expressed. From the modelling undertaken by the NSW DNSPs for the NSW workstream, it has not been possible to assess the impact that a move to a completely probabilistic based approach may have on reliability levels or capital expenditure. Under a probabilistic approach, investments are only undertaken where the value of the reduction in expected energy not served, which is derived using a VCR, is greater than the cost of undertaking the investment.</p> <p>We also consider that any move to a probabilistic approach may take some time to implement in practice by the NSW DNSPs, as it would require substantial changes to the way they currently plan their networks and assess investment options. We note that this estimate of up to \$50 a year in savings on customer bills was based on high level analysis and assumptions and that AEMO has suggested further work would be required to test its accuracy.</p>

Issue raised	Stakeholder	AEMC response
It is appropriate to maintain the existing expression and structure of distribution reliability obligations, as the outcomes of the AEMC's national review have not yet been determined and due to the need to finalise investment programs for regulatory proposals for the next NSW distribution regulatory control period.	Endeavour Energy, pp. 3-4; Essential Energy, p. 5; Ausgrid, pp. 4-5.	We have maintained the existing expression and structure of the NSW distribution licence conditions in our scenarios as the SCER's terms of reference the AEMC was not able to consider a "fundamental re-design" of the way in which distribution reliability standards in NSW are expressed. As the national workstream of the AEMC's review is yet to be finalised it is not possible to determine at this time whether broader changes to jurisdictional frameworks may be made as a result of the national workstream.
Does not support the development of a second set of expenditure forecasts for NSW distribution regulatory proposals to the AER if the NSW policy intent is unclear, given the time and expense involved in making amendments to a regulatory proposal.	Essential Energy, p. 5.	As discussed in Chapter 6, we have suggested that if the NSW Government decides to amend the distribution licence conditions, it should communicate its policy intent and make the required changes to the conditions as quickly as possible to enable the DNSPs to incorporate these changes in their regulatory proposals.
Current electricity customers are paying higher electricity prices as a direct consequence of NSW DNSPs outperforming against the existing reliability standards.	IPART, p. 2	As discussed in Chapter 6, some of the NSW DNSPs are outperforming against some aspects of the existing reliability standards. We have suggested that the NSW Government could further consider this issue to obtain a fuller understanding of how distribution reliability outcomes in NSW are currently being provided.
Endeavour Energy's improvement in reliability performance is likely to be related to the connection of new customers to new and inherently reliable sections of the network. Its performance is as much due to improved asset management practices as it is its capital expenditure.	Endeavour Energy, p. 4	We agree that differences in reliability performance may be due to a range of factors, such as corporate culture, the incentives created within that culture, and local conditions.
Essential Energy has performed better than expected under schedule 2 of the licence conditions, so has ceased specific investment to comply with this schedule. Essential Energy provides a higher level of redundancy than required in some smaller remote towns as if there is a transformer failure it could take several days to reconnect customers.	Essential Energy, p. 6.	Noted.

Issue raised	Stakeholder	AEMC response
Agrees that approaches used by the NSW DNSPs to meet the existing licence conditions are due to a range of historical and external factors that are outside the scope of the AEMC's review. Notes that prior to the introduction of the NSW distribution licence conditions DNSPs were responsible for determining their own level of reliability, and the NSW DNSPs have introduced more accurate reporting since 2005 which has corrected some over-reporting and under-reporting.	Ausgrid, p.5	Noted.
If the design planning criteria in Schedule 1 of the licence conditions are relaxed, this could reduce the time for planned outages which might result in the system becoming un-maintainable.	Ausgrid, p. 4.	Noted.
Supports the introduction of confidence intervals to meet the reliability standards in Schedule 2 of the licence conditions. Recommends the removal of Note 4 in Schedule 1 of the licence conditions, as it can lead to over-investment.	Ausgrid, p. 6.	In our three scenarios for lower distribution reliability outcomes in NSW, we have included confidence intervals in Schedule 2 and amended Note 4 in Schedule 1 to limit capital investment.
The modelling that Endeavour Energy has undertaken for the AEMC's review should not be used in setting future STPIS targets, due to the likely margin for error in its reliability forecasts.	Endeavour Energy, pp. 2-3.	We agree that further work should be undertaken by the AER to determine appropriate STPIS targets for the next regulatory control period if the NSW Government decides to lower the NSW distribution reliability standards.
To the extent that the NSW VCR rates are shown to be more reflective of VCR rates across the NEM, these rates will be reflected in the STPIS in the future.	AER, p.1	We suggest that the use of the NSW VCR values in setting incentive rates for NSW DNSPs under the STPIS may allow the incentive rates to more accurately reflect the value placed on reliability by NSW customers.
The AEMC should convene an Energy Affordability Forum to examine and develop advice on energy affordability.	Public Interest Advocacy Centre, p. 8.	Issues relating to energy affordability remain outside the scope of the SCER's terms of reference for the AEMC's review. However, we have considered the impact on residential electricity bills under each of our four scenarios. We have also included some questions in our customer survey to assess the impact that supply outages may have on low income

Issue raised	Stakeholder	AEMC response
		households.