



**Issues paper**  
**Reviewing the Service Target**  
**Performance Incentive Scheme**  
**and**  
**Establishing a new Distribution**  
**Reliability Measures Guidelines**

Electricity distribution network service providers

January 2017

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# 1 Shortened forms

Shortened form	Extended form
ARR	Annual revenue requirement
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AEMC Final Report	AEMC 2014, Review of Distribution Reliability Measures, Final Report, 5 September 2014, Sydney
CESS	Capital Expenditure Sharing Scheme
distributor	distribution network service provider
EBSS	Efficiency Benefit Sharing Scheme
ESCV	Essential Services Commission of Victoria
MAIFI	Momentary Average Interruption Frequency Index
MAIFle	Momentary Average Interruption Frequency Index event
NER	National Electricity Rules
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
STPIS	Service Target Performance Incentive Scheme

## 2 About this consultation

This issues paper represents our preliminary consultation with stakeholders on both the:

- review of the Service Target Performance Incentive Scheme (STPIS) and
- development of a Distribution Reliability Measures Guidelines.

The primary purpose of the STPIS is to provide incentives to Distribution Network Service Providers (distributors) to maintain the existing level of supply reliability, and to improve the reliability of supply where customers are willing to pay for these improvements.

The primary purpose of the Distribution Reliability Measures Guidelines is to prescribe a set of common definitions of reliability measures that can be used to assess and compare the reliability performance of distributors.<sup>1</sup> We are developing the Guidelines in response to recommendations made by the Australian Energy Market Commission (and subsequently endorsed by the Council of Australian Governments Energy Council through a rule change).<sup>2</sup>

In developing the Distribution Reliability Measures Guidelines, we must have regard to the STPIS because both documents relate to supply reliability.<sup>3</sup> To this end, this issues paper commences the consultation process in order for us to develop the Distribution Reliability Measures Guidelines and also consult with stakeholders on the issues we identified in implementing STPIS.

Following this consultation, we will separately develop a draft Distribution Reliability Measures Guidelines and a draft revised STPIS, taking into consideration stakeholders' submissions, prior to finalising these two documents.

Our proposed timelines are set out Section 2.2 below.

### 2.1 How to make a submission

Energy consumers and other interested parties are invited to make submissions on this issues paper by **24 February 2017**.

In each section, we offer questions for consideration. This may guide your submission; however we encourage you to address any matters of relevance.

We prefer that all submissions are in Microsoft Word or another text readable document format. Submissions on our issues paper should be sent to:

[AERInquiry@aer.gov.au](mailto:AERInquiry@aer.gov.au).

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<sup>1</sup> NER, rules 6.28(a).

<sup>2</sup> AEMC, Review of Distribution Reliability Measures, Final Report, 5 September 2014.

<sup>3</sup> AEMC Final Report, p.iv.

Alternatively, submissions can be sent to:

Mr Chris Pattas  
General Manager  
Australian Energy Regulator  
GPO Box 520  
Melbourne Vic 3001

We prefer that all submissions be publicly available to facilitate an informed and transparent consultative process. Submissions will be treated as public documents unless otherwise requested. Parties wishing to submit confidential information should:

- (1) clearly identify the information that is the subject of the confidentiality claim
- (2) provide a non-confidential version of the submission in a form suitable for publication.

All non-confidential submissions will be placed on our website. For further information regarding our use and disclosure of information provided to us, see the ACCC/AER Information Policy (October 2008), which is available on our website.

## 2.2 Timelines

**Table 1.1 Timeline for STPIS review**

Project steps for STPIS review	Date
Publish Issues paper for stakeholder consultation	January 2017
Submissions on Issues paper close	24 February 2017
Draft decision on new version of STPIS (with Explanatory Statement)	June 2017
Submissions on draft decision close	August 2017
Final STPIS published (with Explanatory Statement)	October/November 2017 (indicative)

**Table 1.2 Timeline for establishing a Distribution Reliability Measures Guidelines (DRMG)**

Project steps for establishing a Distribution Reliability Measures Guidelines (DRMG)	Date
Publish Issues paper for stakeholder consultation	January 2017
Submissions on Issues paper close	24 February 2017
Draft decision on new DRMG (with Explanatory Statement)	April 2017
Submissions on draft decision close	May 2017
Final DRMG published (with Explanatory Statement)	June 2017

## 3 Overview

### 3.1 About the service target performance incentive scheme

We develop, administer and maintain the distribution service target performance incentive scheme (STPIS) in accordance with the requirements of the National Electricity Rules (NER). The STPIS is intended to ensure that distributors' service levels do not reduce as result of the distributors' efforts to achieve efficiency gains, which typically are associated with a reduction in expenditure.

The STPIS also provide incentives to the distributors to improve on the existing level where electricity consumers (the distributors' customers) are willing to pay for these improvements. In other words, the scheme is to provide incentives for the distributors to be cost effective in their attempts to improve services to customers.

The STPIS rewards electricity distributors where they invest additional money that is shown to have improved the power supply reliability outcomes—such as a reduction of the average duration of power outages (known as SAIDI) and a reduction of the average frequency of power outages (known as SAIFI). Likewise, the scheme penalises electricity distributors where they allow power supply to decline below their reliability targets—which are based on the existing level achieved by the distributors. The performance targets are typically amended every five years to be representative of the most up-to-date levels achieved by the distributors as part of our regulatory determination process—where we determine the revenues or prices that a network business can charge.

Distributors will only receive a financial reward after actual improvements are delivered to the customers. More importantly, a distributor can only retain its rewards if it can *maintain the reliability improvements* on an ongoing basis. Once an improvement is made, the benchmark performance targets will be tightened in future years. That is, the distributors' reliability targets for future years will be based on the level of performance that they have achieved to date. The reward for their improved performance is paid to the distributor (by customers) for five years. After which, customers will retain the benefit of the reliability improvement.

If the reliability levels should fall in the future, the distributor will receive penalties for not meeting the tightened targets—hence, the reward paid to the distributor will be returned to customers if the reliability levels fall.

The current version of the STPIS has been in place since 2009. In light of our experience to date, we consider it timely to review the scheme to:

- seek stakeholders' feedback on the workings of the scheme
- implement minor changes to simplify and clarify the scheme
- outline the impact on the future challenges of the scheme and the need for further changes.

