REVIEW

Australian Energy Market Commission

DRAFT REPORT - NSW WORKSTREAM

Review of Distribution Reliability Outcomes and Standards

Commissioners
Pierce
Henderson
Spalding

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Draft Report - NSW workstream

Inquiries

Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

E: aemc@aemc.gov.au
T: (02) 8296 7800
F: (02) 8296 7899

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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 Ministerial Council on Energy. The AEMC has two principal functions. We make and amend the national electricity and gas rules, and we conduct independent reviews of the energy markets for the SCER.

Executive summary

This report sets out the Australian Energy Market Commission's draft advice on the costs and benefits of four alternative levels of distribution reliability in NSW, following a request for this advice from the Ministerial Council on Energy.

How we have developed our draft 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.[1]

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 outline 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 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 increase over time. There is also a significant step change in bill impacts

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

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

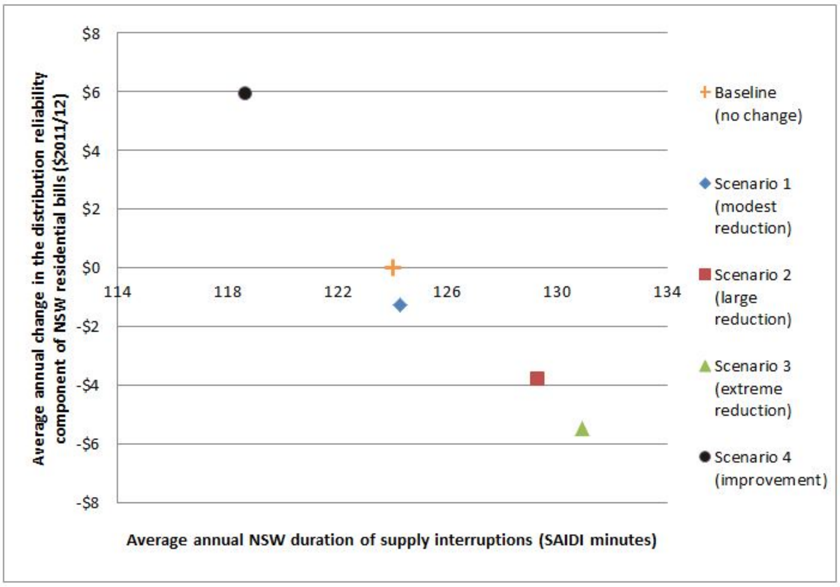
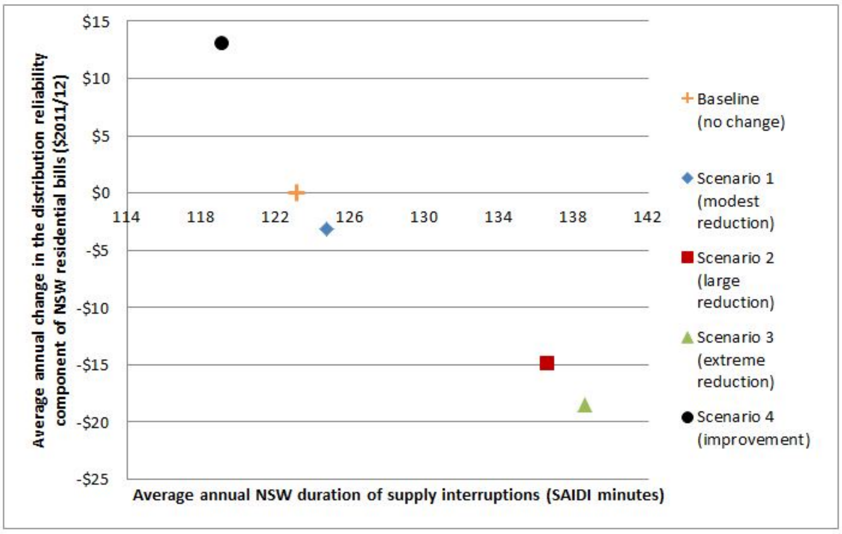


Figure 2 Trade-off between cost and reliability performance by scenario: 2028/29



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.[2]

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.

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;
- $15 a year under the scenario for a large reduction in reliability outcomes; and
- $18 a year under the scenario for an extreme reduction in reliability outcomes.

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;
- 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.

Under our scenario for improved reliability outcomes, in 2028/29 the average NSW consumer would pay around $13 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

[2] 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.

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.[3]

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 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.

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 that period are between $140 million under the modest reduction scenario to $530 million under the extreme reduction scenario.

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.

3 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.

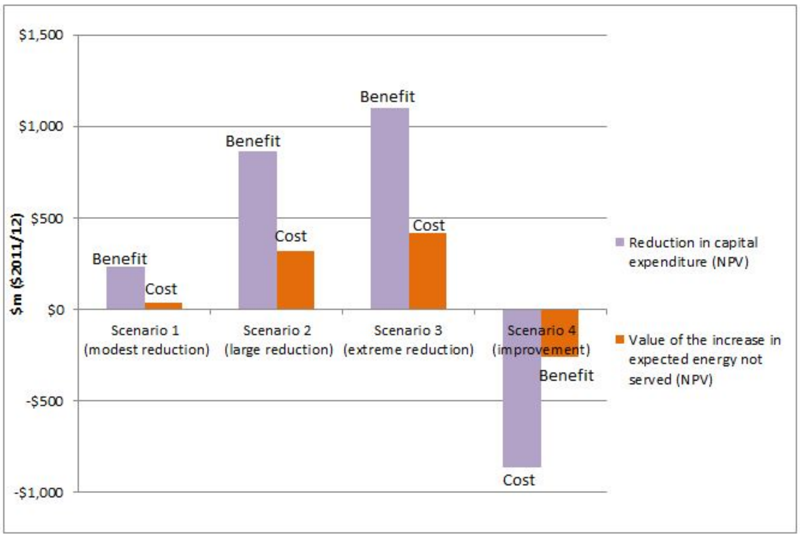
Table 2 Comparison of scenario impacts

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	$112m reduction	$8m increase	Benefits exceed costs
	15 years	$231m reduction	$37m increase	Benefits exceed costs
2: Large reduction in reliability	5 years	$312m reduction	$76m increase	Benefits exceed costs
	15 years	$866m reduction	$321m increase	Benefits exceed costs
3: Extreme reduction in reliability	5 years	$429m reduction	$110m increase	Benefits exceed costs
	15 years	$1,098m reduction	$415m increase	Benefits exceed costs
4: Improvement in reliability	5 years	$467m increase	$114m reduction	Costs exceed benefits
	15 years	$867m increase	$258m reduction	Costs exceed benefits

Note- Totals may not sum due to rounding.

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



Next steps

We are seeking written submissions on our draft advice. Submissions should be lodged on the AEMC website at www.aemc.gov.au by **Friday, 13 July 2012**. After considering these submissions, we will publish our final advice in late August 2012.

Contents

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 Ministerial Council on Energy (MCE), the Australian Energy Market Commission (AEMC) is currently reviewing the NSW distribution licence conditions to assist the NSW Government to decide whether the licence conditions should be amended to reflect different reliability outcomes.[4]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 draft advice for public consultation on the trade-offs between cost and reliability performance for four scenarios for distribution reliability outcomes in NSW.

Our draft advice has been developed after considering submissions provided on the proposed scope and approach for the NSW workstream, which was set out in our issues paper. Our response to each of the issues raised in submissions can be found in Appendix C.

1.2 Why are we undertaking 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% of total price increases in retail electricity bills in NSW over the next few years.[5]

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.

4 The Council of Australian Governments established the new Standing Council on Energy and Resources in late 2011 to replace the Ministerial Council on Energy.

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

In light of the impact of reliability related network expenditure on retail electricity bills, on 20 August 2011 the MCE directed the AEMC to undertake a review of NSW distribution reliability outcomes (the NSW workstream). This workstream will provide 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 aging 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.[6]

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 MCE'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 will be significantly broader in scope than the NSW workstream. After reviewing approaches to distribution reliability in the NEM, we will then consider if there is merit in developing a nationally consistent framework for expressing, delivering, and reporting on distribution reliability outcomes. If requested by the MCE, 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.

6 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.

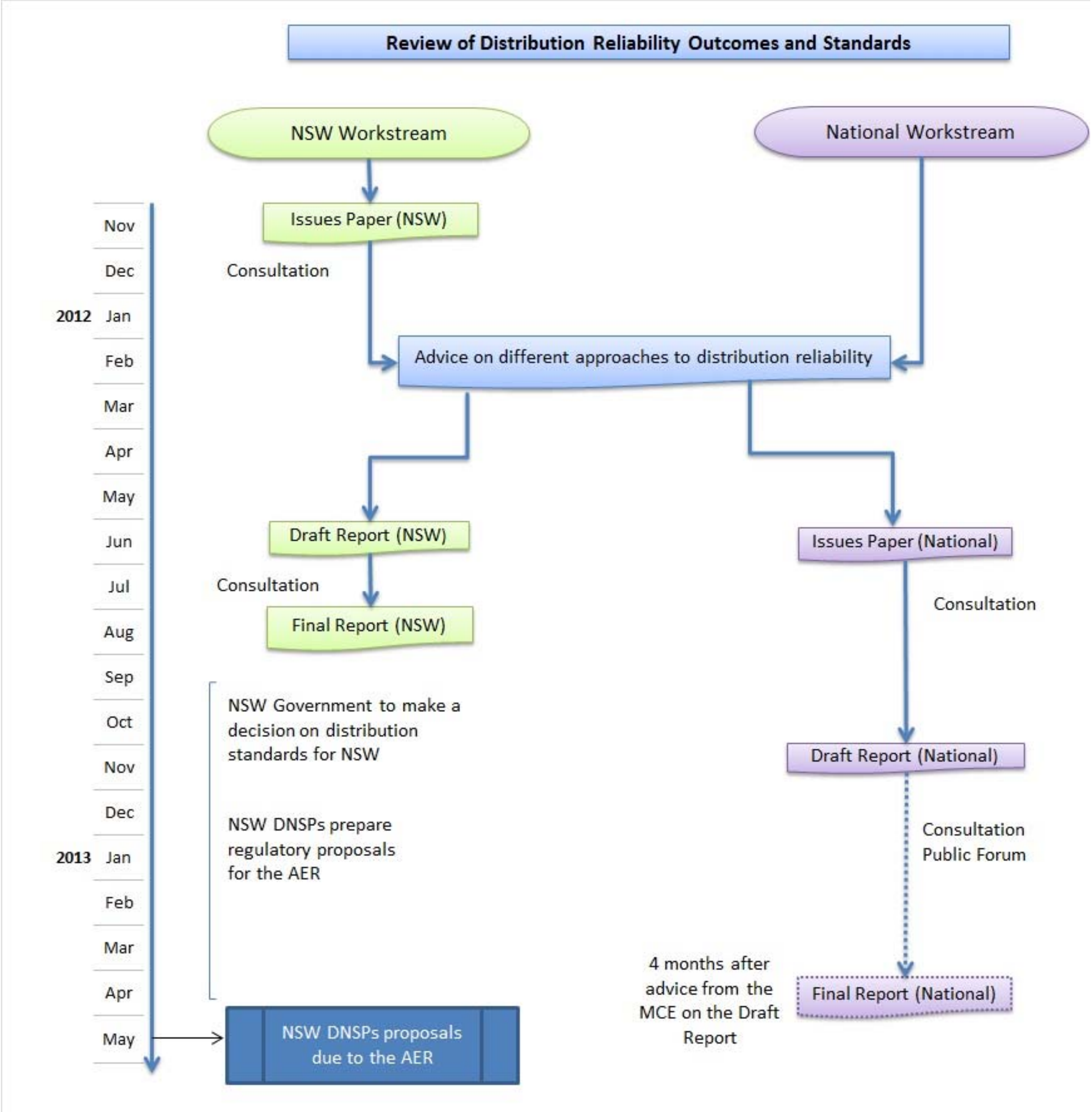
1.4 Timeframe for the review

The indicative timeframe for the review is set out in Figure 1.1 below.

After considering submissions on the draft report, we will publish our final report on the NSW workstream in late August 2012. The NSW Government will then use this advice in considering whether changes to the NSW licence conditions should be made to provide for an alternative level of distribution reliability in NSW.

The national workstream will commence with the publication of an issues paper in late June 2012. This issues paper will set out the proposed scope and approach for the national workstream for public consultation. A draft report on the national workstream on whether there is merit in a nationally consistent framework for distribution reliability will be published in late 2012.

Figure 1.1 Relationship between the NSW and national workstreams



1.5 How to make a submission on the draft report

The closing date for submissions to this draft report is **Friday, 13 July 2012**. We have set out a number of issues in the report that we are seeking specific comments on, which relate to:

- the methodology we have used in our cost-benefit assessment for our scenarios for distribution reliability in NSW, and whether any additional sensitivity analysis should be undertaken (chapter 3);

- the implications of the methodology we have used for our customer survey (chapter 4);
- the scenarios we have developed, and whether any changes should be made to these scenarios (chapter 5); and
- the possible impacts of the scenarios we have developed on the reliability performance and expenditure of the NSW DNSPs (chapter 5).

Submissions must be on letterhead (if submitted on behalf of an organisation), signed and dated. Submissions should quote project number "EPR0027" and may be lodged online at www.aemc.gov.au or by mail to:

Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

1.6 Structure of this report

The remainder of the draft report is structured as follows:

- Chapter 2 - Current framework for NSW distribution reliability and recent performance and network investment.
- Chapter 3 - Methodology used in developing our draft 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 - Sensitivities to our cost-benefit assessment.
- Appendix C - Summary of submissions on the NSW workstream issues paper.

We have also published the following consultant reports on the AEMC website:

- Nuttall Consulting, *NSW DNSP Reliability: Review of licence conditions*. Nuttall Consulting led the development of the distribution reliability scenarios and undertook a review of the DNSPs' forecasts of the cost and reliability impacts of the scenarios.

- Oakley Greenwood, *NSW Value of Customer Reliability*. Oakley Greenwood estimated the value of customer reliability for each NSW DNSP, which was based on a survey of approximately 1,300 NSW customers.

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 capital 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).[7]

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 Victorian and Queensland components of Essential Energy's network are also subject to these conditions.[8]

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.[9] 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.[10] 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.

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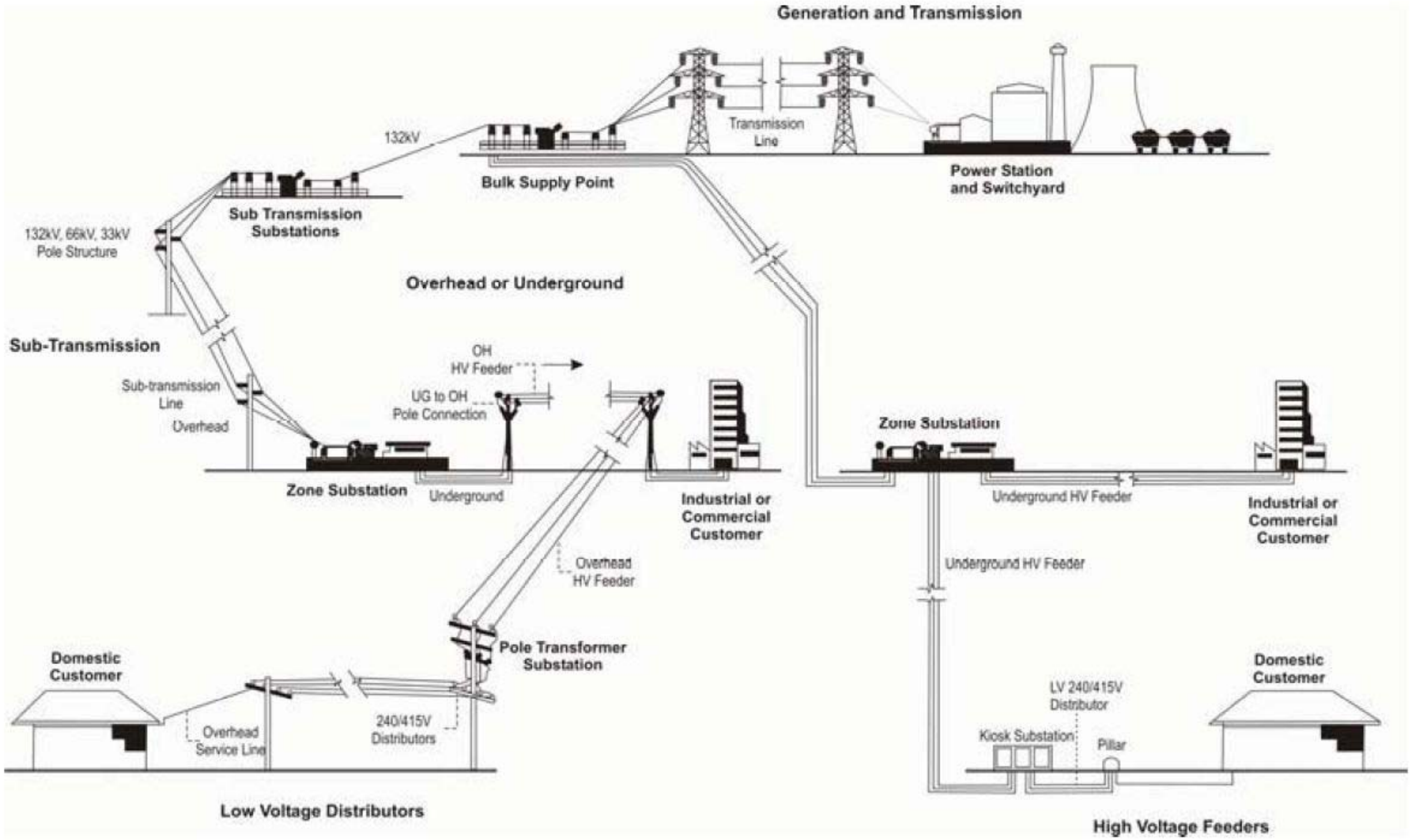
7 Schedule 4 of the NSW distribution licence conditions relates to the definition of excluded interruptions.

8 Essential Energy operates a very small amount of their network in border areas of Victoria and Queensland that are connected to Essential Energy's NSW distribution network.

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

10 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 system[11]



11 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, 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 SydneyCentral 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.[12].

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;[13]
- Ausgrid proposed works to achieve a 95 per cent probability of compliance;[14] and
- Endeavour Energy proposed to target 100 per cent probability of compliance with the reliability standards.[15]

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

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

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

15 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.[16] 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[17]	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.

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

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

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.[18] 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.[19]

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

18 NSW Licence Conditions, cl. 18.7-18.8

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

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	% 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.[20]

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

Submissions to the issues paper revealed broad stakeholder support for our proposed position.[21]

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.[22] 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.[23]

The AEMC notes the views expressed by these stakeholders, but considers 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.[24]

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.