## 3.2 About the distribution reliability measures guidelines

Complimentary to our review of STPIS, the Australian Energy Market Commission (AEMC) recently amended the NER to require us to publish a distribution reliability measures guideline that outlines the definitions of distribution reliability measures<sup>4</sup> to be used across the National Electricity Market (NEM).<sup>5</sup> We have combined the initial consultation processes for establishing this guideline and reviewing the STPIS in this issues paper, because the definitions of reliability measures in the proposed guideline are closely related to how the STPIS operates.

## 3.3 Summary of issues for consultation

This issues paper broadly outlines our observations in implementing the STPIS to date and also seeks stakeholders' feedback on a numbers of issues impacting on the scheme and potentially the distribution reliability measures guidelines.

This issues paper is structured according to the following key themes:

### **Chapters 4 and 5: Our observations in implementing the STPIS to date**

We observe that the scheme has been successful in minimising the number (frequency) of power supply outages endured by all customers compared to five years ago. While the total time (duration) of power supply outages experienced by customers also improved (reduced) under the scheme to some degree, the rate of improvement is far less than for the number of power supply interruptions (the frequency).

More importantly, the average time to restore power supply—after an unplanned outage has occurred—has increased substantially compared to historical levels.

We believe the differences in the outcomes for frequency and duration of supply interruption improvements may be due to the current STPIS design regarding how the incentive rates are set, as explained in detail in chapter 5 of this paper.

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<sup>4</sup> To measure electricity network performance, the electricity utility industry has developed several measures of reliability. These reliability measures include measures of power outage duration, frequency of power outages, system availability, and response time.

<sup>5</sup> The National Electricity Market is the Australian wholesale electricity market that covers the electrically connected states and territories of eastern and southern Australia, and the associated synchronous electricity transmission grid. The Australian Energy Market Commission develops and maintains the Australian National Electricity Rules, which have the force of law for the NEM in the participating states and territories. The Rules are enforced by us (the Australian Energy Regulator).

We seek stakeholders' feedback on whether consumers would prefer to:

- have lesser number of power supply outages, or
- in the event of having a power supply outage, the power is restored faster, or
- Consumers are happy with the current reliability of power supply overall.

### **Chapter 6: Distribution reliability measures guidelines**

This guideline will describe a set of common definitions of reliability measures that can be used to assess and compare the reliability performance of electricity distributors nationally—based on the AEMC's 2014 review finding recommendations. The STPIS is based on the measured results of the service levels (distribution reliability measures) delivered to customers—hence it must align with, where applicable and appropriate, this guideline. We support the AEMC's recommendations and, subject to stakeholders' feedback, will be publish the distribution reliability measures guidelines to give effect to the AEMC's recommendations.

Further, where the AEMC considered that we should further investigate the implication of standardising the reliability measures definitions for STPIS, we seek stakeholders' feedback on how they should be implemented.

### **Chapter 7: Other improvements to the STPIS**

In implementing the STPIS, we identified areas where the scheme is currently unclear and ambiguous. Some of these are more of a housekeeping nature, but we consider it to be good regulatory practice to provide further clarification when necessary and to streamline our administered schemes where possible. We have outlined our intended changes to the STPIS in this issues paper.

### **Chapter 8: Issues that we need to consider in future**

We believe that the emergence of renewable energy and distributed generation would have an impact on how the distributors will operate in the future. Likewise these changes will also affect customers because they will be less reliant on external sources, including distributors, for their electricity power needs and so the impact of power outages on such customers will change. Such changes will need to be considered by the STPIS because the scheme may no longer be fit for purpose (rewarding distributors for minimising power outages where the customer no longer experiences power outages because of self-generation). Hence, we would be interested in the views of stakeholders on a number of issues that may need to be reflected in the scheme in the future.

Based on stakeholders' feedback, we will develop a draft decision on STPIS and reliability measures guidelines for further consultation.

**The consultation period ends on 24 February 2017.**

## 4 The current STPIS and observed outcomes

Our considerations of key issues that need to be explored in any review of the STPIS are directly informed by observed outcomes from the scheme to date. This chapter sets out our observations in implementing the scheme since 2009.

### 4.1 Performance measures of STPIS

Before addressing the specifics of the STPIS, it's important to understand what exactly constitutes reliable electricity service. Under the STPIS we use a number of metrics to measure reliability:

- SAIFI – System Average Interruption Frequency Index, the number of times the average customer will experience unplanned power outages during the year.
- SAIDI – System Average Interruption Duration Index, the time the average customer is without power each year due to unplanned outages.
- MAIFI – Momentary Average Interruption Frequency Index, the average number of short interruptions (under one minute) that a customer would experience during each year.
- Customer service measures (telephone answering) – How quickly distributors answer customers' fault lines calls to their call centres.

Currently only Victorian distributors have adequate monitoring equipment to accurately report momentary interruptions. Hence, they are the only distributors that apply MAIFI in their performance targets.

Distributors will earn most of their financial rewards (around 90 per cent) by either shortening the time the average customer is without power each year or reducing the number of times the average customer will experience unplanned power outages.<sup>6</sup>

While not a specific measure in the scheme, the Customer Interruption Duration Index (CAIDI) can be derived by dividing the SAIDI by the SAIFI measures. CAIDI represents the average amount of time a distributor would take to restore supply once an interruption has occurred—that is how effective a distributor responds to network faults.

We also measure the SAIDI and SAIFI outcomes based on the following network types:

- Central Business District (CBD) feeders
- Urban feeders, those with actual maximum demand per route length greater than 300 kilo-Volt-Ampere (kVA) per kilometre (km).

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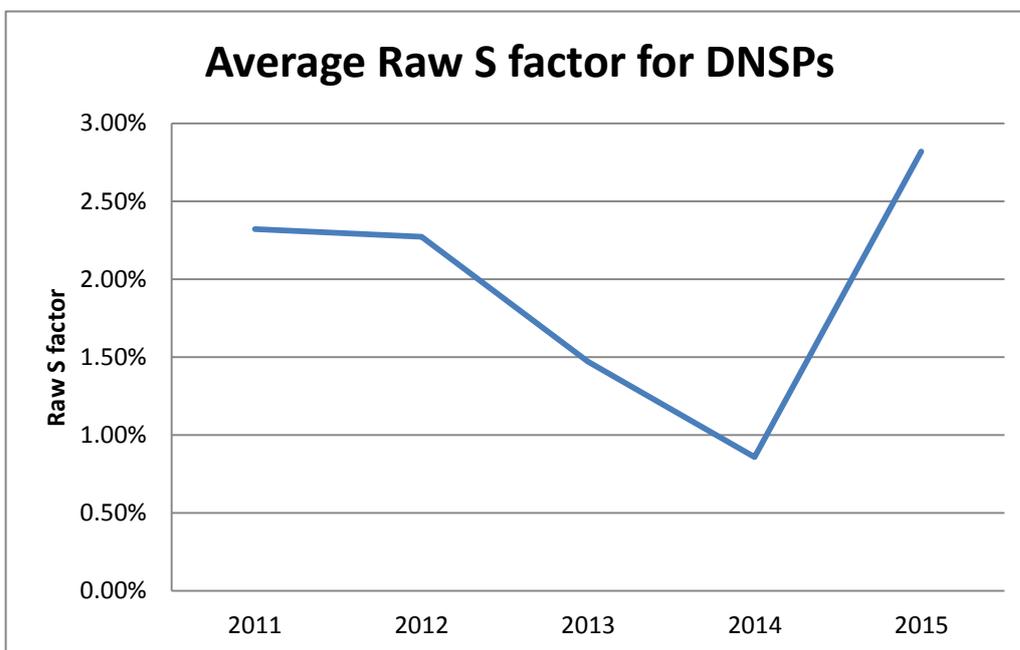
<sup>6</sup> The maximum impact of the telephone answering measures is 10 percent of the overall scheme.