21 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.

22 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.

23 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

24 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.[25]

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 (i.e. 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;
- 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

25 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.[26]

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 n-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. The national workstream will further explore the key differences identified by The Brattle Group between the current NSW approach and other Australian and international approaches to distribution reliability. The recommendations from the national workstream may have implications for the structure of the NSW licence conditions beyond the next regulatory control period.

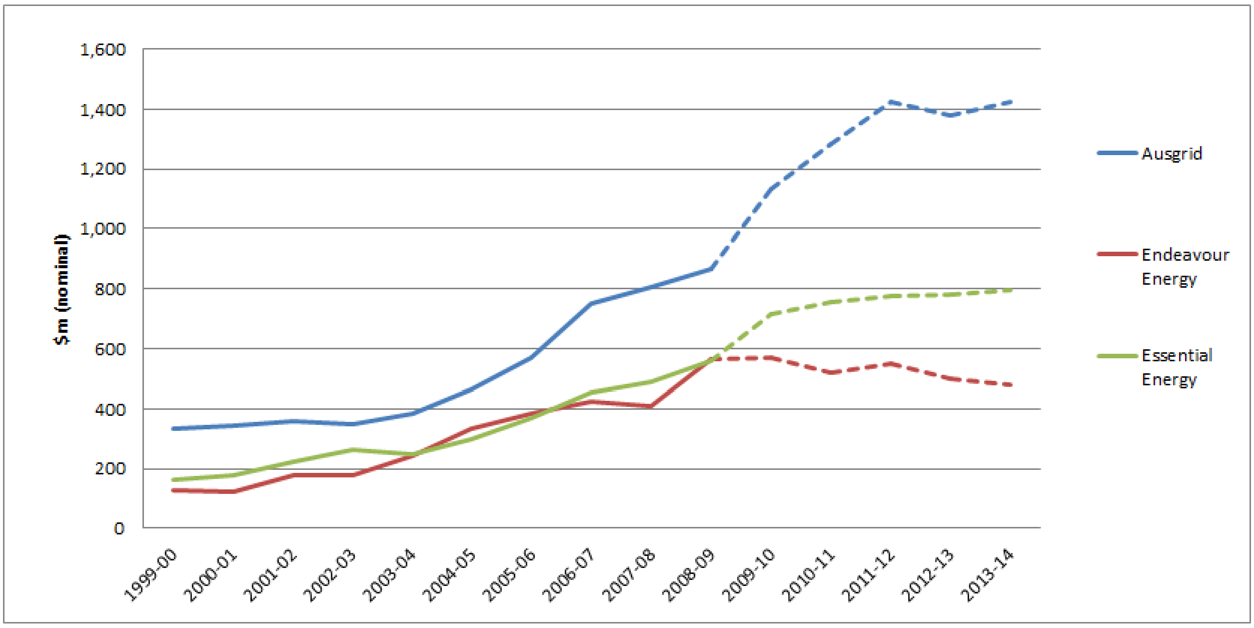
2.2 Recent reliability investment in NSW distribution networks

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%; for Endeavour Energy it is 37%, and for Essential Energy it is

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

87%.[27] Figure 2.2 below demonstrates the growth (actual 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% in nominal terms between 2010/11 and 2013/14, with increases in distribution prices contributing around 36% of this total increase.[28]

The NSW Independent Pricing and Regulatory Authority (IPART) has recently released its draft determination for regulated NSW retail electricity prices, which would result in an average increase of around 16% in nominal terms across NSW for regulated prices over 2012/13.[29] The increase in network costs is driving around 50% of the average increase in regulated retail electricity prices in IPART's draft determination.[30] The significant contribution of rising distribution prices to retail electricity price increases has led to concerns about the level of distribution investment in NSW.

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

28 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.

29 IPART, 2012, *Changes in regulated electricity retail prices from 1 July 2012*, draft report, April, p. 3.

30 Ibid.

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.[31] 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 N-1 to N-2, which falls within Ausgrid's network;
- to provide an N-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 out perform 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 capital expenditure.

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

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

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.

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

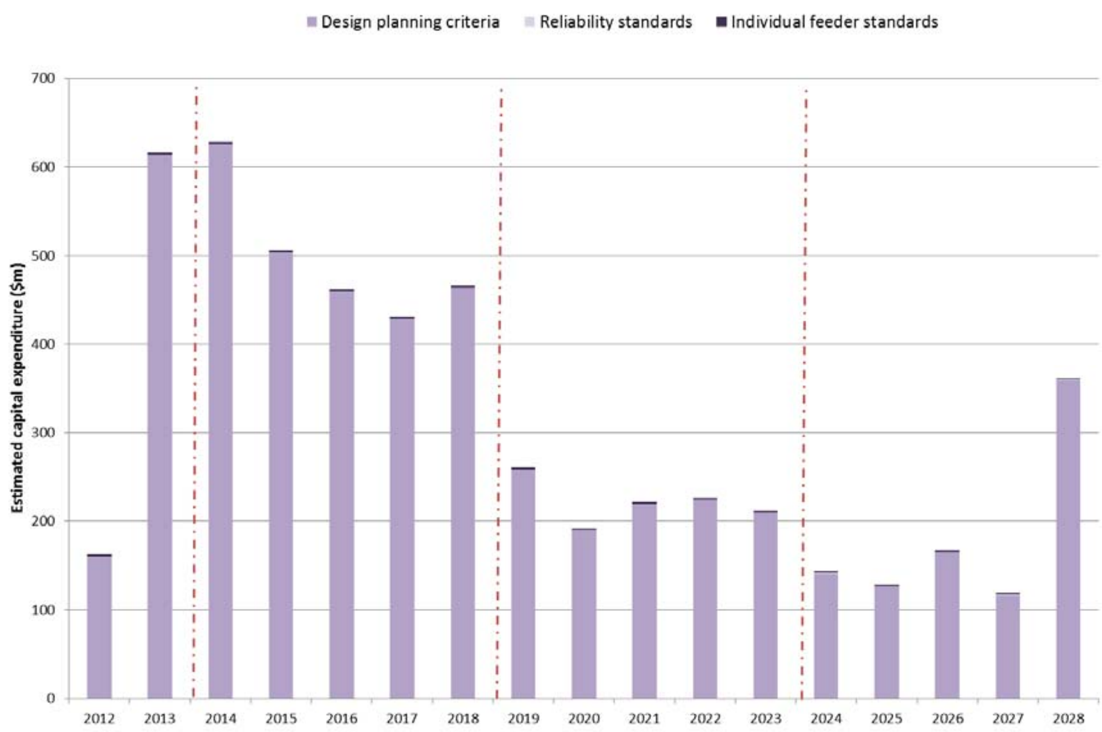


Figure 2.4 Endeavour Energy: Estimated reliability capital expenditure under the current licence conditions

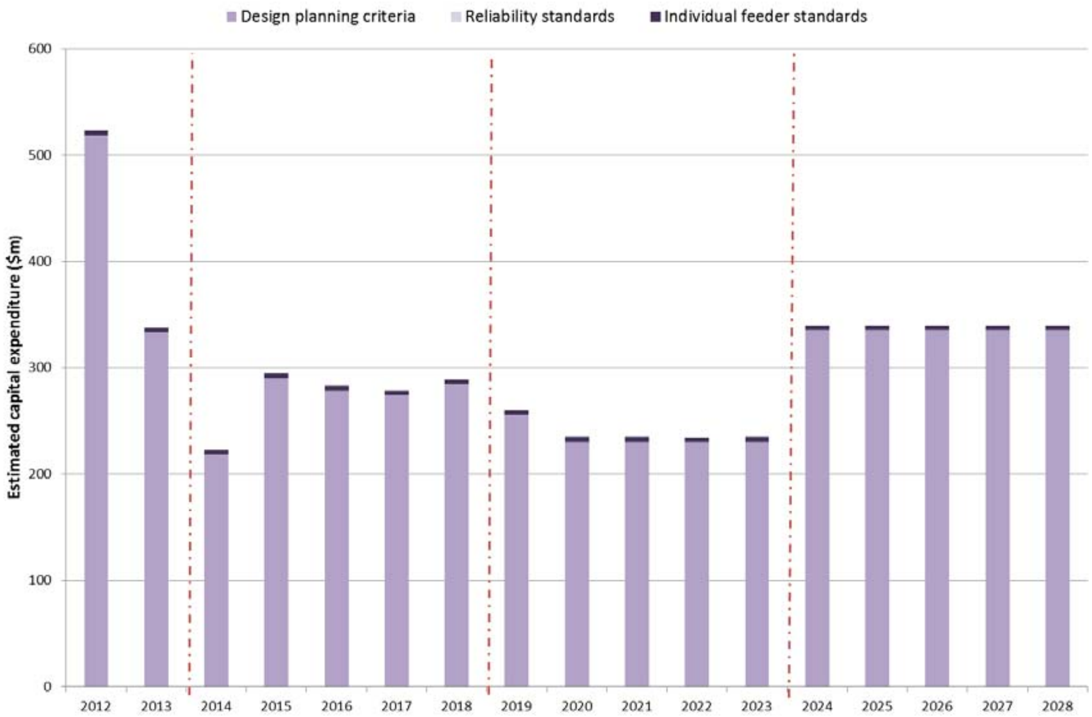
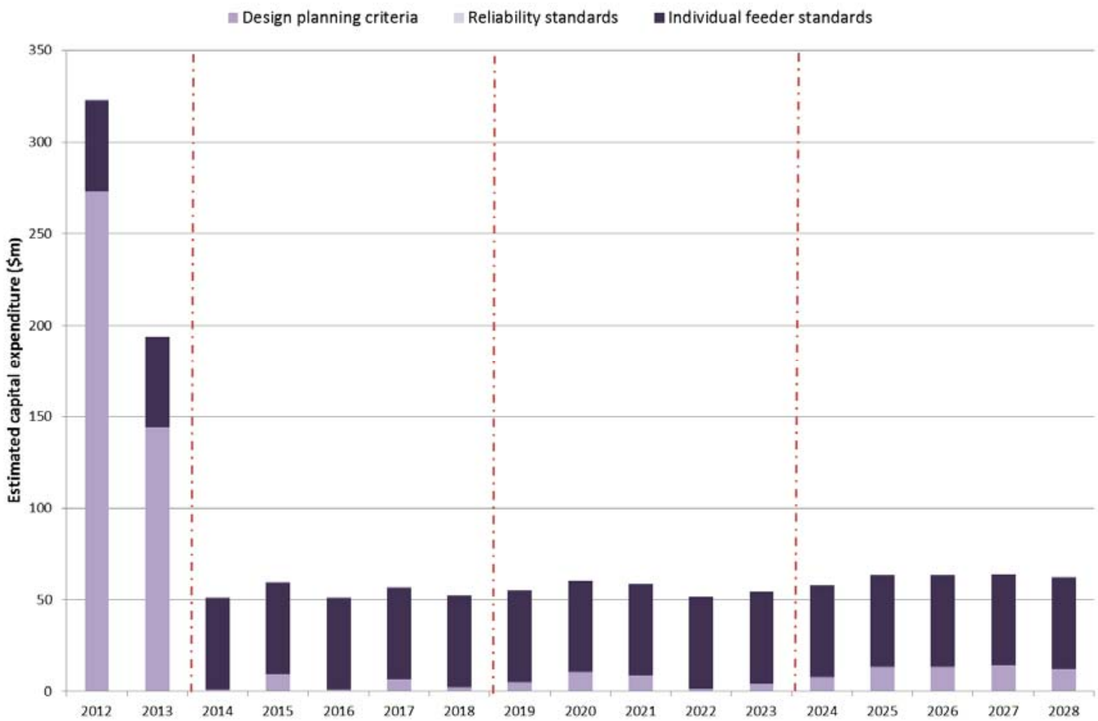


Figure 2.5 Essential Energy: Estimated reliability capital expenditure under the current licence conditions



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 DSNPs 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 draft 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 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.

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 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% 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.[32]

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:

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

- 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.[33] Nuttall Consulting has also identified some issues with 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. In chapter 5, we invite the NSW DNSPs to provide comments on the specific modelling issues raised in Nuttall Consulting's report and to provide an indication of what impact these issues may have, particularly on the estimated expected energy not served.

3.2 NSW value of customer reliability

3.2.1 Use of the value of customer reliability

The MCE's terms of reference requires the Commission to estimate the willingness of the NSW community to pay for a range of reliability outcomes.[34] 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

33 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.

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

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.[35] 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 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.[36]

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% 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% reduction on their electricity bill.[37]

Consideration of how best to estimate the willingness of customers to pay and accept different distribution reliability outcomes will be further considered under the national workstream of this review.

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

36 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.

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

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.

- 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.

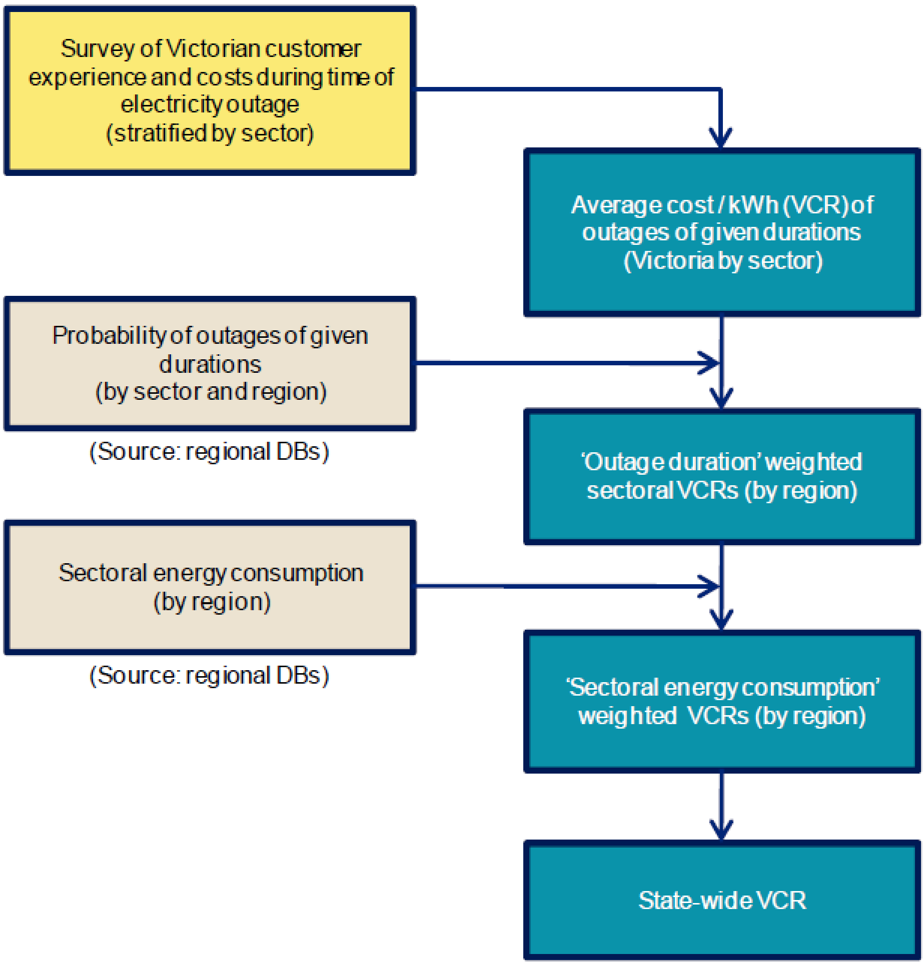
- A VCR for each customer type is then calculated as the sum of the probability-weighted normalised supply interruption costs.

- 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.[38]

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

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

Figure 3.2 Victorian VCR methodology



Source: Oakley Greenwood, 2011, *Valuing reliability in the National Electricity Market*,final report, March, 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.[39]

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.[40] 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 types.[41] 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

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

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

41 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.

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.[42] 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.[43] 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 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.[44]

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42 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.

43 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

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

- **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.

3.3 Cost-benefit assessment

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. A discount rate of 10.02% was used, which reflects the current weighted average cost of capital for the NSW DNSPs over the 2009/10 to 2014/15 regulatory control period. 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. 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 change in expenditure for each DNSP was then compared against the cost of the change in reliability outcomes for each scenario.

The residential retail price impacts and impact on SAIDI was also determined 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. A return on capital of 10.02 per cent on the forecast capital expenditure was calculated, while deprecation was calculated using a 45 year asset life.[45]

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.[46] 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.

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 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.

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

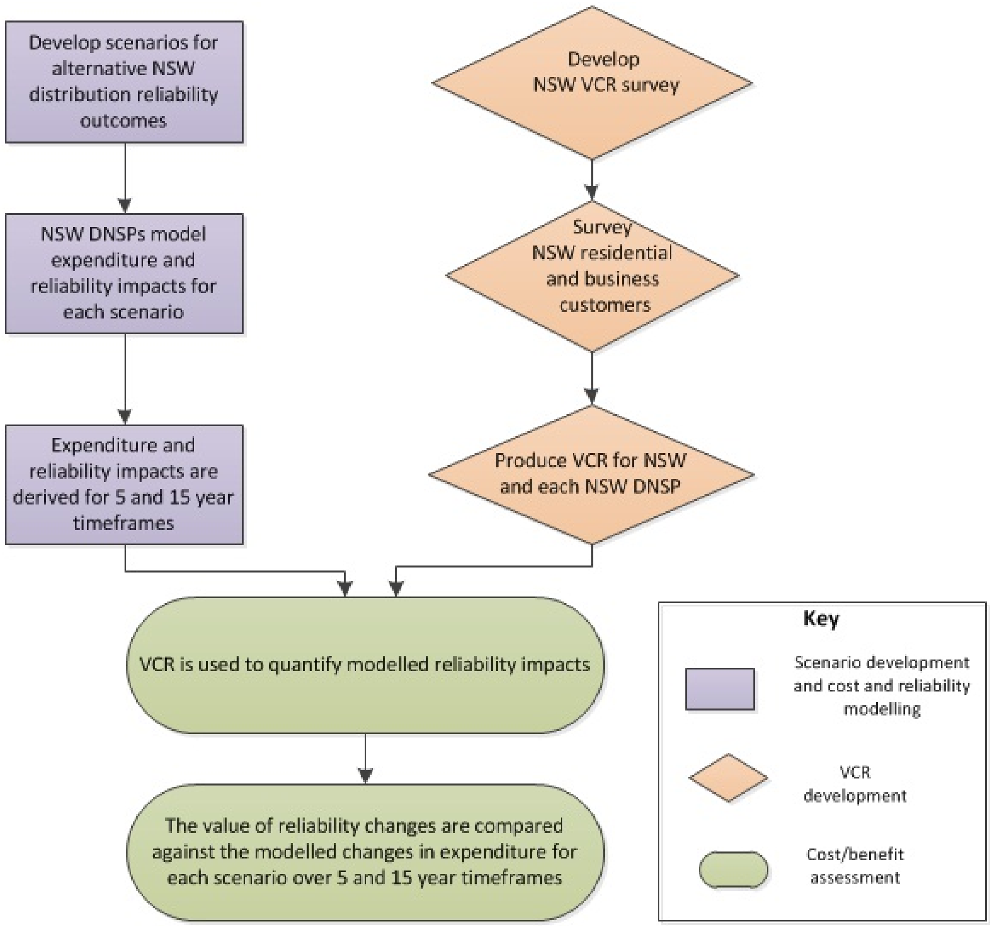
We have also undertaken some sensitivity analysis to test the bounds of our cost-benefit assessment. The results of these sensitivities tests are set out in Appendix B and include:

45 The return on capital of 10.02% that was used reflects the return on capital for the NSW DNSPs over the current regulatory control period.