- Short rural feeder, those with actual maximum demand per route length less than 300 kVA per km and a total feeder route length less than 200 km.
- Long rural feeders, those with actual maximum demand per route length less than 300 kVA per km and a total feeder route length more than 200 km.

## 4.2 Observed outcomes of STPIS to date

The scheme has largely achieved the objective in delivering improvements in supply reliability. Figure 1 provides an overview of the performance of service reliability since the implementation of the STPIS. Although individual distributors' performance varied, overall, the supply reliability has improved given that distributors have outperformed their STPIS targets, which has led to positive s-factors (rewards) over the 2011–15 period.

**Figure 1 - Average raw S factor for distributors 2011-15**



Source: AER analysis. Raw s-factors for 5 Victorian, 2 Queensland and 1 South Australian distributors.

- Notes:
- The chart represents the mathematical average of the raw s-factor results of the distributors.
  - The raw s-factor is a term used in the scheme, meaning the direct result of performance measures prior to adjustments such as banking and change of annual revenue requirement between periods.

The charts in Appendix B present the details of the business-wide average number of unplanned outages (SAIFI) and the average total duration of unplanned supply outages (SAIDI) of each of the Queensland, South Australian and Victorian distributors. Based on the observed results, the scheme appears successful in delivering improvements in supply reliability as:

- Only United Energy reported significant deterioration of performance.

- CitiPower reported a slight improvement (reduction) in the average number of outages (SAIFI) but a substantive deterioration (increase) in the supply outage time (SAIDI), resulting in a 0.02 per cent average annual s-factor penalty.
- All other distributors achieved significant improvements.
- Most significantly, distributors typically achieved better improvements to their SAIFI results (the number of outages) than their SAIDI (duration of outages) results (red lines vs the blue lines of the charts in Appendix B).<sup>7</sup>

We believe this difference in performance between SAIDI and SAIFI may be due to the current scheme design regarding the ratio of the reward/penalty incentive rates between SAIFI and SAIDI. We consider this a key issue that needs to be considered in the operation of the current STPIS and this is further discussed in the next chapter.

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<sup>7</sup> Notes:

We have not yet had the results from NSW/ACT distributors.

Historical performance results for TasNetworks are not included in this analysis because its STPIS measures were on per kVA capacity base instead of the STPIS scheme standard of per customer base.

## 5 Ratio of SAIFI and SAIDI incentive rates

The incentive rates under the STPIS are based on the value of the total annual energy transported by each distributor measured by the value of consumer reliability (VCR), which indicates consumers' willingness to pay for improved levels of service. Appendix C provides the detailed method used to calculate the incentive rates.

As indicated in the summary, the SAIDI and SAIFI components combined form more than 90 percent of the total financial impact of the scheme.<sup>8</sup> Hence, these two components are the key driver of the scheme.

Approximately half of the energy value is allocated to the SAIDI incentive component, which relates to the duration of outages. The SAIDI incentive rate is equal to the ratio of the value of the energy delivered and the distributor's annual revenue requirement (ARR).

The other half of the annual energy value is allocated to SAIFI incentive, which relates to the frequency of outages. The SAIFI incentive rate is the ratio of the value of the energy delivered for each typical supply interruption event and the distributor's ARR. Appendix C provides the further background of the derivation of this ratio.

The ratio between the SAIFI incentive rate and SAIDI incentive rate approximately equals that of the average duration of supply restoration time for each interruption or CAIDI (this is about 60-90 minutes for urban feeders and up to 170 minutes for rural feeders). In other words, the reward to the reduction of 1 SAIFI measure (improvement in the number of outages) is equivalent to a reduction of 60-90 minutes in SAIDI for urban networks in terms of the value of financial rewards.

We believe that this ratio may encourage distributors to focus their effort on network automation such as using auto-reclosing devices to restore supply to customers near the zone substation end of feeders—hence, the observed outcomes of better SAIFI improvements than SAIDI improvements because the improvement is not uniform throughout the length of the feeders. Table 1 shows the current ratio of incentive rates between SAIFI and SAIDI measures.

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<sup>8</sup> The maximum impact of the telephone answering measures is 10 percent of the overall scheme.

**Table 1: Ratio of incentive rates between SAIFI and SAIDI for the current regulatory period**

Distributor	CBD feeders	Urban feeders	short rural feeders	long rural feeders
CitiPower	63	70	na	na
Jemena	na	60	81	na
Powercor	na	82	91	125
AusNet Services	na	76	89	90
United Energy	na	70	82	na
Ergon Energy	na	87	114	151
Energex	98	68	84	na
SA Power Networks	84	93	130	167

Source: AER analysis.

Note: This table shows the equivalent value of 1 SAIFI measure in terms of SAIDI minutes under the current SAIFI/SAIDI weighting ratio under STPIS

Table 2 shows the changes in the ratio of SAIFI/SAIDI (CAIDI) targets from the previous regulatory control period to the current period. Comprehensive tables showing the changes in SAIFI and SAIDI targets between the previous and the current periods for each distributor are shown in Appendix D.

**Table 2: Percentage change in ratio of SAIFI/SAIDI targets (CAIDI) from the previous period to the current period**

Distributor	CBD feeders	Urban feeders	short rural feeders	long rural feeders
CitiPower	17% worse	36% worse	na	na
Jemena	na	4% better	25% worse	na
Powercor	na	22% worse	14% worse	25% worse
AusNet Services	na	5% worse	3% worse	7% worse
United Energy	na	12% worse	32% worse	na
Ergon Energy	na	10% worse	9% worse	11% worse
Energex	7% worse	0%	2% worse	na
SA Power Networks	8% better	11% worse	13% worse	20% worse

Source: AER analysis.