- using discount rates of 5% and 7% instead of the 10.02% we have used, to convert capital expenditure and the value of expected energy not served to net present values; and

- converting capital expenditure to net present values using the discount rate of 10.02%, but not converting the value of expected energy not served to net present values. This sensitivity was undertaken as the customer value of reliability may increase in the future, as customers may become more reliant on electronic appliances and systems. As a result, it could be argued that it may not be appropriate to discount the value of expected energy not served. However, while noting this issue, we consider that the cost-benefit assessment should be based on a net present value of both changes in capital expenditure and the value of expected energy not served.

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



46 IPART, 2012, *Changes in regulated electricity retail prices from 1 July 2012-April 2012*, draft report, April.

Question 1 Approach to cost-benefit assessment

a) What discount rate should be used in converting capital expenditure and the value of expected energy not served to net present values?

b) Should any other sensitivities be undertaken to test the bounds of our cost-benefit assessment?

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.[47] 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.

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

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.[48] 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.[49]

Table 4.1 NSW 2012 VCR survey: Usable sample size by DNSP and customer type[50]

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 type[51]

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**

48 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.

49 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 / DNDP 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.

50 Ibid.

51 Ibid.

The useable sample size achieved is significantly larger than the sample size achieved for the most recent Victorian VCR survey in 2007. 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 is set out in Table 4.3.

Table 4.3 Victorian 2007 VCR survey: Usable sample size

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.

The relatively low standard errors reported for our VCR results, particularly for the residential and the small business VCRs, reflects the sample size that was used and the relatively limited variance in customer responses compared to the average response in our survey.

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 results[52]

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

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.

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.

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

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.

As part of the national workstream, we will be further considering how best to calculate the willingness of customers to pay for reliability.

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 cafe, 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 costs[53]

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.

53 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.

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.

Table 4.15 Comparison of the cost of a 60 minute supply interruption[54]

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

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

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 upgrades could be replaced with improved customer communication and engagement.[55]

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.

55 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.

Table 4.16 Residential customer preferences for distribution investment

	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%

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.

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%

Question 2 Customer survey results

Are there any implications from the NSW VCR survey methodology we have used that we should take into account in considering the survey results?

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.

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.

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. An average NSW impact on the distribution reliability component of electricity bills and the duration of interruptions has also been derived using a weighted average of the calculations for the three DNSPs.

We have also undertaken sensitivity analysis to assess the effects on our cost-benefit assessment if different discount rates are used to convert the net present value of the modelled capital expenditure and value of expected energy not served, and if the capital expenditure is converted to a net present value but the value of expected energy not served is not converted to a net present value. The results of this sensitivity analysis is set out in Appendix B.

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.

- **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. 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.

- **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.

- **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 Scenario 1: Modest reduction in distribution reliability

5.3.1 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

5.3.2 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

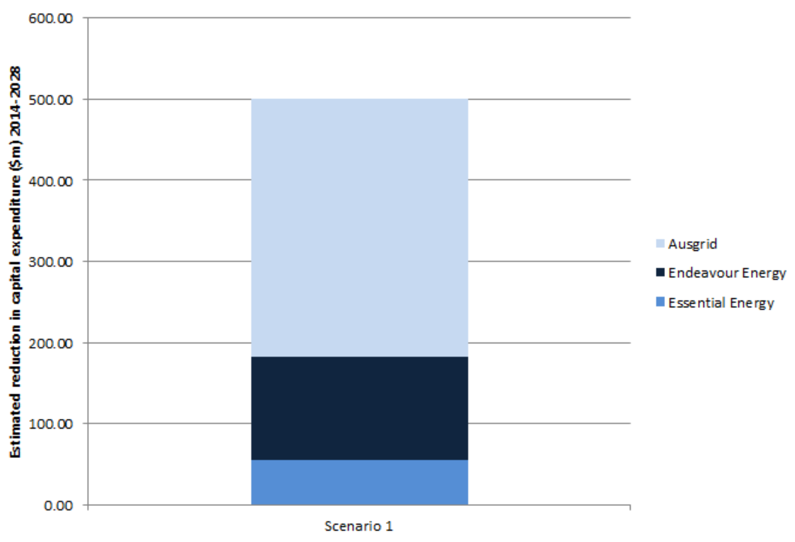


Figure 5.3 Scenario 1: Ausgrid reduction in capital expenditure

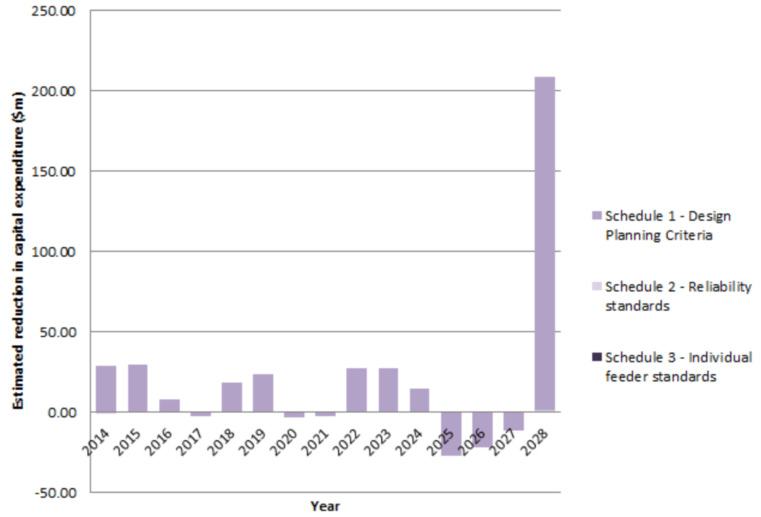


Figure 5.4 Scenario 1: Endeavour Energy reduction in capital expenditure

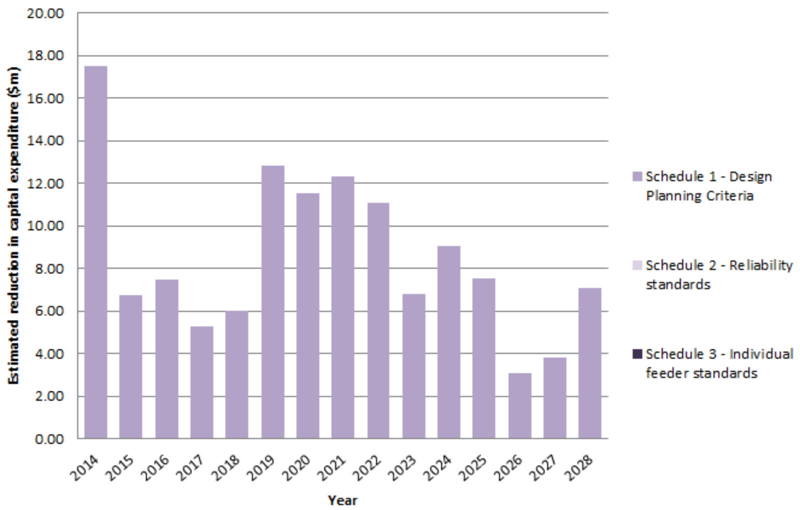
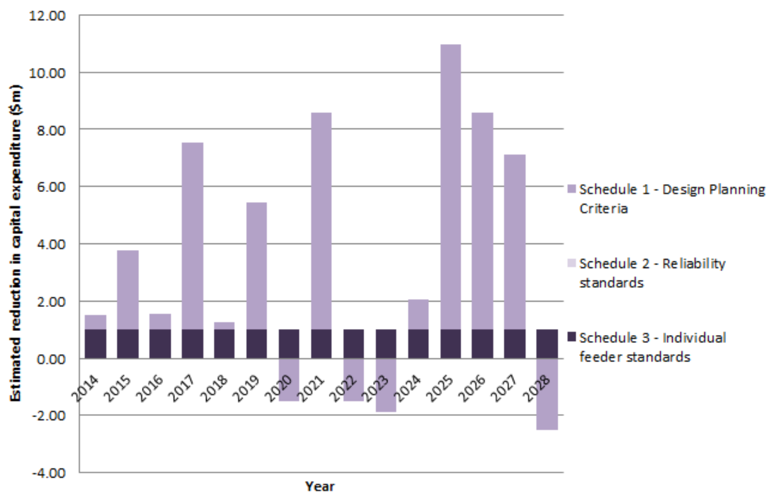


Figure 5.5 Scenario 1: Essential Energy reduction in capital expenditure[56]



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

5.3.3 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.

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

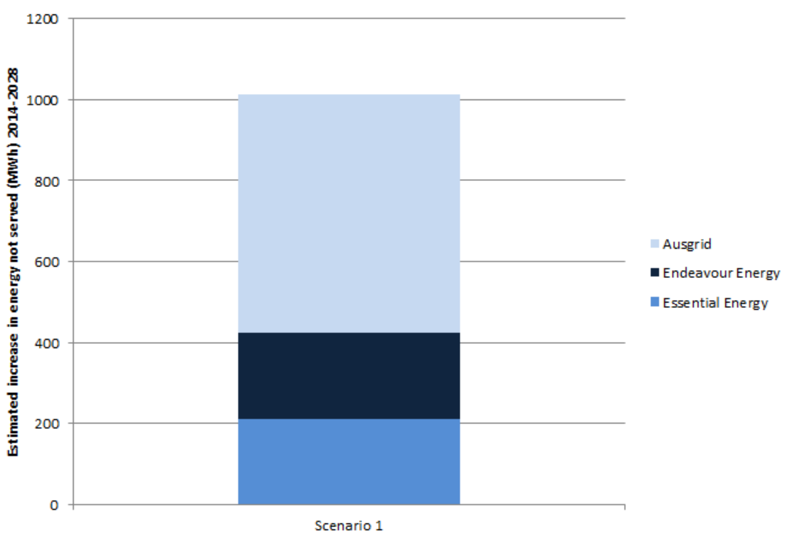


Figure 5.7 Scenario 1: Ausgrid increase in expected energy not served

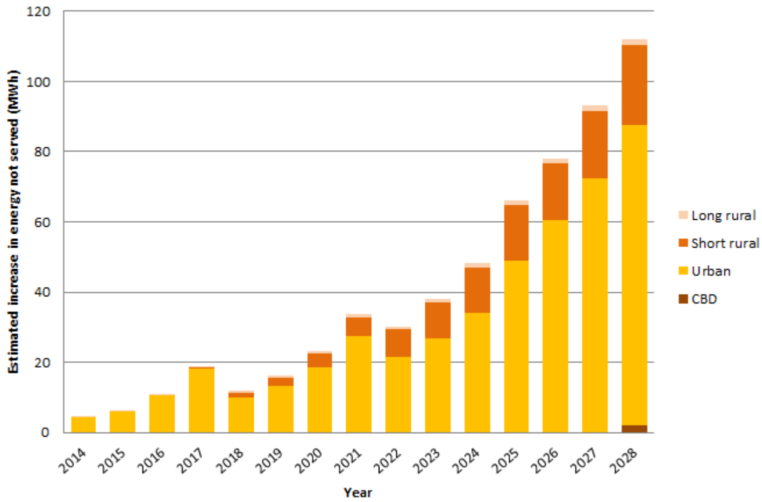


Figure 5.8 Scenario 1: Endeavour Energy increase in expected energy not served

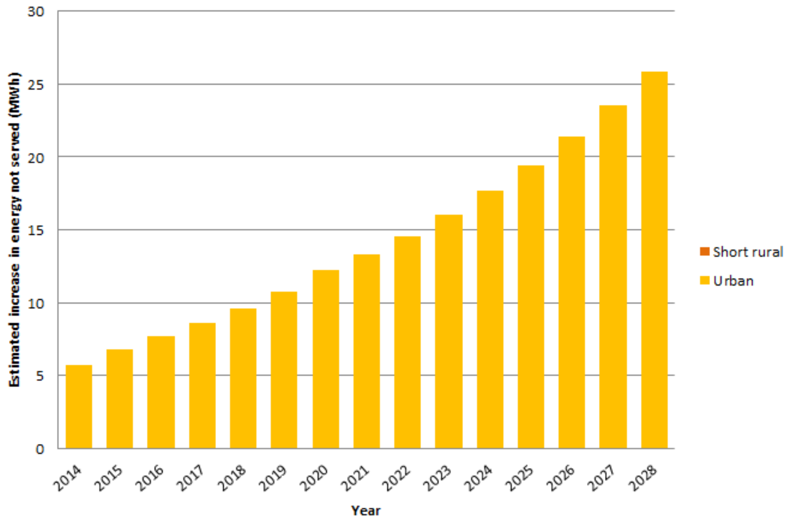
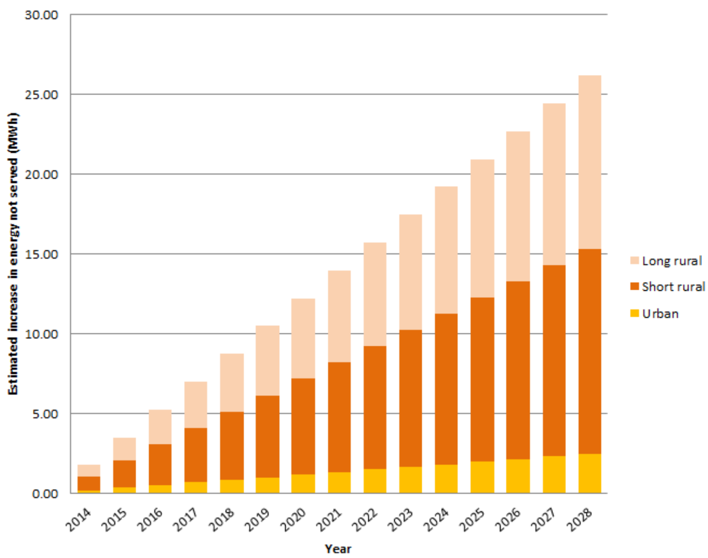


Figure 5.9 Scenario 1: Essential Energy increase in expected energy not served



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.

5.3.4 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.[57]

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.

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.

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57 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.

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 2018/19[58]	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[59]	Result of cost-benefit assessment
Ausgrid	$66m	$1	53MWh	$3m	Changes of less than one minute	Benefits exceed costs
Endeavour Energy	$34m	$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	$112m	$1	119 MWh	$8m	Changes of less than one minute	Benefits exceed costs

Note- Totals may not sum due to rounding.

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	$136m	$4	591 MWh	$19m	3 minutes	Benefits exceed costs
Endeavour Energy	$70m	$3	213 MWh	$10m	1 minute	Benefits exceed costs
Essential Energy	$26m	$2	242 MWh	$9m	1 minute	Benefits exceed costs
NSW total	$231m	$3	1,047 MWh	$37m	2 minutes	Benefits exceed costs

58 This is based on an average annual residential consumption of 7,000 MWh.

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

5.4 Scenario 2: Large reduction in distribution reliability

5.4.1 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

5.4.2 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 underpeforming 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 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

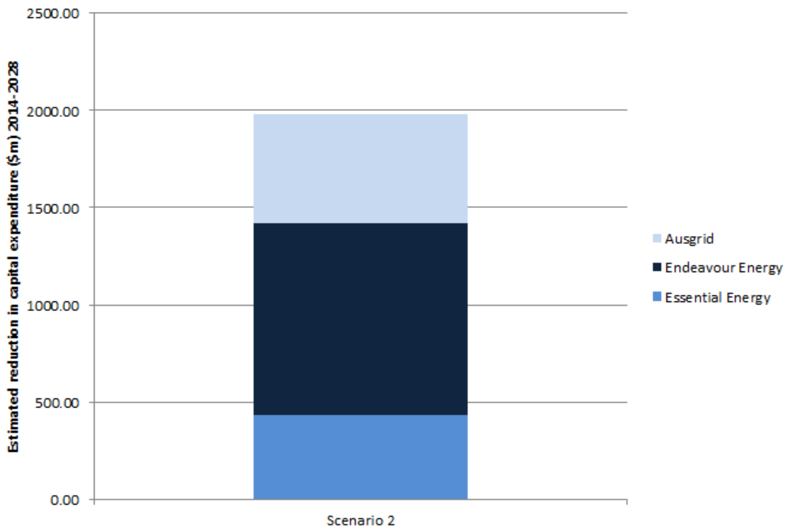


Figure 5.12 Scenario 2: Ausgrid reduction in capital expenditure

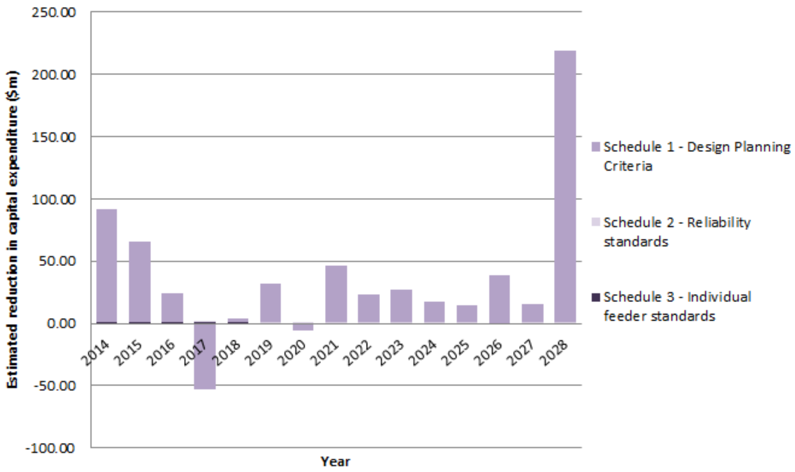


Figure 5.13 Scenario 2: Endeavour Energy reduction in capital expenditure

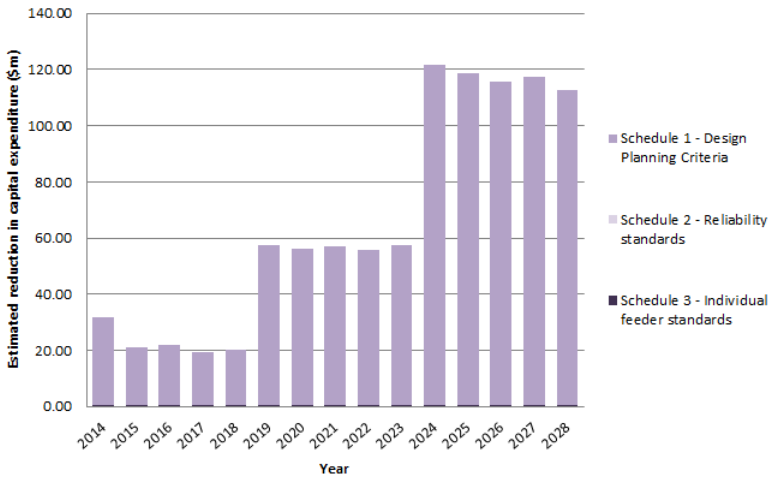
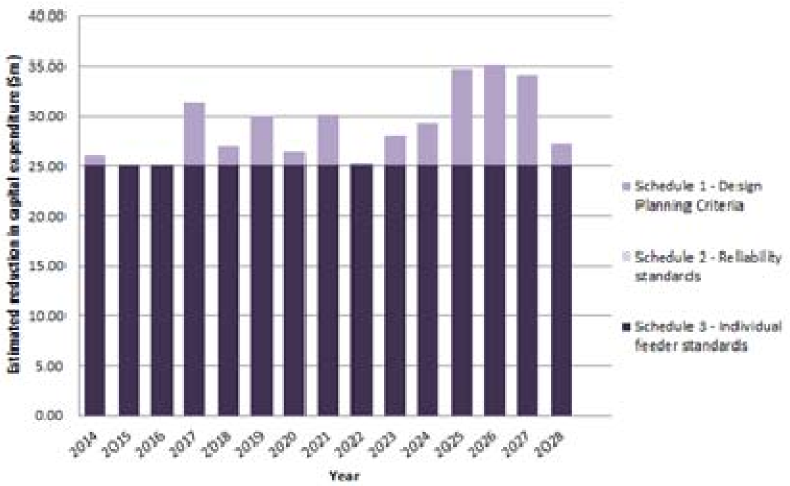


Figure 5.14 Scenario 2: Essential Energy reduction in capital expenditure



5.4.3 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 5.15 **Scenario 2: Total increase in expected energy not served**

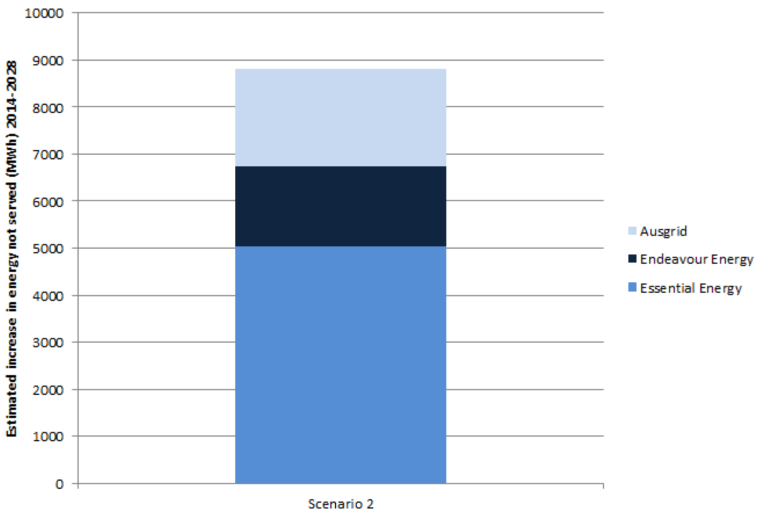


Figure 5.16 **Scenario 2: Ausgrid increase in expected energy not served**

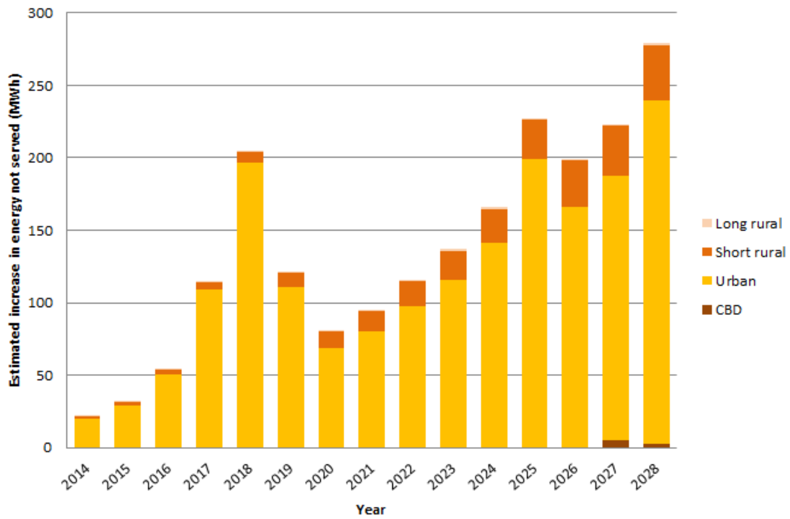


Figure 5.17 **Scenario 2: Endeavour Energy increase in expected energy not served**

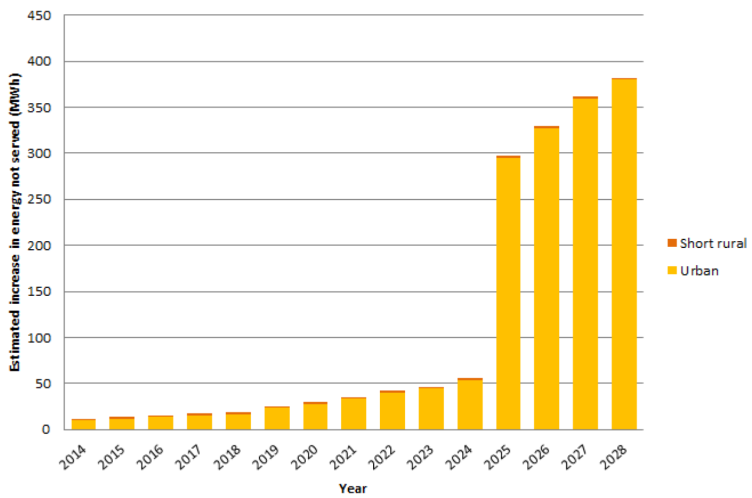
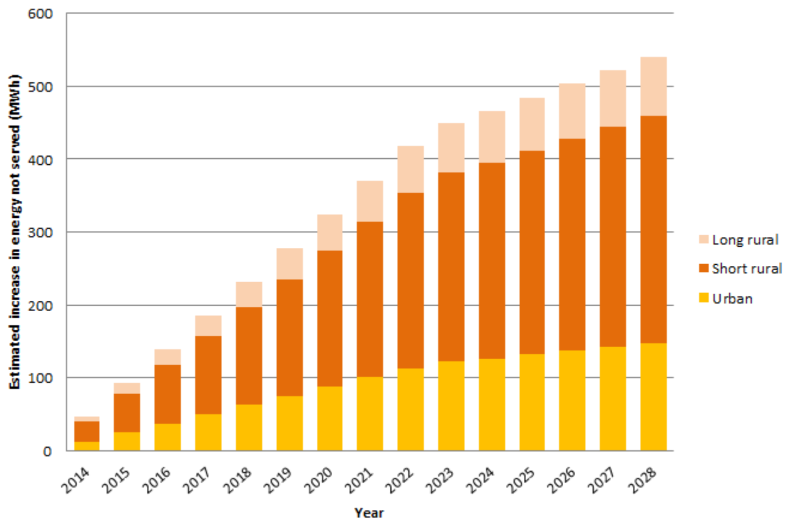
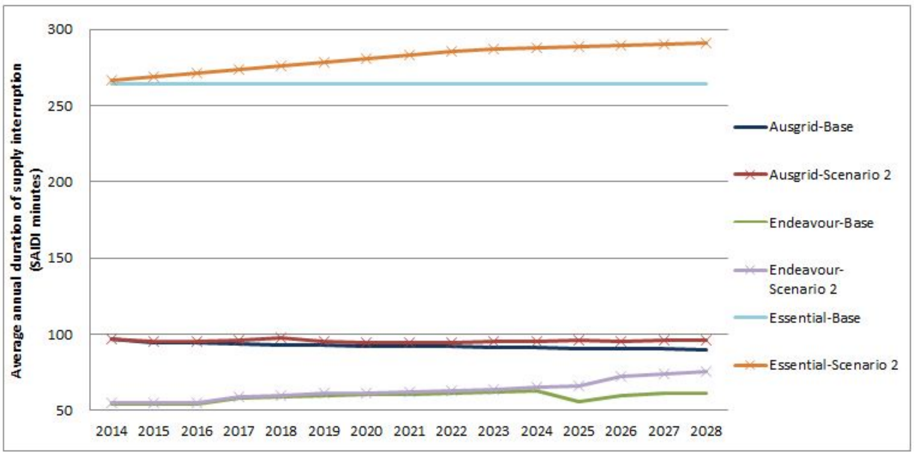


Figure 5.18 Scenario 2: Essential Energy increase in expected energy not served



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



5.4.4 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	$122m	$3	426 MWh	$25m	5 minutes	Benefits exceed costs
Endeavour Energy	$88m	$4	78 MWh	$6m	1 minute	Benefits exceed costs
Essential Energy	$101m	$6	693 MWh	$45m	11 minutes	Benefits exceed costs
NSW total	$312m	$4	1,197 MWh	$76m	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	$258m	$7	2,071 MWh	$75m	6 minutes	Benefits exceed costs
Endeavour Energy	$394m	$26	1,684 MWh	$59m	14 minutes	Benefits exceed costs
Essential Energy	$214m	$17	5,047 MWh	$187m	27 minutes	Benefits exceed costs
NSW total	$866m	$15	8,802 MWh	$321m	13 minutes	Benefits exceed costs

5.5 Scenario 3: Extreme reduction in distribution reliability

5.5.1 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 5.20 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	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 20%
	Work to be done on underperforming feeders	Work restricted to a maximum of 1% of total feeders each year

5.5.2 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 underperfoming 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 5.21 Scenario 3: Total reduction in capital expenditure

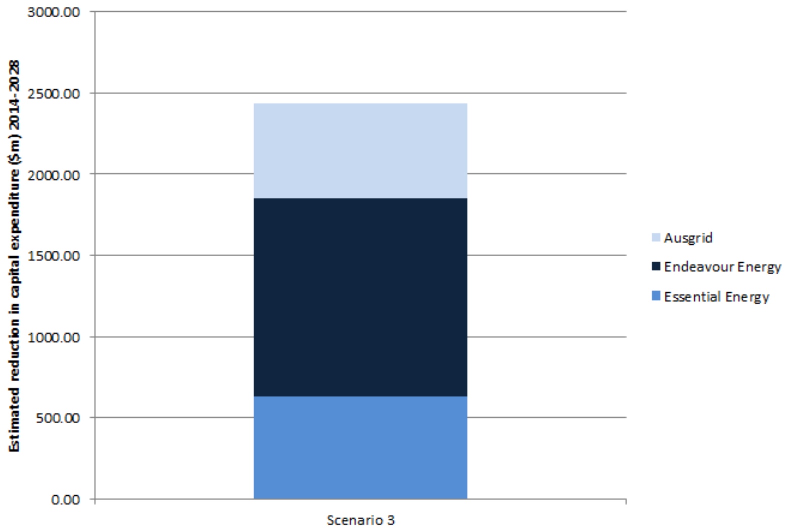


Figure 5.22 Scenario 3: Ausgrid reduction in capital expenditure

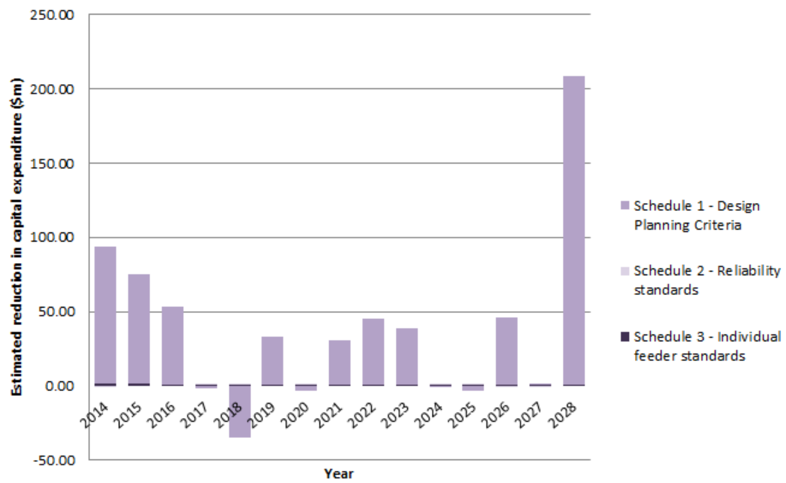


Figure 5.23 Scenario 3: Endeavour Energy reduction in capital expenditure

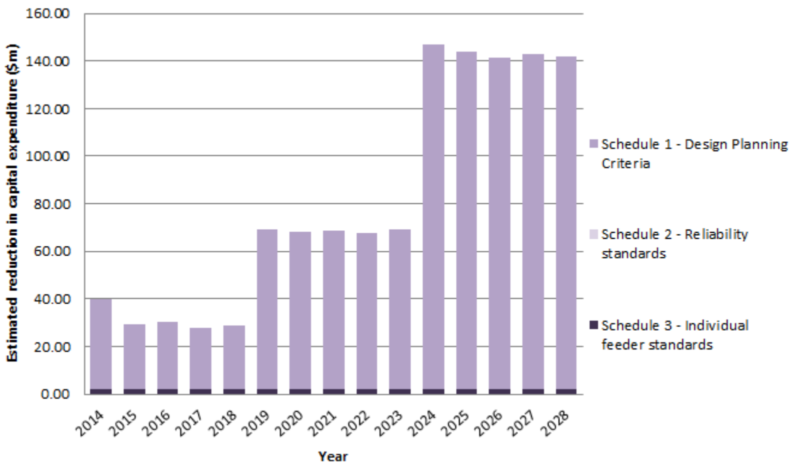
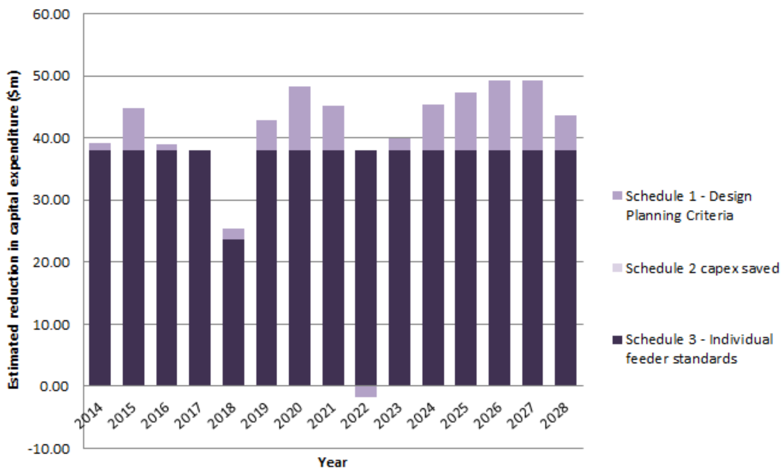


Figure 5.24 Scenario 3: Essential Energy reduction in capital expenditure



5.5.3 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 underpeforming 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 5.25 Scenario 3: Total increase in expected energy not served