Note: Overall reliability outcomes for consumers (SAIDI) have improved for all distributors with the exception of United Energy;

na represents not applicable, the distributor does not have this feeder type.

Table 2 shows that:

- Only the average supply restoration time after a network fault occurred (CAIDI) measures of SA Power Networks' (SAPN) CBD network and Jemena's urban network were better than the previous period.
- Energex' urban network supply restoration time remains unchanged.
- The average supply restoration times (CAIDI) of all other networks were longer than the previous period. Five measures increased by more than 20 per cent over the period with the highest level of increase being 36 per cent for CitiPower's urban feeder network.

The above outcomes are most likely due to the current scheme design regarding the ratio of the reward/penalty incentive rates between SAIDI and SAIFI. However, it is not clear that this is consistent with customers' current expectations. That is, do customers still value a lower number of outages more highly than shorter duration outages?

The current ratio used in the scheme was based on the Essential Services Commission of Victoria's earlier work, in 2000, which assumed customers value a reduction in the frequency of interruptions more than their duration.<sup>9</sup> By comparison, the ratio between the SAIFI and SAIDI incentive rates during the 2006–10 regulatory period in Victoria was between 50 and 70. This ratio is now between 60 and 125. That is, the supply restoration time under the CAIDI measure has increased significantly between 2000 and 2010.

Further, as the CAIDI value of current regulatory period increases, so would the ratio of incentive rates between SAIFI and SAIDI for the forthcoming regulatory period. This reinforcing effect exists because the ratio of the SAIFI and SAIDI performance target is an input for the incentive rates calculation for the SAIFI and SAIDI for next regulatory period. For example, Powercor's urban and rural networks' CAIDIs for the current regulatory period are about 20 percent higher than the previous period.

We consider that, in general:

- capex investments such as auto-reclosers and network automation would result in SAIFI improvements as well as the associated SAIDI improvements.
- opex investments mainly result in SAIDI improvements through faster response time.

It appears that distributors may have been incentivised to invest more in capex to improve SAIFI rather than opex to improve SAIDI under the current incentive framework.

Appendix C provides a worked example to demonstrate this effect.

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<sup>9</sup> KPMG, Australia, 2003, Consumer preferences for electricity service standards.

## Questions

1. The AER would like views on the appropriateness of the current approach for setting the ratio of the relative reward/penalty rates between SAIDI and SAIFI, which is very close to the duration of a typical outage time, or CAIDI.
2. Would allocating a higher incentive rate to the SAIDI measure—by allocating a higher proportion of the energy value to this measure—provide a more balanced approach between incentives to improve reliability through capex and opex, and provide a more even improvement to all customers? If yes, what should be the relative weights between SAIDI and SAIFI incentives?
3. Currently there is a slight difference between the ratios for SAIDI and SAIFI incentive weights across the CBD, urban and rural networks (the  $W_n$  factor of equations (1) and (2) of STPIS, see appendix C). Should a uniform ratio be applied to all network types?

## 6 Distribution reliability measures

The AEMC recently published its final report on its review of Distribution Reliability Measures on 18 September 2014. The report outlined common definitions for distribution reliability targets and outcomes that could be applied across the NEM. The report proposes the use of these common definitions to increase transparency and consistency of distribution reliability measurements and improve stakeholder confidence.

The AEMC report resulted in a rule change that requires the AER to publish a Distribution Reliability Measures Guidelines that take into account the report's recommendations.

Appendix E provides a summary of our preliminary views on the common reliability measures definitions proposed by the AEMC.

We generally support the AEMC's recommendations. However, there are some issues that need to be explored before we finalise a common distribution reliability measurement approach. These issues are discussed below.

The AEMC Final Report recommended that the objectives of distribution reliability measures are:<sup>10</sup>

- capable of being used by standard setters to set distribution reliability targets
- provide consistency in reporting on performance against the reliability targets and
- to assist distributors, the AER and other stakeholders to compare the reliability performance of distributors across the NEM.

The AEMC final report recommended applying common definitions to the following measures currently contained in the STPIS:<sup>11</sup>

- system average interruption duration index (SAIDI), which measures the total duration of all sustained interruptions experienced by customers on average
- system average interruption frequency index (SAIFI), which measures the average number of sustained interruptions experienced by customers
- momentary average interruption frequency index (MAIFI), which measures the average frequency of momentary interruptions experienced by customers

***(note: where an auto-recloser made three attempts to restore supply, the MAIFI equals three events)***

- momentary average interruption frequency index event (MAIFIE), which measures the average frequency of momentary interruption events experienced by

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<sup>10</sup> AEMC Final report, p.ii.

<sup>11</sup> *ibid*, p.ii.

customers, where a momentary interruption event is one or more momentary interruptions within quick succession

***(note: where an auto-recloser made three attempts to restore supply, the MAIFle is counted as one event).***

The key difference from the existing STPIS measures is to change the threshold level for MAIFI from 1 minute to 3 minutes.<sup>12</sup> Under the proposed framework, short duration supply interruptions with duration less than 3 minutes will be classified as momentary interruptions, rather than a "sustained interruption". The current threshold level is 1 minute under the STPIS.

We support the AEMC's recommendations and consider that the new 3-minutes MAIFI could be used as a common measure in the Distribution Reliability Measures Guidelines. However, we consider that the incentive mechanism for implementing the 3-minutes MAIFI in the context of STPIS needs further consideration.

The AEMC also recommended the AER give consideration to:

- the treatment of exclusions and major event days particularly the exclusions of catastrophic events days from the STPIS calculation.
- clarifying the definitions of CBD, urban, short rural and long rural feeders.
- adopting a system wide approach to measure those customers experiencing lower reliability.
- the measurement and collection of other reliability measures data.

These issues are also discussed below.

## **6.1 Momentary Interruption measures, MAIFI or MAIFle**

Under the STPIS, MAIFI is currently defined as the total number of customer interruptions of one minute or less, divided by the total number of distribution customers.

The STPIS standard momentary interruption measure is MAIFI. Currently only Victorian distributors have adequate monitoring equipment to accurately report momentary interruptions. Hence, they are the only distributors subject to the MAIFI measure under STPIS. Due to historical practice, MAIFle is still being used instead of MAIFI for most of the Victorian distributors under STPIS.