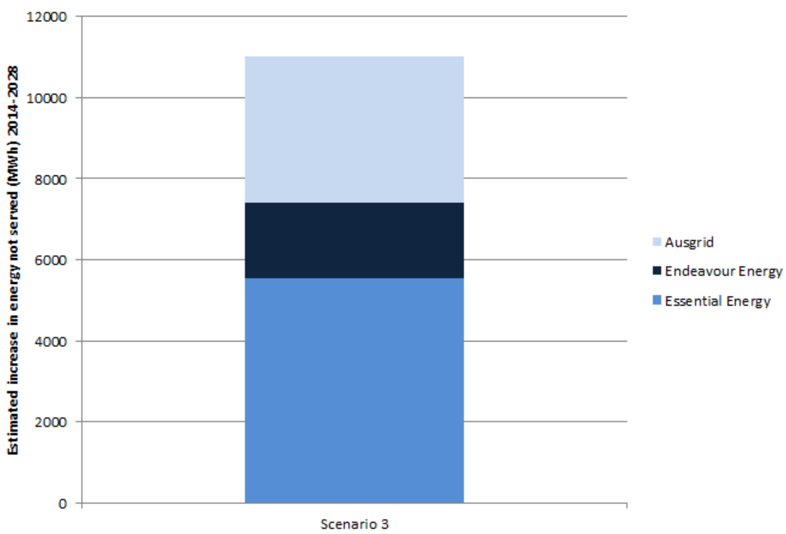


Figure 5.26 Scenario 3: Ausgrid increase in expected energy not served

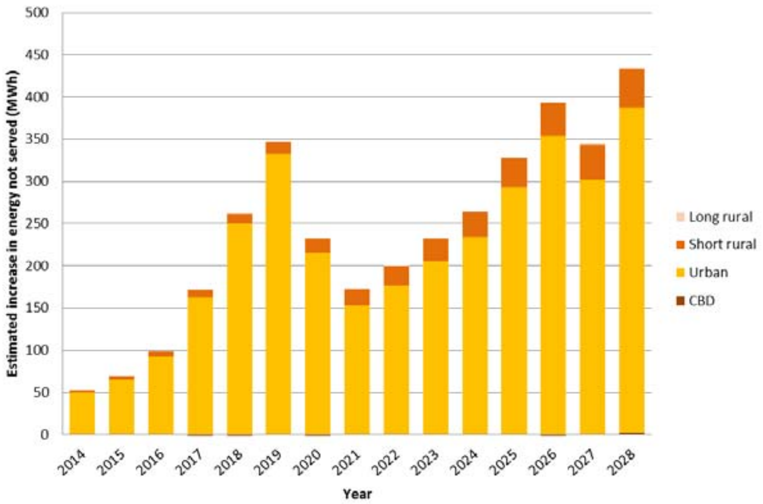


Figure 5.27 Scenario 3: Endeavour Energy increase in expected energy not served

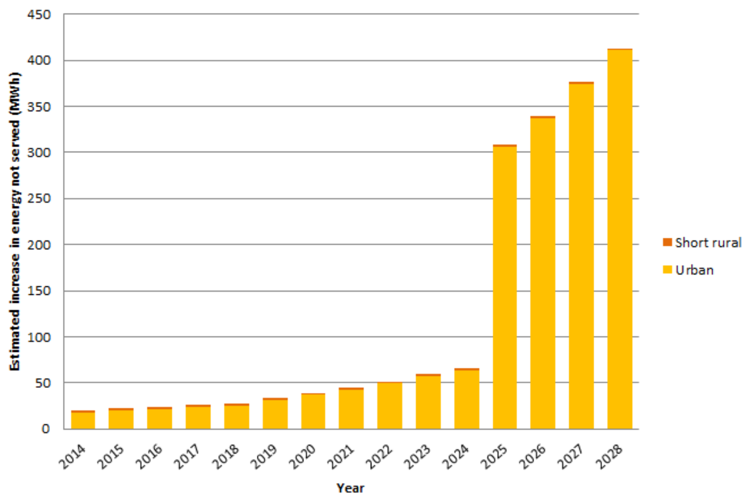
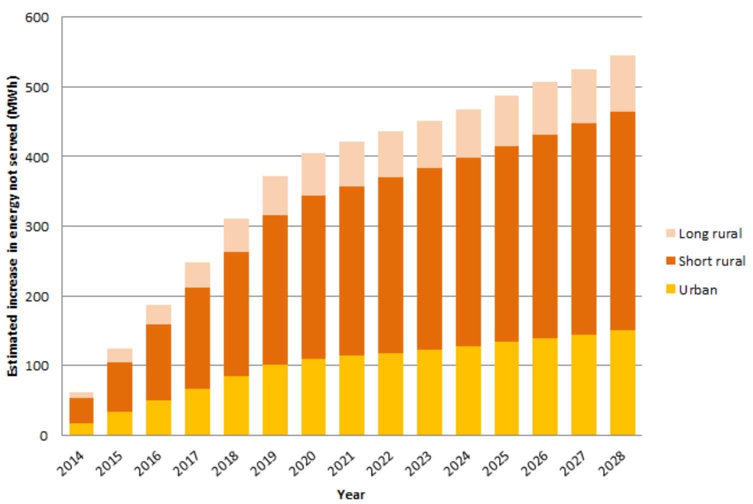
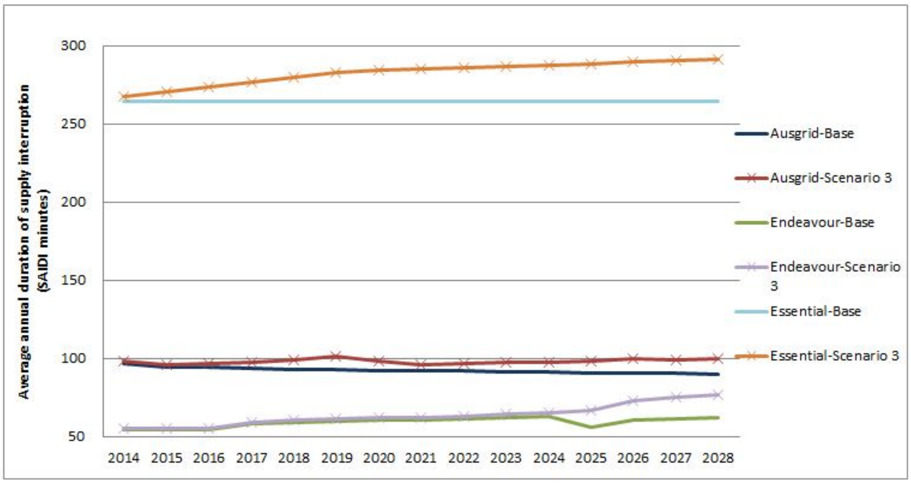


Figure 5.28 Scenario 3: Essential Energy increase in expected energy not served



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



5.5.4 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 5.5 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	$166m	$4	653 MWh	$40m	6 minutes	Benefits exceed costs
Endeavour Energy	$120m	$5	119 MWh	$10m	1 minute	Benefits exceed costs
Essential Energy	$143m	$9	931 MWh	$60m	15 minutes	Benefits exceed costs
NSW total	$429m	$5	1,704 MWh	$110m	7 minutes	Benefits exceed costs

Table 5.6 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	$295m	$8	3,608 MWh	$133m	10 minutes	Benefits exceed costs
Endeavour Energy	$491m	$32	1,852 MWh	$68m	15 minutes	Benefits exceed costs
Essential Energy	$312m	$24	5,550 MWh	$214m	27 minutes	Benefits exceed costs
NSW total	$1,098m	$18	11,010 MWh	$415m	15 minutes	Benefits exceed costs

5.6 Scenario 4: Improvement in distribution reliability

5.6.1 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 5.30 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

5.6.2 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 5.31 Scenario 4: Total increase in capital expenditure

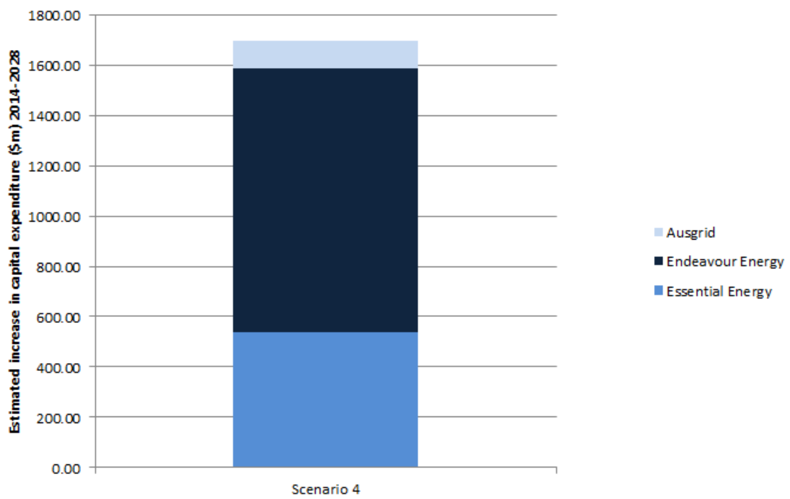


Figure 5.32 Scenario 4: Ausgrid increase in capital expenditure

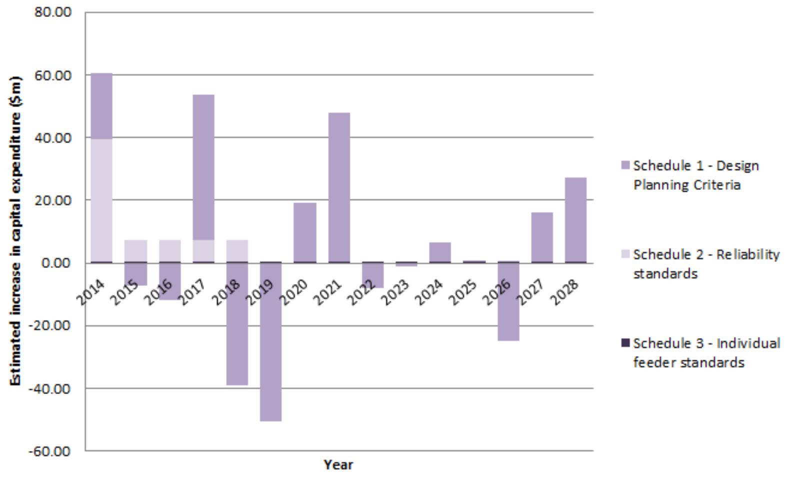


Figure 5.33 Scenario 4: Endeavour Energy increase in capital expenditure

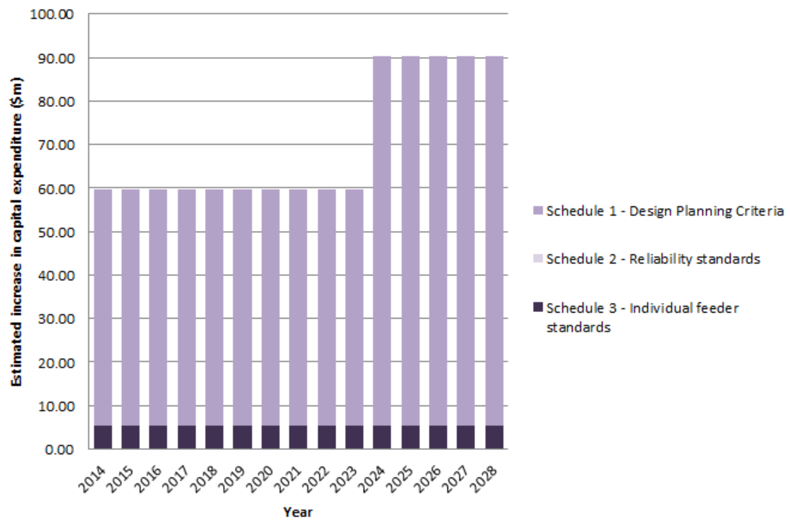
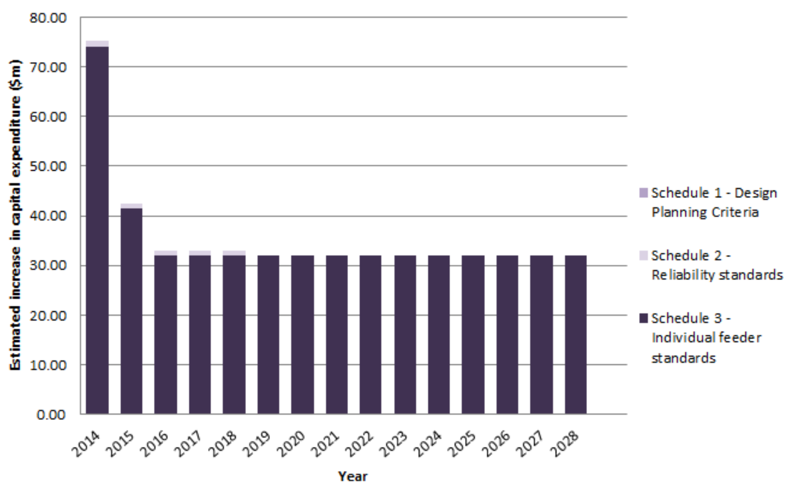


Figure 5.34 Scenario 4: Essential Energy increase in capital expenditure



5.6.3 Impact on distribution reliability

The issues identified above in section 5.6.2 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.[60] 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.

60 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 5.35 Scenario 4: Total decrease in expected energy not served

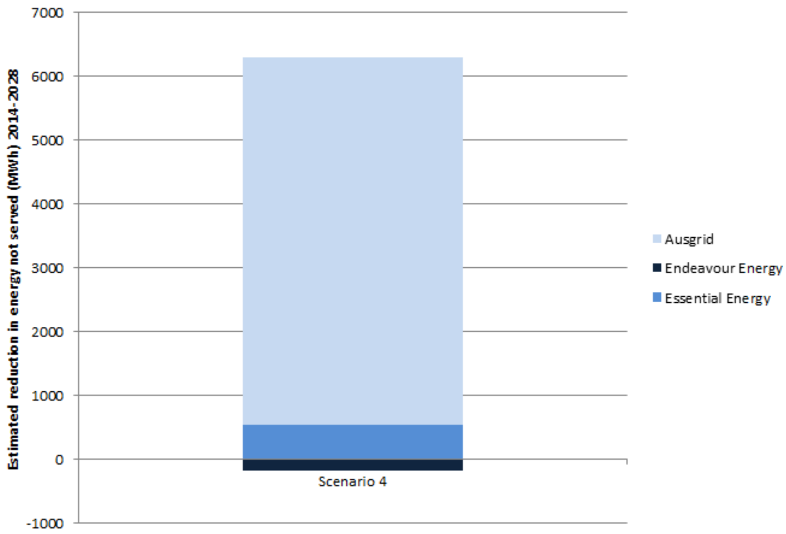


Figure 5.36 Scenario 4: Ausgrid decrease in expected energy not served

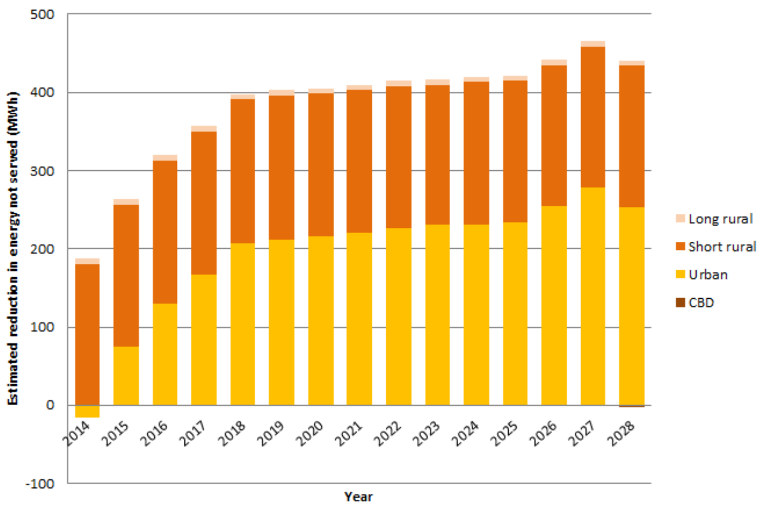


Figure 5.37 Scenario 4: Endeavour Energy decrease in expected energy not served

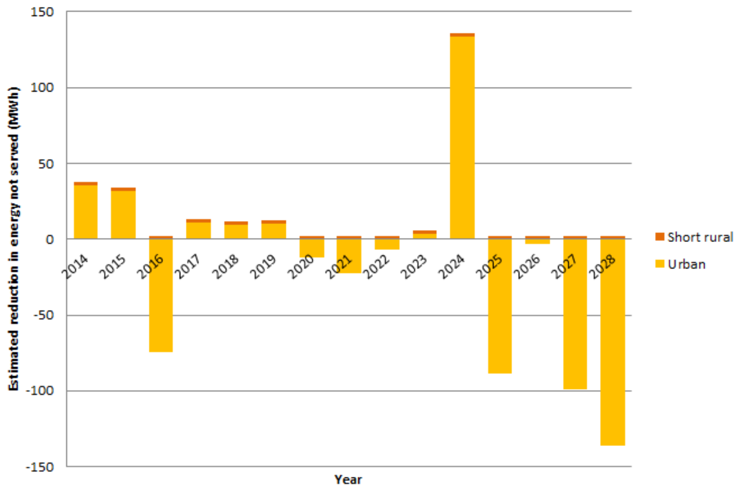
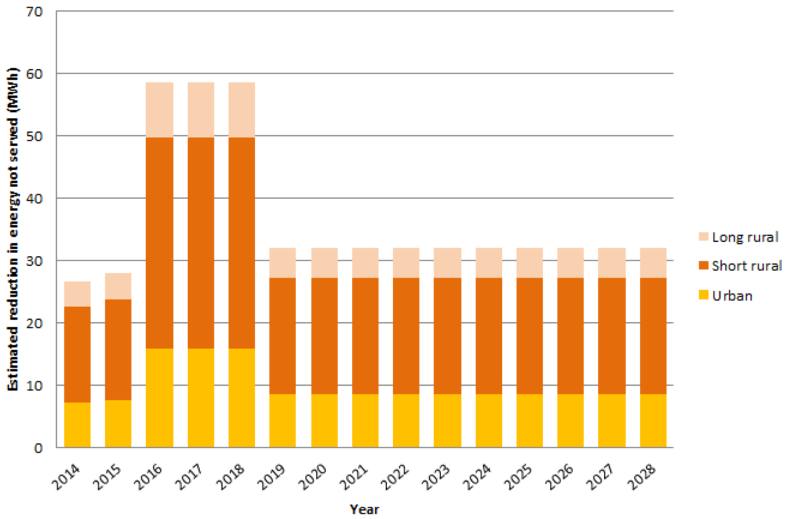
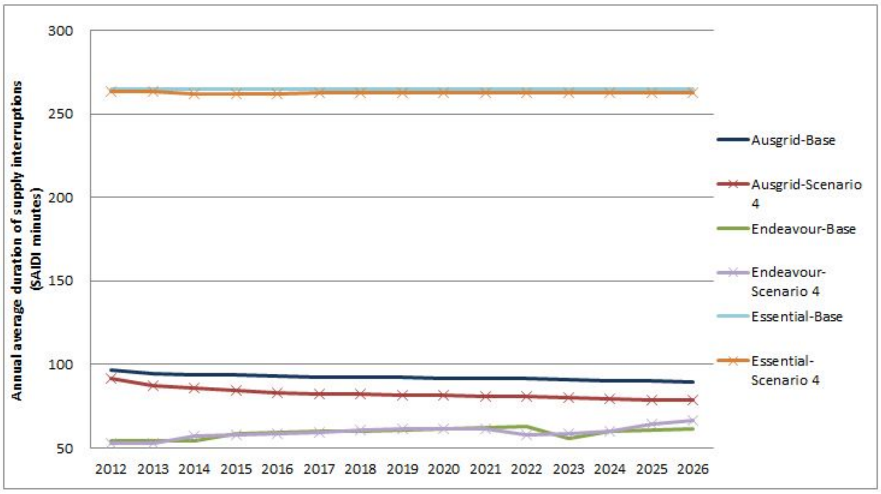


Figure 5.38 Scenario 4: Essential Energy decrease in expected energy not served



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



5.6.4 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 5.7 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	$69m	$2	1,509 MWh	$96m	10 minutes	Benefits exceed costs
Endeavour Energy	$226m	$10	25 MWh	$3m	1 minute	Costs exceed benefits
Essential Energy	$171m	$10	230 MWh	$15m	3 minutes	Costs exceed benefits
NSW total	$467m	$6	1,764 MWh	$114m	5 minutes	Costs exceed benefits

Table 5.8 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	$75m	$1	5,743 MWh	$234m	11 minutes	Benefits exceed costs
Endeavour Energy	$498m	$27	-174 MWh	-$2m	- 5 minutes	Costs exceed benefits
Essential Energy	$293m	$20	550 MWh	$26m	2 minutes	Costs exceed benefits
NSW total	$867m	$13	6,120 MWh	$258m	4 minutes	Costs exceed benefits

5.7 Options for changes to the proposed scenarios

After considering the results of the modelling that has been undertaken by the NSW DNSPs, Nuttall Consulting has suggested that some further changes to our proposed scenarios should be considered. These changes include:

- 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.[61]

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 suggest 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.[62] 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.

  Nuttall Consulting has estimated that over the 2014/15 to 2028/29 modelling timeframe, for Essential Energy alone capital expenditure would be around $300m higher for Scenarios 2 and 3 if this limit was removed and there would be around 4,000 MWh less expected energy not served under Scenario 2 and 3,500 MWh less expected energy not served under Scenario 3, compared to the current modelled outcomes for Scenarios 2 and 3.[63]

- 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.[64]

Changes to the scenarios could potentially be modelled by the DNSPs in the period prior to the AEMC's final report, which will be published in late August 2012. Remodelling could also be undertaken by the DNSPs to resolve some of the methodology issues raised by Nuttall Consulting, if it was considered that the remodelling would have a significant effect on the AEMC's cost-benefit assessment. However, we note that the timeframes for this would be very tight and only high level analysis would be possible.

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61 Nuttall Consulting report, p. 80.

62 Nuttall Consulting report, p. 84.

63 Ibid.

64 Nuttall Consulting report, p. 86.

We also note 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. As major event days are excluded from SAIDI and SAIFI figures, 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.[65] Aligning this definition would have limited implications and would reduce the regulatory burden for the NSW DNSPs. This change to the licence conditions could also be considered if any amendments are made to the conditions.

Question 3 Options for changes to the proposed scenarios

a) Should any further changes to the AEMC's proposed scenarios be considered? If so, what changes should be considered?

b) Are there any additional impacts associated with the AEMC's proposed scenarios which should be taken into account? For example, this could include impacts which may have been difficult to model by the DNSPs?

c) Should the definition of a "major event day" in the NSW licence conditions be aligned to the definition used in the AER's reporting framework?

5.8 Conclusions

Table 5.9 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.

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

Table 5.9 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	**$112m reduction**	-$1	119 MWh increase	No change in 2018/19	**$8m increase**	**Benefits exceed costs**
	15 years	**$231m reduction**	-$3	1,047 MWh increase	2 minute increase in 2028/29	**$37m increase**	**Benefits exceed costs**
2: Large reduction in reliability	5 years	**$312m reduction**	-$4	1,197 MWh increase	5 minute increase in 2018/19	**$76m increase**	**Benefits exceed costs**
	15 years	**$866m reduction**	-$15	8,802 MWh increase	13 minute increase in 2028/29	**$321m increase**	**Benefits exceed costs**
3: Extreme reduction in reliability	5 years	**$429m reduction**	-$5	1,704 MWh increase	7 minute increase in 2018/19	**$110m increase**	**Benefits exceed costs**
	15 years	**$1,098m reduction**	-$18	11,010 MWh increase	15 minute increase in 2028/29	**$415m increase**	**Benefits exceed costs**
4: Improvement in reliability	5 years	**$467m increase**	+$6	1,764 MWh reduction	5 minute reduction in 2018/19	**$114m reduction**	**Costs exceed benefits**
	15 years	**$867m increase**	+$13	6,120 MWh reduction	4 minute reduction in 2028/29	**$258m 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 fourteen 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 $37, 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.

Figure 5.40 Change in capital expenditure by scenario 2014/15 to 2028/29

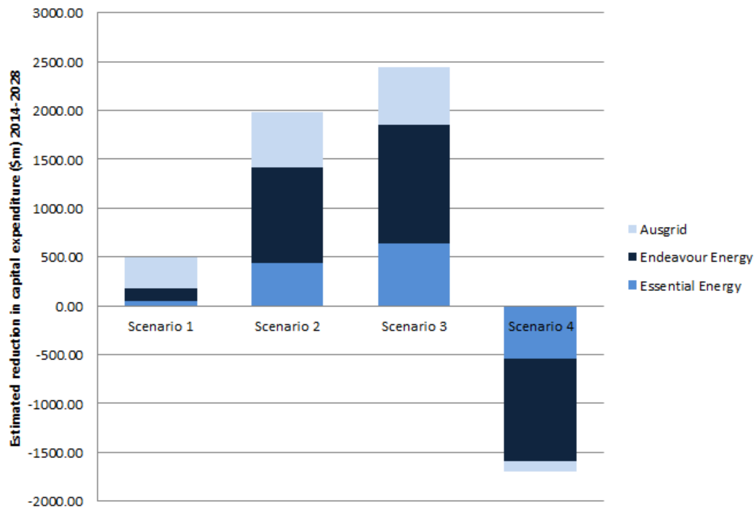


Figure 5.41 Change in expected energy not served by scenario 2014/15 to 2028/29

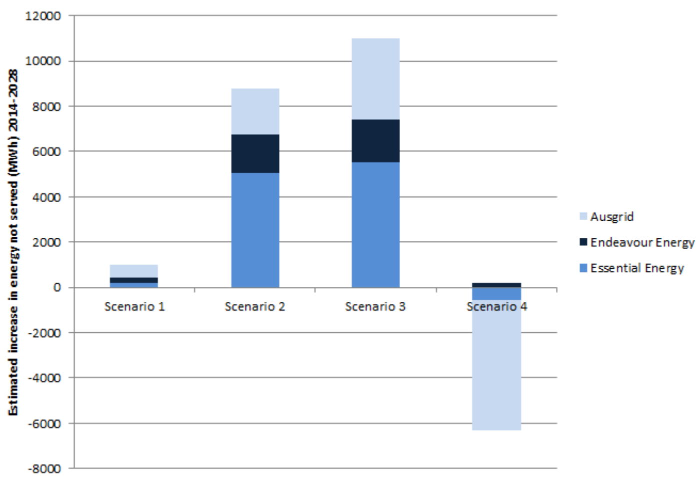


Figure 5.42 Comparison of the change in capital expenditure and expected energy not served by scenario: 2014/15 to 2028/29

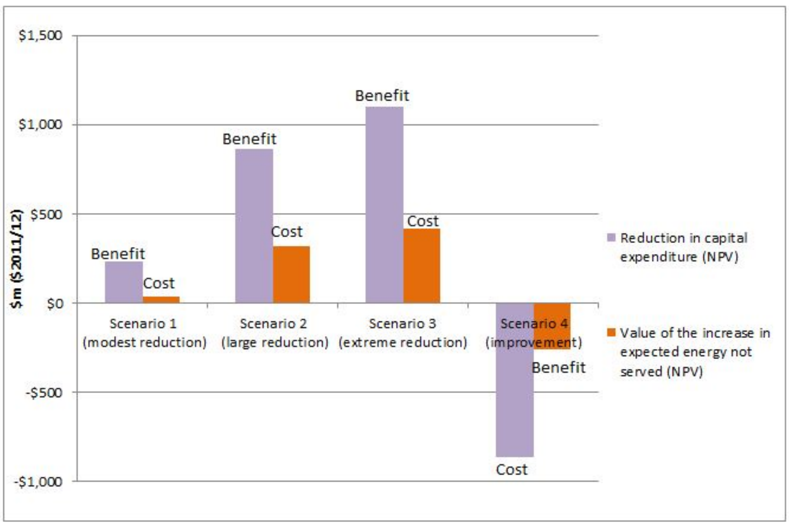


Figure 5.43 Trade off between cost and reliability by scenario: 2018/19

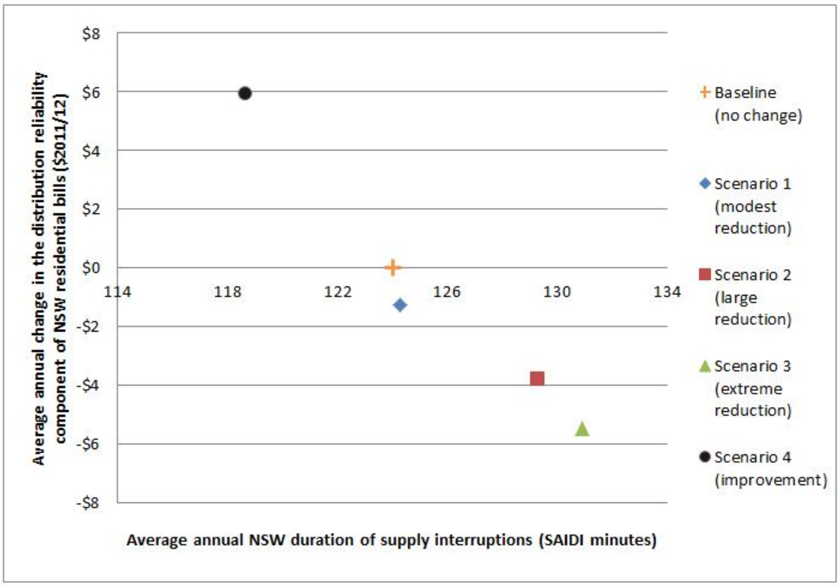
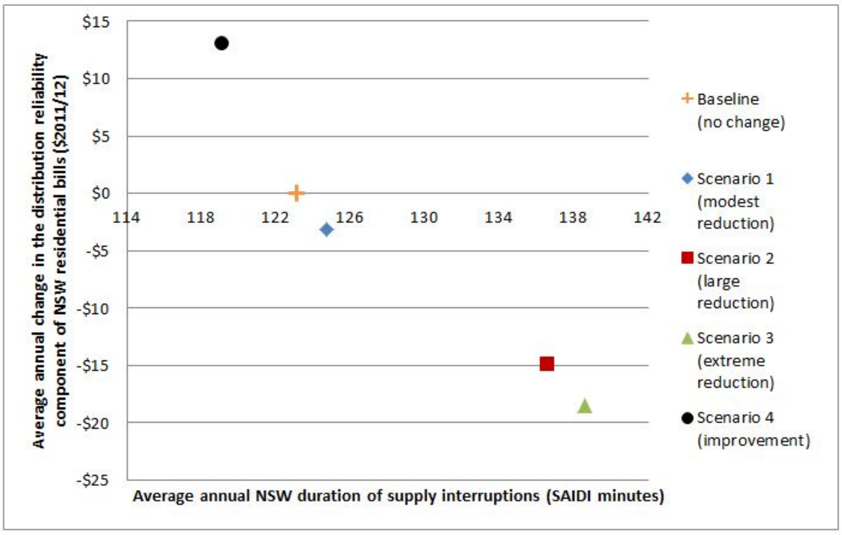


Figure 5.44 Trade off between cost and reliability by scenario: 2028/29



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. 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 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.[66]

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.[67]

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

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

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 Victoria and 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.

6.2 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.[68]

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.[69] 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.

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

69 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.

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.

6.3 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.

6.3.1 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.[70] 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.[71] 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.

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.

70 Clause 6.8.2(b)(1) of the NER.

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

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

6.3.2 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.[72]

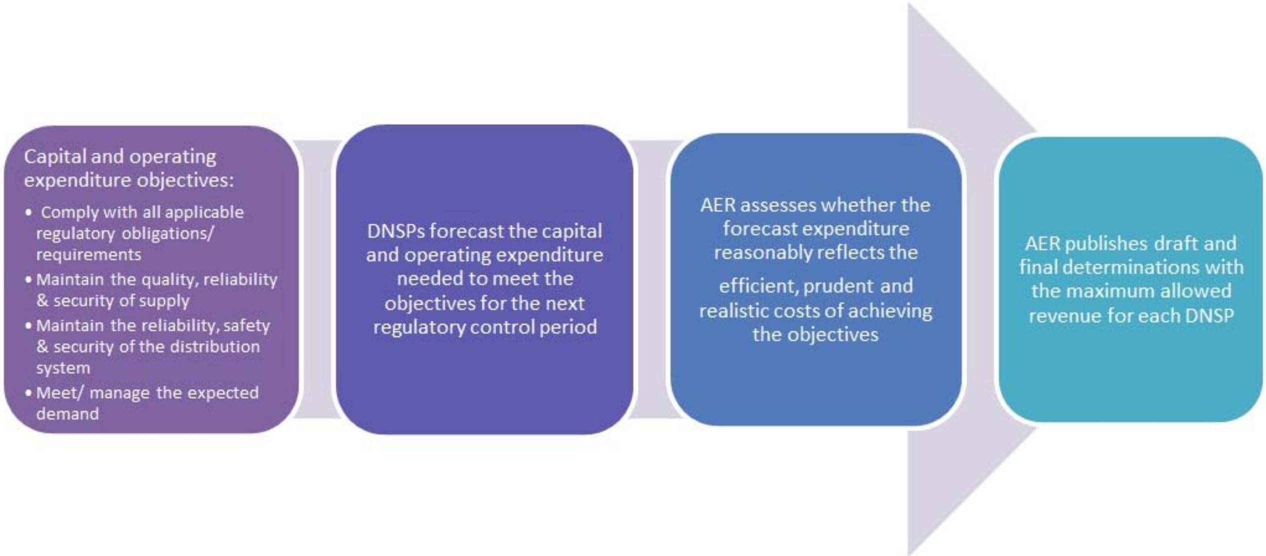
The AER is required to accept a DNSP's forecast expenditure where it is satisfied that the expenditure reasonably reflects the efficient, prudent and realistic costs of achieving the capital and operating expenditure objectives.[73]

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

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

73 Clauses 6.5.6(c) and 6.5.7(c) of the NER.

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

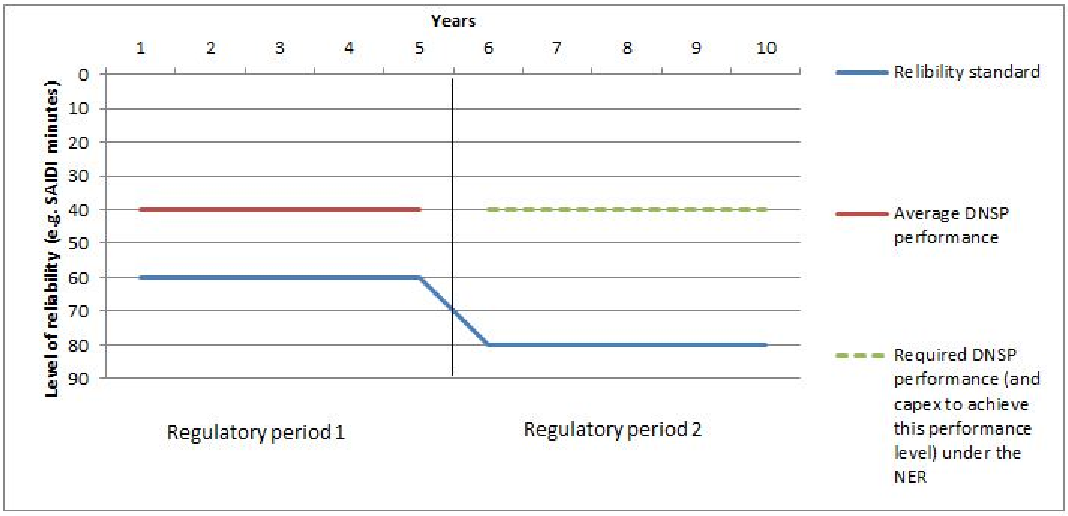


Under the current wording in the capital and operating expenditure objectives, the need to "maintain" the reliability of standard control services and the distribution system has implications where jurisdictional requirements are amended to require DNSPs to provide a lower level of reliability compared 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.[74] We released a directions paper on this rule change proposal in March 2012, which asked for comment on this issue.[75]

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.[76]

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.[77] 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 6.3.1, 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.

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.

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

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

76 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.

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

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.

6.3.3 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).[78]Performance targets are generally based on the average performance of the DNSP over the previous five regulatory years.[79] However, performance targets may be modified by a number of factors, including any factors that are expected to "materially affect" reliability performance.[80]

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.

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78 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.

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

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

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.[81]

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.[82]

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.[83] 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.[84]

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.

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

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

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

84 Ibid.

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.[85] 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.[86] 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.

6.4 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.

6.4.1 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 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.[87]

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. 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.[88] 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.

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

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

87 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

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

6.4.2 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.

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% compliance with the average SAIDI and SAIFI targets in schedule 2 each year, only Endeavour Energy appears to be seeking to achieve 100% compliance.[89] In comparison, during the AER's distribution determination process for the current regulatory control period, Ausgrid suggested it was seeking to achieve a 95% probability of compliance, while Essential Energy was seeking to achieve an 80% probability of compliance.[90] The AER considered that the NSW DNSPs had targeted appropriate levels of compliance, given the costs and benefits of the alternatives.[91]

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.[92] 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.

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 of reliability are prudent and necessary to deliver acceptable levels of customer service.

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

90 Ibid.

91 Ibid.

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

For example, from discussions we have had with Essential Energy we understand that it provides a n-1 level of redundancy for zone substations where the customer load exceeds 5MVA, despite the licence conditions only requiring a n-1 level of redundancy for loads which are larger than 15MVA.[93]

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.

Question 4 Implementation considerations

a) Are there any other implementation considerations that should be taken into account in relation to the AEMC's scenarios for distribution reliability in NSW?

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

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 forecast demand	2% of time (no forecast demand limit)	No change
Sub-transmission	N load at risk	Thermal	Thermal	Thermal	Thermal	No change

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
substations, OH and UG lines and zone substations		capacity at 115% of forecast demand	capacity to meet 10% PoE forecast peak demand, but capped at 115% of the 50% PoE maximum demand	capacity to meet 10% PoE forecast peak demand, but capped at 115% of the 50% PoE maximum demand	capacity at 100% of forecast demand	
	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 capped at 115% of the 50%	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

Network type	Licence condition change type	Existing	Scenario 1 (modest)	Scenario 2 (large)	Scenario 3 (extreme)	Scenario 4 (improve)
			PoE maximum 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 Sensitivity analysis: Cost-benefit assessment

This Appendix outlines the results of three sensitivities to our cost- benefit assessment for the four scenarios for distribution reliability in NSW we have developed. These sensitivities include:

1. using a discount rate of seven per cent rather than 10.02 per cent to calculate the net present value of the change in capital expenditure and the value of the expected energy not served;

2. using a discount rate of five per cent rather than 10.02 per cent to calculate the net present value of the change in capital expenditure and the value of the expected energy not served; and

3. converting the change in capital expenditure to a net present value, but not converting the change in the value of expected energy not served to a net present value. A discount rate of 10.02 per cent was used to undertake this sensitivity.

The results for each sensitivity are set out below for each DNSP and at a NSW level. Results are outlined for a five year timeframe and a fifteen year timeframe. The overall results of the cost-benefit assessments for the first two sensitivities are unchanged compared to the cost-benefit assessment set out in chapter 5.

However, in the third sensitivity, there are some differences in the cost-benefit results at a DNSP level over a fifteen year timeframe (but not at an overall NSW level or over a five year timeframe) in Scenario 2 and Scenario 3. The costs and benefits under Scenario 3 under the third sensitivity are extremely close. Accordingly, if it was determined that the value of expected energy not served should not be converted into a net present value, it is questionable whether this scenario may deliver net benefits on a NSW level.

B.1 Sensitivity 1 - Seven per cent discount rate

Sensitivity one estimates the impact on the cost benefit assessment of applying a discount rate of seven per cent rather than 10.02 per cent, for each of the scenarios, over five and 15 year timeframes.