While recommending that both MAIFI and MAIFle could be used for benchmarking and economic incentive scheme, the AEMC expressed the view that:

generally MAIFle provides a better regulatory signal than MAIFI. In a specific instance where distribution reliability is required to be measured as part of a

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<sup>12</sup> AEMC Final Report, p.ii.

reporting or regulatory incentive scheme, the relevant regulatory body or standard setter would need to decide how to treat momentary interruptions. This could include using MAIFI and/or MAIFle, or not considering momentary interruptions at all.<sup>13</sup>

We also support the AEMC's recommendation that MAIFle is a more suitable measure because it is more reflective of the customers' experience in terms of availability of supply. We consider that customers will have negligible value to receive a few very brief (typically a fraction of a second) period of power supply during the 3 minutes MAIFI threshold time. Our consideration on the measurement of MAIFI application is below.

### **Question**

4. Should MAIFle be implemented as the standardised measure for momentary interruptions?

## **6.2 Application of 3-minutes MAIFI**

The AEMC recommended a change to the definition of a momentary interruption from the current threshold level of less than 1 minute to less than 3 minutes because this would increase the flexibility and options for distribution automation systems, which potentially reduce distributors' costs.<sup>14</sup>

As explained in chapter 5, the SAIFI/SAIDI incentive ratio may have incentivised distributors to increase capital expenditure (capex) in automated systems that further reduce the frequency of supply interruption. The following example would explain the impact on the incentive to distributors to further invest in network automation if the 3-minutes MAIFI is adopted.

As explained in Chapter 5, the incentive rate for each SAIFI event (each sustained interruption) is equivalent to that of the SAIDI reward rate for the time duration of a typical supply restoration time (CAIDI). That is about 60-80 minutes for urban feeders.

Moving to a 3 minutes MAIFI definition is likely to increase the distributors' rewards under STPIS as showed in Table 3

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<sup>13</sup> AEMC Final Report, p.15.

<sup>14</sup> Ibid, pp. i-ii.

**Table 3: Differences in STPIS reward to distributors between the current and proposed 3-minute MAIFI definition, after reducing a 60 minutes sustained interruption to a 3-minute interruption**

	60 minute interruption	3 minute interruption	STPIS reward for changing a 60 minute interruption to a 3-minute interruption
	1 SAIFI	1 SAIFI	
	60 minutes of SAIDI	3 minutes of SAIDI	
Performance measures under the current MAIFI definition (less than 1 minute)	(equivalent to 130 minutes of SAIDI incentive rate based on a SAIFI/SAIDI incentive rate ratio of 70)	(equivalent to 73 minutes of SAIDI incentive rate based on a SAIFI/SAIDI incentive rate ratio of 70)	equivalent to 57 minutes of SAIDI incentive rate
Performance measures under the propose 3-minute MAIFI definition	1 SAIFI 60 minutes of SAIDI (equivalent to 130 minutes of SAIDI incentive rate based on a SAIFI/SAIDI incentive rate ratio of 70)	1 MAIFI  Note: Currently MAIFI is only applicable to Victorian distributors)	equivalent to 130 minutes of SAIDI incentive rate for non-Vic distributors  equivalent to about 124 minutes of SAIDI incentive rate for Vic distributors  (this reward is more than double of that under the 1-minute MAIFI definition)

Source: AER analysis.

From customers' value of supply availability perspective, we are also concerned that the change to 3-minutes MAIFI would result in the value of some of the supply unavailability not being measured.

When changing MAIFI measures from 1 minute to 3 minutes, the unserved energy during the time slot between the second and third minute will only be covered by the MAIFI measure, instead of at the previous SAIFI and SAIDI incentive rates. The MAIFI

incentive rate is 8 percent of that of SAIDI.<sup>15</sup> Because the SAIDI incentive rate is about 50 percent of the total energy value, only about 4 percent of the energy value of this time slot is taken into account under STPIS.

If the SAIFI/SAIDI incentive rates ratio is changed (see chapter 5), the optimisation point between the costs of current technologies available to the distributors, the forgone unmeasured unserved energy and customers' preferences (as discussed in section 7.4) may also be changed. In other words, we need to balance customers' value for improvements and the cost to provide such improvements.

### Question

5. Even if the definition for performance comparisons was set at 3 minutes, should the STPIS provide flexibility to change the MAIFI threshold to a value other than 3 minutes to balance the cost of the technologies available to the distributors, the forgone unmeasured unserved energy and customers' preferences?

## 6.3 Exclusions

The STPIS allows certain events to be excluded from the performance measures. These exclusions include the events that are beyond the distributors' control, such as the effects of transmission network outages and other upstream events. They also exclude the effects of extreme weather events that have the potential to significantly affect distributors' STPIS performance (the major event days).

The scheme standard for major event day (MED) threshold is set at 2.5 standard deviations from the mean value after transforming the daily outage data into a normal distribution data stream—the 2.5 beta method (or 2.5 standard deviation from the mean) is in accordance with appendix D of the STPIS.<sup>16</sup> However, the scheme allows distributors to apply a different threshold, to set the MED threshold at a higher than 2.5 beta level.<sup>17</sup> This has the effect of excluding a smaller (corresponding to more extreme events) number of exclusion events.

### 6.3.1 Major Event Days and exclusions from performance measures

Major Event Day Exclusions under the STPIS use a statistical formula to calculate a threshold value. Where the SAIDI value of a particular day (the daily SAIDI) exceeds this threshold value, it is considered to be a MED. The performance data for all MEDs are reported by the distributors. This data is not counted towards the calculation for the reward/penalty under the STPIS incentive framework.

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<sup>15</sup> AER, *STPIS*, November 2009, clause 3.2.2(j).

<sup>16</sup> *Ibid*, Appendix D, pp. 35–37.

<sup>17</sup> *Ibid*.

The AEMC noted the principles for exclusions under the STPIS but also recommended that:<sup>18</sup>

- When benchmarking the performance of distributors or applying an incentive scheme, it is common to remove events that are beyond the control of the distributor from the calculation of the reliability measures. Such events include (1) lack of generation or a failure in the transmission network where the distributor can neither act to reduce the probability of such an event occurring nor manage the restoration of supply; (2) to comply with jurisdictional regulations; and (3) under direction of from state or federal emergency services.
- Generally, catastrophic events and major incident event days are days on which the distribution network experience stresses beyond that normally expected (such as during severe weather). It is common to remove major event days, as well as the exclusions discussed above, from the database of interruptions when considering the underlying performance of a distribution network. This is because major event days can be considered as outliers when compared to the normal day-to-day interruptions that occur within a distribution network.
- Even though the interruptions that occur on MEDs may be removed from the network's database of interruptions, they should not be ignored. Rather, these interruptions should be separately analysed and reported given that they have had a significant impact on the reliability experienced by many customers.