B.1.1 Scenario 1: Modest reduction in distribution reliability

Table B.1 Adjusted impact of Scenario 1 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	$70m	53 MWh	$4m	Benefits exceed costs
Endeavour Energy	$37m	38 MWh	$3m	Benefits exceed costs
Essential Energy	$13m	28 MWh	$2m	Benefits exceed costs
NSW total	$119	104 MWh	$9	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.2 Adjusted impact of Scenario 1 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	Result of cost-benefit assessment
Ausgrid	$168m	591 MWh	$25m	Benefits exceed costs
Endeavour Energy	$82m	213 MWh	$13m	Benefits exceed costs
Essential Energy	$32m	243 MWh	$11m	Benefits exceed costs
NSW total	$282	924 MWh	$49m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.1.2 Scenario 2: Large reduction in distribution reliability

Table B.3 Adjusted impact of Scenario 2 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	$126m	426 MWh	$28m	Benefits exceed costs
Endeavour Energy	$95m	78 MWh	$7m	Benefits exceed costs
Essential Energy	$110m	693 MWh	$49m	Benefits exceed costs
NSW total	$330m	1197 MWh	$84m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.4 Adjusted impact of Scenario 2 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	Result of cost-benefit assessment
Ausgrid	$313m	2071 MWh	$95m	Benefits exceed costs
Endeavour Energy	$506m	1684 MWh	$82m	Benefits exceed costs
Essential Energy	$259m	5047 MWh	$240m	Benefits exceed costs
NSW total	$1078m	8802 MWh	$417m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.1.3 Scenario 3: Extreme reduction in distribution reliability

Table B.5 Adjusted impact of Scenario 3 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	$172m	654 MWh	$44m	Benefits exceed costs
Endeavour Energy	$129m	119 MWh	$11m	Benefits exceed costs
Essential Energy	$155m	931 MWh	$66m	Benefits exceed costs
NSW total	$456m	1704 MWh	$121m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.6 Adjusted impact of Scenario 3 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	Result of cost-benefit assessment
Ausgrid	$350m	3608 MWh	$168m	Benefits exceed costs
Endeavour Energy	$630m	1852 MWh	$92m	Benefits exceed costs
Essential Energy	$377m	5551 MWh	$271m	Benefits exceed costs
NSW total	$1356m	11010 MWh	$532m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.1.4 Scenario 4: Improvement in distribution reliability

Table B.7 Adjusted impact of Scenario 4 over five years from 2014/15 to 2018/19

DNSP	Increase in capital expenditure (NPV)	Reduction in expected energy not served	Value of the reduction in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	$71m	1,509 MWh	$105mBenefits exceed costs	
Endeavour Energy	$245m	25 MWh	$3m	Costs exceed benefits
Essential Energy	$183m	230 MWh	$18m	Costs exceed benefits
NSW total	$500m	1764 MWh	$126m	Costs exceed benefits

Note- Totals may not sum due to rounding.

Table B.8 Adjusted impact of Scenario 4 over fifteen years from 2014/15 to 2028/29

DNSP	Increase in capital expenditure (NPV)	Reduction in expected energy not served	Value of the reduction in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	$83m	5743 MWh	$287m	Benefits exceed costs
Endeavour Energy	$608m	174 MWh	$5m	Costs exceed benefits
Essential Energy	$343m	551 MWh	$31m	Costs exceed benefits
NSW total	$1033m	6120 MWh	$314m	Costs exceed benefits

Note- Totals may not sum due to rounding.

B.2 Sensitivity 2- Five per cent discount rate

Sensitivity two estimates the impact on the cost benefit assessment of applying a discount rate of five per cent rather than 10.02 per cent, for each of the scenarios, over five and 15 year timeframes.

B.2.1 Scenario 1: Modest reduction in distribution reliability

Table B.9 Adjusted impact of Scenario 1 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	$73m	53 MWh	$4m	Benefits exceed costs
Endeavour Energy	$38m	38 MWh	$4m	Benefits exceed costs
Essential Energy	$13m	28 MWh	$2m	Benefits exceed costs
NSW total	$125m	104 MWh	$9m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.10 Adjusted impact of Scenario 1 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	$198m	591 MWh	$30m	Benefits exceed costs
Endeavour Energy	$92m	213 MWh	$15m	Benefits exceed costs
Essential Energy	$37m	243 MWh	$13m	Benefits exceed costs
NSW total	$327m	924 MWh	$58m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.2.2 Scenario 2: Large reduction in distribution reliability

Table B.11 Adjusted impact of Scenario 2 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	$128m	426 MWh	$30m	Benefits exceed costs
Endeavour Energy	$100m	78 MWh	$7m	Benefits exceed costs
Essential Energy	$116m	693 MWh	$53m	Benefits exceed costs
NSW total	$343m	1197 MWh	$90m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.12 Adjusted impact of Scenario 2 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	$363m	2071 MWh	$113m	Benefits exceed costs
Endeavour Energy	$605m	1684 MWh	$103m	Benefits exceed costs
Essential Energy	$296m	5047 MWh	$285m	Benefits exceed costs
NSW total	$1264m	8802 MWh	$501m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.2.3 Scenario 3: Extreme reduction in distribution reliability

Table B.13 Adjusted impact of Scenario 3 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	$398m	3608 MWh	$199m	Benefits exceed costs
Endeavour Energy	$136m	119 MWh	$11m	Benefits exceed costs
Essential Energy	$163m	931 MWh	$71m	Benefits exceed costs
NSW total	$475m	1704 MWh	$129m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.14 Adjusted impact of Scenario 3 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	$176m	653 MWh	$47m	Benefits exceed costs
Endeavour Energy	$751m	1852 MWh	$115m	Benefits exceed costs
Essential Energy	$432m	5551 MWh	$320m	Benefits exceed costs
NSW total	$1581m	11010 MWh	$633m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.2.4 Scenario 4: Improvement in distribution reliability

Table B.15 Adjusted impact of Scenario 4 over five years from 2014/15 to 2018/19

DNSP	Increase in capital expenditure (NPV)	Reduction in expected energy not served	Value of the reduction in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	$73m	1509 MWh	$111m	Benefits exceed costs
Endeavour Energy	$259m	25 MWh	$3m	Costs exceed benefits
Essential Energy	$192m	230 MWh	$18m	Costs exceed benefits
NSW total	$524m	1764 MWh	$132m	Costs exceed benefits

Note- Totals may not sum due to rounding.

Table B.16 Adjusted impact of Scenario 4 over fifteen years from 2014/15 to 2028/29

DNSP	Increase in capital expenditure (NPV)	Reduction in expected energy not served	Value of the reduction in expected energy not served (NPV)	Result of cost-benefit assessment
Ausgrid	$89m	5743 MWh	$333m	Benefits exceed costs
Endeavour Energy	$701m	-174 MWh	-$8m	Costs exceed benefits
Essential Energy	$385m	550 MWh	$35m	Costs exceed benefits
NSW total	$1175m	6120 MWh	$360m	Costs exceed benefits

Note- Totals may not sum due to rounding.

B.3 Sensitivity 3 - Not converting the value of expected energy not served into a net present value

Sensitivity three estimates the impact of not converting the value of expected energy not served into a net present value on the cost benefit assessment for each scenario, over five and 15 year timeframes. However, the change in capital expenditure has been converted into a net present value, and a discount rate of 10.02 per cent has been used.

This sensitivity has been undertaken as it is recognised that it is likely that customers' value of reliability will increase into the future. As a result, it may not be appropriate to discount the value of expected energy not served.

B.3.1 Scenario 1: Modest reduction in distribution reliability

Table B.17 Adjusted impact of Scenario 1 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	Result of cost-benefit assessment
Ausgrid	$66m	53 MWh	$5m	Benefits exceed costs
Endeavour Energy	$34m	38 MWh	$4m	Benefits exceed costs
Essential Energy	$12m	28 MWh	$3m	Benefits exceed costs
NSW total	$112m	104 MWh	$12m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.18 Adjusted impact of Scenario 1 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	Result of cost-benefit assessment
Ausgrid	$136m	591 MWh	$51m	Benefits exceed costs
Endeavour Energy	$70m	213 MWh	$24m	Benefits exceed costs
Essential Energy	$26m	243 MWh	$22m	Benefits exceed costs
NSW total	$231m	924 MWh	$97m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.3.2 Scenario 2: Large reduction in distribution reliability

Table B.19 Adjusted impact of Scenario 2 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	Result of cost-benefit assessment
Ausgrid	$122m	426 MWh	$37m	Benefits exceed costs
Endeavour Energy	$88m	78 MWh	$9m	Benefits exceed costs
Essential Energy	$101m	693 MWh	$63m	Benefits exceed costs
NSW total	$312m	1197 MWh	$108m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.20 Adjusted impact of Scenario 2 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	Result of cost-benefit assessment
Ausgrid	$258m	2071 MWh	$180m	Benefits exceed costs
Endeavour Energy	$394m	1684 MWh	$186m	Benefits exceed costs
Essential Energy	$214m	5047 MWh	$458m	Costs exceed benefits
NSW total	$866m	8802 MWh	$824m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.3.3 Scenario 3: Extreme reduction in distribution reliability

Table B.21 Adjusted impact of Scenario 3 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	Result of cost-benefit assessment
Ausgrid	$166m	653 MWh	$57m	Benefits exceed costs
Endeavour Energy	$120m	119 MWh	$13m	Benefits exceed costs
Essential Energy	$143m	931 MWh	$84m	Benefits exceed costs
NSW total	$429m	1704 MWh	$154m	Benefits exceed costs

Note- Totals may not sum due to rounding.

Table B.22 Adjusted impact of Scenario 3 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	Result of cost-benefit assessment
Ausgrid	$295m	3608 MWh	$313m	Benefits exceed costs
Endeavour Energy	$491m	1852 MWh	$205m	Benefits exceed costs
Essential Energy	$312m	5551 MWh	$504m	Costs exceed benefits
NSW total	$1098m	11010 MWh	$1022m	Benefits exceed costs

Note- Totals may not sum due to rounding.

B.3.4 Scenario 4: Improvement in distribution reliability

Table B.23 Adjusted impact of Scenario 4 over five years from 2014/15 to 2018/19

DNSP	Increase in capital expenditure (NPV)	Reduction in expected energy not served	Value of the reduction in expected energy not served	Result of cost-benefit assessment
Ausgrid	$69m	1509 MWh	$131m	Benefits exceed costs
Endeavour Energy	$226m	25 MWh	$3m	Costs exceed benefits
Essential Energy	$171m	230 MWh	$21m	Costs exceed benefits
NSW total	$467m	1764 MWh	$155m	Costs exceed benefits

Note- Totals may not sum due to rounding.

Table B.24 Adjusted impact of Scenario 4 over fifteen years from 2014/15 to 2028/29

DNSP	Increase in capital expenditure (NPV)	Reduction in expected energy not served	Value of the reduction in expected energy not served	Result of cost-benefit assessment
Ausgrid	$75m	5743 MWh	$498m	Benefits exceed costs
Endeavour Energy	$498m	-174 MWh	-$19m	Costs exceed benefits
Essential Energy	$293m	550 MWh	$50m	Costs exceed benefits
NSW total	$867m	6120 MWh	$529m	Costs exceed benefits

Note- Totals may not sum due to rounding.

C Summary of submissions on the NSW workstream issues paper

This Appendix sets out a summary of the issues raised in submissions on the NSW workstream issues paper and the AEMC's response to the issues raised.

Table C.1 Summary of submissions on NSW workstream issues paper

Issue raised	Stakeholder	AEMC response
Background and context for the NSW workstream		
What is the actual proportion of network prices attributable to reliability outcomes - ie, what are the potential price impacts on changing reliability standards on retail prices for end users?	MEU, pg. 12.	The AEMC's draft report includes an estimate of the change in the distribution component of residential electricity prices associated with each scenario for NSW distribution reliability outcomes.
The AEMC should understand how different 'drivers' of capex contribute to the overall network reliability. For example, capex driver by growth and replacement can also have significant impacts on reliability.	MEU, pg. 14.	The AEMC requested the NSW DNSPs to provide information on the drivers of forecast capital expenditure under each scenario for NSW distribution reliability outcomes. The DNSPs' forecast capital expenditure for each scenario, together with the drivers of this expenditure, is set out in the draft report and Nuttall Consulting's consultant report.
In order to *guarantee* that the standards are met, in reality reliability performance consistently exceeds the standards. Clarification around the consequences for not meeting the reliability standards should be provided - ie is it true that the conditions require 100% compliance, and should this be the case? The only consequence for not meeting the reliability conditions which is spelt out in the conditions is that the DNSPs must report on non compliance.	MEU, pg. 9.	Under the existing NSW distribution licence conditions, the NSW DNSPs are required to meet the SAIDI and SAIFI targets set out in schedule 2 of the conditions in every year. The licence conditions are enforceable under the *Electricity Supply Act 1995* by IPART and the NSW Energy Minister. In the scenarios for lower distribution reliability outcomes that were considered, we included changes to schedule 2 of the licence conditions which specified the confidence levels that the reliability standards in any year would not be exceeded. These confidence levels ranged from 50% to

Issue raised	Stakeholder	AEMC response
		75%, and would effectively allow the DNSPs greater flexibility in how they comply with the SAIDI and SAIFI targets.
The AEMC should be aware of the AER's role in driving reliability outcomes, which may result in higher reliability than mandated in the NSW licence conditions. The AEMC should ensure consistency between the NSW licence conditions and the AER's STPIS, for example, if the reliability outcomes in the NSW licence conditions are lowered, DNSPs should not incur penalties for reduced reliability performance. Alternatively, the AEMC should consider if there is indeed a need for standards where a STPIS is in place. Ausgrid notes that the STPIS uses Victorian values for the incentive rates. The responsibility for setting reliability standards should lie with the AER because only it has the ability to balance the cost with setting the standard.	Endeavour Energy, pg. 1; MEU, pp. 3, 8; Ausgrid, pg. 9.	The AEMC understands that the NSW DNSPs will become subject to the STPIS in the next regulatory control period. We note that changes to the NSW distribution licence conditions and the development of a NSW VCR may have implications for how the STPIS is applied to NSW DNSPs. The AEMC has outlined these implications and set out possible options to address these implications in chapter 6 of the draft report. Jurisdictional authorities remain responsible for setting distribution reliability standards. However, the national workstream will explore whether there is merit in a nationally consistent approach to distribution reliability.
The reliability standards in the licence conditions should be clearly defined - ambiguity makes it easier to justify a range of expenditure plans and makes it more difficult for the AER to review and challenge proposals. Ambiguity can also have implications for the AER's compliance and enforcement role.	AER, pg. 2.	In drafting scenarios for NSW distribution reliability outcomes, we have sought to be as clear as possible in defining the proposed changes to the licence conditions. However, the AEMC would welcome comments on whether the proposed wording in the licence conditions could be further clarified.
The retention of deterministic standards for NSW for the next regulatory period should not preclude probabilistic standards being considered for a nationally consistent approach. The Rules would allow for a probabilistic planning approach to be implemented in NSW after the commencement of the next regulatory period at the conclusion of the national review.	SP AusNet, pg. 2.	Under the MCE's terms of reference and timetable for the NSW workstream, a fundamental re-design of the way the NSW distribution reliability standards are expressed cannot be considered under this workstream. However, the AEMC agrees that this does not preclude the consideration of changes to the approach that is used to deliver NSW distribution reliability outcomes in the national workstream. The AEMC will publish an

Issue raised	Stakeholder	AEMC response
		issues paper for the national workstream in June 2012 which will set out the proposed scope and approach for this workstream.
Standards should provide an incentive for the DNSP to optimise the mix of approaches available to deliver the reliability outcomes required. The current NSW licence conditions do not appear to provide sufficient opportunity for non-network investment. The focus of the licence conditions should be end use service, rather than assets.	AEMO, pg. 2.	The AEMC notes that schedule 1 of the NSW distribution licence conditions specifies the planning criteria that must be applied in developing the NSW distribution networks. As discussed above, under the MCE's terms of reference, the AEMC is unable to consider a fundamental re-design of the way the NSW distribution reliability standards are currently expressed, which includes schedule 1 of the licence conditions. More fundamental changes to the approaches used to deliver distribution reliability in the NEM can be considered under the national workstream. We are also currently undertaking work to consider how non-network investments can be undertaken in an economically efficient manner in other projects. These projects include the AEMC's Power of Choice review and its consideration of the Distribution Network Planning and Expansion Framework Rule change proposal.
Scope of the NSW workstream		
To ensure that any improvements are passed onto NSW customers ahead of the 2019 regulatory period, and departures from the current licence conditions would not be too onerous for implementation by DNSPs, any changes to the NSW licence conditions should be considered transitional arrangements ahead of the national review. The review is appropriately framed given the timeframes, noting that an opportunity to provide the AER with a revised regulatory proposal may not present itself. Any amendments to the licence conditions need to be made with adequate time to prepare regulatory proposals on the	AEMO, pg. 1. Citipower Powercor, pg. 2. Ausgrid, pg. 4; Endeavour Energy, pg. 3.	The AEMC's final report will be published in August 2012. The AEMC's advice will then be considered by the NSW Government who will decide if any changes to the NSW distribution licence conditions should be made for the 2014/15 to 2018/19 regulatory control period. The AEMC notes that ideally any changes to the NSW distribution licence conditions should be made to allow the NSW DNSPs sufficient time to include the impact of these changes in their regulatory proposals for the next regulatory control period. These regulatory proposals are due to be submitted to the AER by the end of May 2013.

Issue raised	Stakeholder	AEMC response
amendments for the AER.		
The AEMC should concentrate on the reliability issues for the worst performing elements of the networks as these operate at less than the targeted reliability. The schedule 3 minimum feeder standards should be combined with an obligation to improve the feeders which are consistently the worst performing feeders even if the service performance is not less than the minimum.	MEU, pp. 7, 25, 15.	Under the current distribution licence conditions, the NSW DNSPs have an obligation to provide quarterly reports to the Minister on the details of the remedial action they propose to take to address feeders which exceed the individual feeder standards in schedule 3 of the licence conditions.[94] Under Scenario 4, the AEMC has included changes to schedule 3 of the NSW distribution licence conditions, which would result in improved standards for individual feeders and would also require the DNSPs to undertake corrective action on up to 10% of their feeders in a year.
A probabilistic approach involves the explicit assessment of marginal costs, risks, and benefits of improved reliability, which is more likely to ensure efficient investment. For remote customers where reliable electricity supply is difficult to justify on economic grounds, a default level of service may be appropriate. However this default level should be output focussed, rather than asset focussed.	AEMO, pg. 2.	We consider that issues relating to the application of a probabilistic planning approach to remote areas are outside the scope of the NSW workstream. However, these issues could be explored under the national workstream.
The licence conditions should also account for planned outages. For customers there is often little difference between a planned and unplanned outage as they are both inconvenient. Recognising both outages in the licence conditions may ensure that planned outages are scheduled to minimise inconvenience to customers, and ensure that performance reporting does not provide a distorted picture of the actual level of service received by customers.	MEU, pg. 15.	Planned outages are currently excluded from the SAIDI and SAIFI targets for the NSW DNSPs. The NSW DNSPs are required to provide customers with advance notice of any planned interruptions, which should assist customers to manage the impact of the interruption. The national workstream will consider the reporting requirements associated with distribution reliability across the NEM. Greater consistency in how planned outages are reported on could be considered under this workstream.
Customer service standards (schedule 5 of the licence	Endeavour	The AEMC has excluded customer service standards from the scope of

94 Clause 18.4 of the NSW distribution licence conditions.

Issue raised	Stakeholder	AEMC response
conditions) should be excluded from the scope of the NSW workstream because they do not have a significant impact on reliability investments, and have no impact on the reliability outcomes achieved.	Energy, pg. 1; MEU, pg. 15; Ausgrid, pg. 2.	the NSW workstream as we agree that the customer service standards do not have a significant impact on capital investment.
Rather than high cost extensive network upgrades to improve reliability, customers may value improved communication during outages, which is relatively low cost. If better communication is important to customers, the licence conditions could be amended to include communication standards during to customer during outages, for example, sending SMS messages to affected customers advising them of coverage and likely duration of the outage.	Essential Energy, AEMO, pg. 2; Customer Council of Essential Energy, pg. 1; Rural Advisory Group of Essential Energy, pg. 1.	We have included a question in our VCR survey which asks NSW consumers whether they would prefer more information during and following outages. However, this issue is not considered to be directly related to the MCE's terms of reference for the NSW workstream. We also note where DNSPs can demonstrate to the AER that an improved communication system represents a prudent and efficient way to meet the capital and operating expenditure objectives in the NER, the AER may allow these costs to be recovered. For example, other DNSPs in the NEM such as Citipower and Powercor in Victoria currently have communications systems in place to advise consumers by SMS or email of outages in their area.[95]
Time of use pricing may reduce peak consumption as an efficient way of improving network reliability.	MEU, pg. 17.	The use of non-network options to improve network reliability are considered outside the scope of the NSW workstream. However, the AEMC notes that it is currently undertaking a range of work to identify how non-network investments can be undertaken in an economically efficient manner. This work includes the AEMC's Power of Choice review and its consideration of the Distribution Network Planning and Expansion Framework Rule change proposal.
Quality of service (voltage dips and spikes) should be considered because they can cause considerable harm through production trips. These are not accounted for in the SAIDI/SAIFI measures.	MEU, pg. 17.	The NSW distribution licence conditions do not currently include any requirements relating to quality of service. As the MCE's terms of reference for the NSW workstream relates to the NSW distribution licence conditions, issues relating to quality of service are considered outside the scope of the NSW workstream. However, we note the Australian

95 Further details of Citipower and Powercor's communcations sytem can be found here: http://www.powercor.com.au/Latest_News/_97/

Issue raised	Stakeholder	AEMC response
		Standards and the NER set out requirements relating to quality of service for DNSPs.
Estimating the cost of different NSW distribution reliability scenarios,		
There is a risk that the DNSPs could use their extensive knowledge to the detriment of consumers by manipulating data sets provided the AEMC. Relying on AER data as a source of cost information will mean that the AEMC is using inflated costs as the basis of its assessment.	MEU, pp. 13, 16.	The AEMC engaged Nuttall Consulting, an independent technical consultant, to review the expenditure and reliability modelling that has been undertaken by the NSW DNSPs. Due to the limited time available for the DNSPs to prepare their modelling, the expenditure and reliability impacts outlined for each of the scenarios should only be considered as providing high level trends of what may occur under each scenario rather than providing a definitive forecast of likely reliability and expenditure outcomes.
Drivers of reliability expenditure		
The n-1 and n-2 security standards have driven significant capital expenditure on the sub-transmission network in the current regulatory period. By the end of the regulatory period, DNSPs will largely comply with these security standards. Therefore a reduction in the security standards for future regulatory periods will only have a small impact affecting the timing rather than the volume of expenditure.	Endeavour Energy, pg. 2.	We understand that a change in the licence conditions is likely to have a limited impact on expenditure in the short term, because of the large amount of expenditure which will be spent in the current regulatory control period to comply with the existing licence conditions. To address this, we have requested the NSW DNSPs to model the impacts of each considered scenario over a fifteen year timeframe. This will allow the impacts of each scenario to be more fully considered.
Reliability outcomes are most impacted by expenditure at the distribution feeder level which constitutes a minor component of Endeavour Energy's overall capital expenditure program.	Endeavour Energy, pg. 2	The scenarios that have been developed include a range of changes to the distribution licence conditions, which will affect assets across each of the three NSW DNSPs. The NSW DNSPs have been requested to model the expenditure and reliability impacts of each scenario, so that the drivers of expenditure and reliability under each scenario can be identified.
Capital expenditure can be deferred by increasing the utilisation of existing overhead distribution and transmission lines. The installation of ambient condition monitors with real-time rating	WEATHERATE, p. 1.	The scenarios include proposed changes to the licence conditions to improve the utilisation of distribution lines. However, each DNSP will determine the methods that should be used to meet any changes in the

Issue raised	Stakeholder	AEMC response
systems should be considered to improve the utilisation of lines.		licence conditions.
Developing reliability scenarios		
The impact of changes arising out of the review are likely to take many years to realise. The AEMC must be clear on the timeframes required for the purposes of analysis.	Ausgrid, pg. 8.	We have requested the NSW DNSPs to provide estimates of the likely implementation timeframes for each considered scenario. The NSW DNSPs were also requested to model the impacts of each scenario over a fifteen year timeframe to take into account the longer term impacts of these proposed changes. We have used this modelling to undertake a cost-benefit assessment for each scenario on a five year timeframe and a fifteen year timeframe.
Given the timeframes available for the review, it will not be possible to rigorously consider the impact of different reliability outcomes. It is a very complex task to prepare forecasts that isolate the forecasts attributable to reliability performance standards. Scenarios based on a different structure to the current licence conditions would be difficult to evaluate in the time allowed. A focus on incremental cost estimates compared to the base licence conditions are likely to be the most appropriate when considering the costs of alternative outcomes	Essential Energy, pg. 1-2; Endeavour Energy, pg. 2; Citipower Powercor, pg. 3; Ausgrid, pp. 2 and 8.	We have asked the NSW DNSPs to estimate the expenditure and reliability impacts of each considered scenario against a baseline of no change to the current distribution licence conditions. We are conscious the DNSPs have had a limited time to prepare this modelling and that a number of simplifying assumptions have been needed to finalise the modelling within the timeframes for the NSW workstream. As a result, the estimates provided by the DNSPs should be treated with some caution and should be viewed in terms of providing an indication of broad trends, rather than a precise estimate of likely changes in expenditure and reliability outcomes.
Developing reliability scenarios could involve the following changes to the NSW licence conditions: *Schedule 1* • changes to the 1% risk factor that currently applies to supply security criteria;	Ausgrid, pg. 6-7; Endeavour Energy, pg. 2.	We have held detailed workshops with the DNSPs to understand their drivers of expenditure and reliability performance in order to develop meaningful scenarios. Each of the AEMC's proposed scenarios for NSW distribution reliability outcomes includes a combination of different changes to the distribution licence conditions. The proposed changes to the distribution licence conditions in submissions have been taken into account in the development of scenarios.

Issue raised	Stakeholder	AEMC response
• differing times for the restoration of supply, • different capacity levels for network elements before supply security criteria apply, • changing average utilisation factors for urban distribution factors (note 4), • changing the forecast demand for thermal capacity of network components, • investigate whether it is appropriate to differentiate between performance based on whether it is overhead or underground infrastructure. *Schedules 2 and 3*: • different threshold levels of SAIDI for the different feeder classes or individual feeders standards, • recategorise feeders based on urban rural supply areas, rather than the demand along an entire feeder which may cover many types of customers, • change the confidence level of meeting the reliability outcomes.		
One of the lower scenario outcomes should be symmetrical with the higher scenario, to test whether resultant costs are symmetrical, and to gauge whether the cost data is consistent.	MEU, pg. 17.	We have not included a symmetrical lower and higher scenario in our proposed scenarios. As noted above, for each proposed scenario the AEMC has included a range of changes to the distribution licence conditions. The estimated expenditure and reliability impacts provided by the NSW DNSPs have been reviewed by an independent consultant.

Issue raised	Stakeholder	AEMC response
The NSW definition of major event day should be aligned with the definition used by the AER. This would ensure like for like comparison of performance.	Ausgrid, pg. 5.	The AEMC agrees in principle that aligning jurisdictional definitions of major event days with the AER's definition would make it easier to compare performance between the DNSPs and would also result in a lower regulatory burden for the DNSPs. We have requested comments from stakeholders on whether the licence conditions should be amended to require the NSW DNSPs to use the AER's definition of a major event day when reporting their performance to the NSW Government.
Deterministic input criteria are not required to deliver reliability outcomes. Alternatives may include smart network options.	Energex, pp. 1-2.	Alternative approaches to achieving reliability outcomes will be considered in the national workstream.
Measuring the benefits of NSW distribution reliability		
The terms of reference for this review specifically ask for a measure of willingness to pay. The VCR methodology is a measure of the benefits of augmenting the network which is not equivalent to customers' willingness to pay. Willingness to pay includes a level of acceptable performance which varies according to circumstance. The AEMC should carry out a willingness to pay survey and integrate this with the results of the surveys carried out by the Essential Services Commission of Victoria (which has used a willingness to pay methodology previously). The survey must include asking the basic question - is the customer willing to pay more for better reliability. In order to produce a meaningful strict 'willingness to pay'	Essential Energy, pg. 2; Endeavour Energy, pg. 3; Ausgrid, pg. 8-9; MEU, pg. 23.	We agree that the value of customer reliability and the willingness of customers to pay may produce different estimates of the benefits of distribution reliability. However intuitively, customers should be willing to pay at least as much as it would cost them to avoid an outage. While our terms of reference request that the willingness to pay of customers be estimated, we did not have sufficient time during the NSW workstream to develop, test and then run a willingness to pay survey. As a result, we have sought to develop a NSW VCR using AEMO's (formerly VenCorp's) methodology, which has been tested and used a number of times previously. We have included some willingness to pay and willingness to accept questions in our survey, and have compared the NSW VCR and a willingness to pay and accept results in our draft report.

Issue raised	Stakeholder	AEMC response
measure for reliable electricity supply that can be compared to the cost of network costs of different reliability outcomes, a 12 month minimum timeframe is required because it is a resource and data intensive process. Customers tend to have difficulty in valuing high impact/low probability reliability events outside their recent experience.		
The VCR is fundamentally flawed. A cost related to the amount of unserved energy is not a valid basis on which to assess a customer willingness to pay for improved reliability. It is questioned why the Victorian VCR is about 4-5 times the value of the market price cap used for reliability of generation supply. International VCRs are well below that used in Victoria, therefore the input data is questionable and should not be used for NSW. It is noted that the AEMO assessments only relate to critical time usage, and therefore is not representative of an average over time. There is an implicit assumption in the VCR that value is linearly proportional to summated duration. The VCR should be seen as a long term fixed value, rather than one which needs to be regularly updated.	MEU, pp. 19-23; Ausgrid, pg. 9.	As discussed above, under the AEMC's timeframe for the NSW workstream, we were unable to explore alternative options to assess the willingness of customers to pay. Alternative methodologies to AEMO's VCR will be explored during the national workstream. The VCR value is not linearly proportional to the summated outage duration. The value of reliability placed on different outage durations have been surveyed and weighted according to the probability of an outage of that duration occurring.
It is important that reliability and security standards are informed by the value that customers place on increased reliability. The VCRs should be specific to an operating region - it is not appropriate to use the survey values from Victorian and apply them to different jurisdictions. For example, the differing levels of gas penetration between Victoria and NSW could lead to	Energex, pg. 1; Endeavour, pg. 3; Ausgrid, pg. 9.	Agreed. We have conducted a survey of NSW customers so that the VCR estimates for our analysis are NSW specific. VCRs have also been developed for each NSW DNSP. The AEMC notes that the Victorian VCR is currently being used to set STPIS incentive payments. In chapter 6 of the draft report, we set out

Issue raised	Stakeholder	AEMC response
customers having different VCRs for their electricity supply. It is noted that as well as informing reliability and security standards, the VCR is used under the STPIS and RIT-D regimes.		some implementation options for consideration, which includes discussion on how the NSW VCR can be regularly updated to ensure it can continue to be used for other purposes. The implementation of the Regulatory Investment Test for Distribution is still being considered by the Commission under a separate Rule change process. However, the AEMC understands that the Victorian VCR may be currently used by some DNSPs outside Victoria for planning purposes.
Variations in interruption durations should be considered in the survey methodology.	Ausgrid, pg. 9.	The survey results for outage duration range have been weighted by the probability of an outage of that duration occurring.
There is no certainty that the VCR is appropriate for use in distribution networks as the VCR was specifically developed to replicate the higher standards of performance required of transmission networks.	MEU, pg. 14.	The AEMC has adapted AEMO's survey methodology for the VCR to ensure it is appropriate for NSW and to assess the value of distribution reliability.
There should be discrete VCRs for each NSW distribution area, which may be further segmented by metropolitan and rural customers. Electricity consumption varies between the DNSPs, for example, income is lower, and consumption is higher for residential customers in Essential Energy's area than in the metro areas. There are often different types of customers on the same feeder type that would have a different value of customer reliability. The licence conditions should continue to reflect the prevailing segmentation of feeder types/customer types, and customers should be surveyed accordingly. It is noted that the market cap for generation reliability is uniform across the NEM - why should a different VCR apply to different distribution regions? Care is needed in segmenting customers	Essential Energy, pg. 2; Endeavour Energy, pg. 3; IPART, pg. 2; Ausgrid, pg. 9;.MEU, pg. 24.	Separate VCRs have been developed for each NSW DNSP, each feeder type, and each customer type. The feeder types used in the survey align with the feeder types contained in the NSW distribution licence conditions, with the exception of short and long rural feeder types. Instead, a single rural feeder type has been used as an insufficient sample size was obtained to develop a statistically significant VCR for long rural feeders. The following customer types have been used in the survey: residential, small business, medium/large business.

Issue raised	Stakeholder	AEMC response
below a regional level.		
Oakley Greenwood was engaged by AEMO to explore improvements to the current Victorian VCR methodology which should be considered for this review.	AEMO, pp. 2-3.	Oakley Greenwood was engaged by the AEMC to undertake the NSW VCR survey. Amendments to AEMO's survey design have been made to ensure it is appropiate to meet the needs of the AEMC's NSW workstream. Options for alternative ways to value customer reliability will be considered in the national workstream.
Opportunities for individuals or businesses to improve their own reliability (for example, using uninterruptible power supply equipment) may mean that the optimal reliability level should not be based on the average or median willingness to pay for reliability, but a value below this. Setting the reliability standards too high may discourage competition and innovation in services on the customer's side of the meter.	IPART, pg. 2.	In the AEMC's survey, all customers were asked whether they had any other options to deal with power outages in their household or business. This included equipment such as battery systems, solar panels, standby generators etc. Where customers have alternative sources of power which can be used during an outage, this should reduce the cost of outages for customers and lead to a lower value of customer reliability.
The survey should ascertain ability to pay, and provide information on customers' preferences for a range of reliability outcomes associated with bill impacts.	PIAC, pg. 2.	The AEMC has included some willingness to pay questions in the VCR survey to test the willingness of customers to pay for different reliability outcomes.
The survey should clarify whether anyone in the household is reliant on life support equipment or mobility aids, which may drive different requirements for reliable supply.	PIAC pg. 2.	The AEMC's VCR survey does not include any specific questions relating to whether anyone in the household is reliant on life support equipment or mobility aids. However, the survey does allow respondents to comment on any other effects that power failures may have on their household, which would allow respondents to raise these issues if relevant.
DNSP's systems do not identify agricultural customers separately. Determining individual customers of a certain type on feeder categories may be problematic.	Essential Energy, pg. 2; Endeavour, pg. 3.	The AEMC acknowledges that NSW DNSPs are not able to differentiate between agricultural customers from other business customers. As a result, the AEMC has adapted the customer types used in its VCR survey to reflect the following customer types: residential, small business, and medium/large business. The business customer types are categorised in

Issue raised	Stakeholder	AEMC response
		relation to their level of consumption.
DNSPs cannot disclose individual customer information unless the law permits it to do so, or customers' consent is obtained.	Endeavour Energy, pg. 3.	The AEMC does not require DNSPs to disclose individual customer information which would allow individuals to be identified to complete the VCR survey. Instead, the AEMC has requested survey respondents to provide their NMIs, which have then been sent to the NSW DNSPs to determine their consumption as this is a required input to develop the VCR.
Cost benefit analysis for the NSW workstream		
A significant driver of network redundancy is the need for planned outages to maintain equipment.	Ausgrid, pg. 10.	The AEMC agrees that requirements relating to the level of network redundancy will be affected by planned outages. The impact of planned outages should be included in the expenditure estimates provided by the NSW DNSPs.
The community impact of changes to the licence conditions should be considered.	Ausgrid, pg. 10.	We have considered the reliability impacts and retail electricity bill impacts of each scenario for NSW distribution reliability outcomes. We would welcome comments on any other impacts that stakeholders consider could arise from the proposed scenarios.
A higher distribution reliability standard increases the requirement for transmission investment to support the distribution network.	AEMO, pg. 2.	The potential impact on the transmission network associated with any changes in the NSW distribution licence conditions has not been explicitly considered as the focus of the NSW workstream has been on the NSW distribution networks. The NSW DNSPs were requested to provide any advice on any additional impacts of each of the considered scenarios and no specific transmission related impacts were identified. However, the AEMC welcomes any comments on the potential impacts on the NSW transmission network where it is considered this impact is likely to be significant.
Best practice approaches to distribution reliability		

Issue raised	Stakeholder	AEMC response
Principles for successful reliability standards should include transparency, consistency, independently established, specific, and provide upward flexibility.	Ausgrid, pg. 6.	The proposed scope and approach for the national workstream will be set out in an issues paper, which will be published for public consultation in June 2012.
Reliability outcomes are likely to be different in different network areas due to the different environment that DNSPs operate in. Network performance can differ for a number of reasons, including the age of a network, geographical factors, and the historical configuration of the network. The regulatory framework is only one variable impacting on reliability outcomes.	Essential Energy, pg. 2; Endeavour Energy pg. 1; Ausgrid pg 1.	In February 2012, the AEMC published a paper by the Brattle Group which set out Australian and international approaches to distribution reliability. In addition to considering the regulatory framework for distribution reliability, the Brattle Group's paper also considered the characteristics of each network and its customers and how that may impact on the network's reliability performance. Further consideration of how network characteristics may impact network performance in the NEM will be undertaken in the national workstream.
The work on best practice national and international approaches to reliability should include a review of planning criteria and reliability standards.	Citipower, Powercor, pg. 1.	Brattle's paper on Australian and international approaches to distribution reliability has included the reliability standards and any relevant reliability related planning criteria for each of the jurisdictions it has reviewed.