The above AEMC recommendations are similar to the current STPIS exclusion framework. The AEMC also recommended that we consider excluding catastrophic events such as major bush fires, cyclones and floods from setting MEDs.

However, we consider that the definition should not refer specifically to catastrophic days, but should instead be captured through the 2.5 beta threshold under the current scheme. Our reasons are explained below.

### **6.3.2 Excluding catastrophic days from the distribution reliability measures guideline**

The current scheme allows for the effect of MEDs to be removed from the incentive scheme formula.<sup>19</sup>

The rationale for MED is to distinguish between day-to-day operations from major event days in order to reveal trends in daily operation that would normally be hidden by the large statistical effects of major events. These events are deemed to be outside the random process that is assumed to control distribution network reliability.

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<sup>18</sup> AEMC Final Report, section 4.

<sup>19</sup> A MED is any day that exceeds a daily SAIDI threshold. We currently apply the method specified by IEEE Standard 1366, IEEE Guide for Electric Power Distribution Reliability Indices—that is at the 2.5 standard deviation point above the average over the period after transforming the data set into a normal distribution by log-normal method.

We consider this method reasonable because:

- it easy to apply
- the process for the calculating exclusions is same for all distributors.

In 2012, the Institute of Electrical and Electronics Engineers (IEEE) revised the IEEE Standard 1366. In the revised standard, the IEEE explored the development of an objective methodology for the identification and processing of "catastrophic days" (those major events that have a low probability of occurring, yet tend to skew the distribution of network performance by causing a shift of average data sets). The IEEE concluded that it was unable to devise an objective methodology for the identification and processing of catastrophic events and recommends that regulators and utilities determine a process for catastrophic events on a case-by-case basis.<sup>20</sup>

The AEMC Final Report noted the IEEE's findings and recommended the AER consider allowing catastrophic events to be excluded from the statistical method used to calculate the thresholds for Major Event Days. It also recommended that the distributor can, with the agreement of the AER, propose an alternative method when it is applying an incentive scheme.<sup>21</sup>

In their regulatory proposals for the 2015–20 and 2016–20 regulatory control periods respectively, SA Power Networks and United Energy submitted that our STPIS should be amended to reflect AEMC's recommendations on catastrophic events.<sup>22</sup>

We note that:

- Currently, there is no objective method to identify catastrophic events.
- There are huge differences between network characteristics in Australia, ranging from localised urban network such as CitiPower, to physically diverse and geographically large networks such as SA PowerNetworks and Ergon Energy.

Hence, we seek stakeholders' feedback on a suitable method to define catastrophic events. If a suitable method cannot be identified, we do not intend to modify the current MED exclusion method for the purpose of a common measure of supply reliability.

## Question

**6.** What method should be applied to identify catastrophic days so that it is able to consistently, reasonably and universally operate across all distributors?

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<sup>20</sup> IEEE Standard 1366-2012, p.20.

<sup>21</sup> AEMC Final Report, section 4.2.

<sup>22</sup> SA PowerNetworks, Attachment 23.14; SA Power Networks: Proposed amendment to STPIS Guideline, October 2014, pp. 7–9; United Energy, 2016–20 Regulatory proposal, 30 April 2015, p. 140.

### 6.3.3 Treatment of catastrophic days under STPIS

While we consider that catastrophic events should not be a part of the standard distribution reliability measure, there may be legitimate reasons to exclude such events from STPIS measures. For reasons stated above, the measurement method is NOT likely to be uniform across all distributors.

However, given the rare nature of such event, we do not consider it will impact on STPIS's normal operation.

#### Question

7. Given catastrophic days are already excluded under the MED framework, should such events be treated differently from the "major event days" concept under STPIS?

### 6.3.4 Other exclusion criteria

#### 6.3.4.1 Load interruptions under direction from state or federal emergency services

The AEMC also recommended adding the following exclusion criterion:<sup>23</sup>

- for load interruptions caused or extended by a direction from state or federal emergency services, provided that a fault in, or the operation of, the network did not cause, in whole or part, the event giving rise to the direction

We agree that load interruptions caused or extended by a direction from state or federal emergency services is beyond the control of distributors, hence these should be excluded from performance measures.

#### 6.3.4.2 Outage due to failure of transmission connection assets

Currently, load interruptions caused by a failure of transmission connection assets are excluded, except where the interruptions were due to inadequate planning of transmission connections and the distributor is responsible for transmission connection planning. It is not clear to us that the current criterion is appropriate or captures the range of circumstances that should penalise distributors for events under their control (i.e. where the distributor is responsible for the failure of the transmission asset). We consider that distributors' control over such supply interruptions extends beyond the planning input. We propose to add a further test to this exclusion criterion to ensure that the primary cause of outages was not due to any act or omission by the distributor.

#### Question

8. Should distributors be permitted to exclude a transmission outage event if the event is caused by the action, or inaction, of that distributor?

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<sup>23</sup> AEMC Final Report, p.22.

## 6.4 Definition of feeders

The AER and most jurisdictions currently classify feeders as CBD, urban, short rural and long rural feeders. In the STPIS, our current classification system divides feeders into four categories namely:<sup>24</sup>

- *CBD feeder* - a feeder supplying predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection and redundancy when compared to urban areas.
- *Urban feeder* - a feeder, which is not a CBD feeder, with actual maximum demand over the reporting period per total feeder route length greater than 0.3 MVA/km.
- *Short rural feeder* - a feeder which is not a CBD or urban feeder with a total feeder route length less than 200 km.
- *Long rural feeder* - a feeder which is not a CBD or urban feeder with a total feeder route length greater than 200 km.

The AEMC final report identified a number of issues with the current feeder classifications, including:<sup>25</sup>

- the classification of some urban and rural feeders changes from year to year due to seasonal variations
- the classification of some feeders as urban or rural is not always intuitive for customers
- the concept of CBD means different things to different parties
- the classifications are coarse
- some feeders can supply a variety of customers.

The AEMC final report did not recommend major changes to the current definitions as any material changes to the feeder classifications could re-classify a significant number of feeders and change the measured reliability for the affected feeder classifications.<sup>26</sup>

The AEMC final report thus proposed the following new definitions for feeder classifications:<sup>27</sup>

- *CBD feeder* means a feeder in one or more geographic areas that have been determined by the relevant participating jurisdiction as supplying electricity to predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection and redundancy when compared to urban areas.

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<sup>24</sup> AER, STPIS, November 2009, p. 22.

<sup>25</sup> AEMC, Final report - executive summary, pp. 32–38, 5 September 2014.

<sup>26</sup> Ibid p. iii.

<sup>27</sup> Ibid, p. 32.

- *Urban feeder* is a feeder which is not a CBD feeder and has a maximum demand (which can be weather normalised) over the feeder route length greater than 0.3 MVA/km.
- *Short rural feeder* means a feeder with a total feeder route length less than 200 km, which is not a CBD feeder or urban feeder.
- *Long rural feeder* means a feeder with a total feeder route length greater than 200 km, which is not a CBD feeder or urban feeder.

We agree with these new definitions for feeder classifications to be adopted in the STPIS.

### Questions

9. The AER would like views on the current definitions of the feeder classifications.

10. Historically, only feeders supplying the central business districts of the capital cities of each jurisdiction have been classified as CBD feeders for STPIS purpose. Should this practice be maintained?

## 6.5 Planned interruptions

Planned interruptions are necessary for the maintenance, repair and replacement of the distribution system.

Planned Interruption means an intentional disconnection of customers' premises where the customer has been provided with prior notification of the interruption in accordance with all applicable laws, rules and regulations.

Distributors must provide a minimum of four-days-notice prior for the planned interruption. With sufficient notice, the impact of planned interruption to the consumer can be significantly less than that of an unplanned interruption.

However, there is still some cost to consumers from a planned interruption. Further, not all customers have the same preference for the outage time and the duration of a planned interruption is typically much greater than that of an unplanned interruption. For example, commercial and industrial consumers may prefer to not have planned interruptions during normal working hours, whereas restaurants and residential customers may prefer to not have planned interruptions during weekend and Friday evenings.

Some customers may need to use a temporary generator during the interruption and this represents a cost to that consumer.

In some cases, the distributor may be able to modify the proposed works to reduce the impacts of a planned interruption on affected consumers. Moving planned works to a time that suits the consumer, reducing the duration of the planned works or undertaking the works via 'live line' techniques may be possible alternatives.

The distributor is likely to incur additional costs to undertake planned works outside normal working hours, or via 'live line' techniques. Therefore there is a trade-off

between the cost to undertake the planned works and minimising the impacts on consumers.

The AEMC Final Report noted that planned interruptions are generally not included in current economic incentive schemes.<sup>28</sup> This is consistent with the current STPIS measurement method, which does not include planned interruptions. As such, the distributor may not be provided with a relevant incentive to reduce or modify planned interruptions in a manner that is consistent with consumer needs.

Since planned interruptions do cause inconveniences to customers and, sometimes, incurs extra costs to customers, it may be practicable to provide incentives to reduce the level of planned outages

We note that prior to the introduction of STPIS, the Essential Services Commission of Victoria (ESCV) included planned interruptions as one of the s-factor (a service incentive scheme similar to STPIS) measures for the 2001–05 regulatory period. The ESCV, however, removed planned interruptions as a measure from its s-factor scheme in the following period because it was concerned that it would create an incentive for more ‘live-line’ work, potentially resulting in a greater incidence of unsafe work practices.<sup>29</sup> In consideration of the previous review on this matter, we propose to continue to monitor planned interruption, but not to include planned interruption as a STPIS measure.

## Questions

**11.** Should planned outages be included in the STPIS? What is the value/cost of a planned outage?

**12.** What considerations should we take to address the potential safety related issues in order to enable the introduction of incentives to reduce planned outages?

## 6.6 Monitoring service to worst served customers and GSL payments

The STPIS comprises two parts:

- a service incentive factor (s-factor) provides an incentive to maintain average service levels, and
- a Guaranteed Service Level (GSL) payments scheme that provides payments directly to the worst served customers (in the case of reliability) or where certain levels of service are not met.

The s-factor and the GSL payments scheme both provide an incentive for the electricity distributors to maintain or improve reliability. The s-factor encourages

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<sup>28</sup> AEMC Final Report, p. 30.

<sup>29</sup> Essential Services Commission (Victoria), Electricity Distribution Price Review 2006–10 Final Decision Overview, October 2005, p. 5.

distributors to implement actions that will improve the average level of reliability over their entire networks where it is cost effective to do so. However, reliability improvements for the worst served customers may not be prioritised under the service incentive factor. This may be because there are a small number of customers at a feeder's extremity where the cost to improve reliability outweighs the STPIS reward, and the impact from this improvement has no significant effect on the average reliability level. Or there may be characteristics associated with some feeders which require relatively high cost actions to improve reliability. Therefore, the GSL payments scheme provides an additional incentive for electricity distributors to improve the reliability for the worst served customers, but more importantly provides direct compensation to these customers.

Since currently all jurisdictions have their own GSL payment scheme, we have not applied the national GSL payment scheme under STPIS.

That said, the STPIS only measures the average performance of a distributor. We consider that there may be situations where there is a higher than acceptable level of customers receiving very poor supply reliability. However, the average performance measures do not clearly identify these customers. Hence, we agree with the AEMC that we should collect information on worst served customers.

We consider the data should, at a minimum:

- be applied consistently across the jurisdictions and distributors.
- account for reliability outcomes that may vary from year to year.<sup>30</sup>

Hence, we propose that the level of worst served customers should be measured by:

- defining the threshold level for being worst served, for example experiencing more than 48 hours of unplanned SAIDI or more than 10 unplanned sustained interruptions in a year
- or
- by identifying the supply areas and the actual unplanned SAIDI and SAIFI levels of the bottom, say 10 per cent, of the total distribution customers.

## Question

13. The AER would like views on what level of supply interruptions is considered worst served?

## 6.7 Consistent approach to measure outages

The capturing and reporting of electrical interruption data varies across the NEM to reflect the systems and processes of the different distributors.

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<sup>30</sup> AEMC Final Report, p.40.

Previous reports have identified significant variations in the accuracy of the reliability information across distributors. These potential variations have historically been assessed between +5% and -20% of the actual data.<sup>31</sup> Improvements in information systems, data capture and smart metering will have improved these error rates. However the potential for variations still exists in a number of areas.

The STPIS definition for unplanned SAIDI is:

The sum of the duration of each unplanned sustained customer interruption (in minutes) divided by the total number of distribution customers. Unplanned SAIDI excludes momentary interruptions (one minute or less).

This definition is supported by a number of notes:

1. The number of distribution customers is calculated as the average of the number of customers at the beginning of the reporting period and the number of customers at the end of the reporting period.
2. Unmetered street lighting supplies are excluded. Other unmetered supplies can either be included or excluded from the calculation of reliability measures.
3. Inactive accounts are excluded.
4. In calculating MAIFI, each operation of an automatic reclose device is counted as a separate interruption. Sustained interruptions which occur when a recloser locks out after several attempts to reclose should be deleted from MAIFI calculations.

The capture of reliability statistics is essentially a process of linking a network outage incident to the customers interrupted by the incident. As an incident (e.g. resulting from a short circuit fault) may occur on any part of the network, it is necessary to create a link that is representative of the connectivity of the network in terms of fault location, associated network outage, and customers interrupted (affected) due to the network outage.

The availability of connectivity data (the smallest network segment that customers are generally allocated to) varies between each distributor and typically ranges between the feeder circuit breaker and the distribution substation. Some distributors have historically used postcode averaging.

The greatest accuracy from a reliability measurement system will be gained from a system that links the customer at the lowest possible level. If a distributor maintains connectivity data at the distribution substation level this means that the collection of data below this level must come from approximations and manual intervention.

In general, the greater the degree of approximation and manual intervention, the more inaccurate the resulting information will be. As the connectivity level information used

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<sup>31</sup> Review of NSW Distribution Network Service Provider's Measurement and Reporting of Network Reliability Prepared for IPART by PB Associates, 2003.

by a distributor could impact the rewards or penalties under STPIS, is there a need to better understand or audit this information?

It is proposed that the definition and notes be expanded to provide greater clarity on the capture and reporting of specific events.

- Standardising the reporting of unmetered supplies
- National Metering Identifiers - clarifying which NMI status codes should be reported? (e.g. active, not energised, extinct, greenfield)
- Single premises outages – Standardising on the reporting of single premises interruptions as a network interruption unless customer fault is actively identified.
- Where more accurate (i.e. smart meter) information is absent:
- HV single phase outage – Standardising on the reporting of 67% of all downstream customers for a single-phase HV outage on a three phase network.<sup>32</sup> Reporting of 100% of customers for all other HV outages, for example; when there is a single HV phase outage on a two phase or single phase HV system.
- LV single phase outage – Standardising on the reporting of 33% of all downstream customers for a single phase outage.

## Questions

**14.** Do you consider that improved standardisation would increase the effectiveness of STPIS?

**15.** Should unmetered supplies be included in the performance measure?

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<sup>32</sup> A single phase outage on a typical three phase system will result in low-voltage being supplied across two of the three low voltage phases.

## 7 STPIS specific issues

This section sets out the other issues we have identified with the scheme design for consultation separate to those matters discussed in earlier chapters.

### 7.1 Adjusting the targets where the reward or penalty exceed the revenue cap under STPIS

STPIS caps distributors' maximum reward/penalty for improvement/decline in service levels. Once the actual service levels result in this cap being reached, the actual performance level should also be capped so that the distributor's performance target in future represents the financial reward/penalty funded by the customers. In particular, a distributor should not be rewarded for poor performance because of the financial cap protection mechanism under the STPIS.

Currently, the STPIS provides that, when a distributor's actual performance is much better or worse than the performance targets to the extent that the financial reward/penalty under the STPIS exceeds the revenue at risk cap under the scheme, its actual performance must be adjusted accordingly. However, the scheme currently does not set out how this is done. Clause 3.2.1(a)(1B) of STPIS sets out that:

The performance targets to apply during the regulatory control period must be based on average performance over the past five regulatory years, modified by an adjustment to correct for the revenue at risk, that is the sum of the s-factors for all parameters, to the extent it does not lie between the upper limit and the lower limit in accordance with clause 2.5(a).

We consider that there needs to be a clear method based on a sound hierarchy, which reflects users' values, to determine the adjustment values.

Hence, we seek stakeholders' opinion on how such adjustments should be achieved, for example, based on a fixed ratio of the performance measures.

A possible method might be to adjust the targets by reversing the calculation (equations 1 and 2 of Appendix B) used to determine the reward and penalty (s-factor) for the regulatory year.

- Determine the actual s-factor prior to the necessary adjustment
- Determine the difference between the actual s-factor and the revenue cap percentage, typically five percent
- Allocate the above difference in s-factor value to the SAIFI and SAIDI measures of each network element type base on the relative incentive rates of each network element.
- Calculate the target adjustments according to the above allocations for each network element.

## Question

16. What is the appropriate method to adjust the target when the performance improvement or deterioration results in the financial reward/penalty that exceeds that cap level?

## 7.2 Balancing the incentive to maintain and improve reliability with the incentive to reduce expenditure

The revenue and pricing principles require that distributors should be provided with effective incentives to promote economic efficiency.<sup>33</sup> Consequently, it is important that distributors be provided an incentive to improve customer reliability where customers value that improvement in reliability more than the cost of achieving the improvement. To this end it is important that the incentive to improve reliability is balanced with the incentives to reduce expenditure, both capex and opex.

The incentive to reduce opex is driven by the ex-ante opex allowance, our revealed cost forecasting approach and the efficiency benefit sharing scheme (EBSS). The EBSS allows distributors to retain opex efficiency gains for an extra five years after they are made, regardless of the year in which the gains are made. Taking into account the time value of money this allows distributors to retain approximately 30 per cent of the efficiency gain.<sup>34</sup> Similarly the capital expenditure sharing scheme (CESS) allows distributors to retain 30 per cent of capex efficiency gains.

A distributor's share of reliability benefits is determined by the way in which performance targets are set. By setting performance targets based on a five year historic average distributors should be able to retain around 30 per cent of the value of reliability improvements. This is because the reward or penalty incurred under STPIS is kept for five years after which time it is removed. This approach aligns the scheme with incentives under the EBSS or CESS.

## Question

17. Do you consider that allowing distributors to retain the same proportion of the value of reliability improvements as they do capital and operating expenditure reductions will promote economic efficiency?

## 7.3 A symmetrical financial incentive scheme

Our current STPIS provides a direct financial incentive for a DNSP to maintain or improve service standards. It operates in a symmetrical way by rewarding good performance as well as penalising deteriorating performance. It achieves this by

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<sup>33</sup> NEL, clause 7A(3).

<sup>34</sup> AER, Final decision, Electricity distribution network service providers, Efficiency benefit sharing scheme, June 2008, pp. 33–35. Through the operation of the EBSS with a revealed cost forecasting approach the NSP is able to retain 30 per cent of the efficiency gain. Network users retain 70 per cent, of the efficiency gain.

providing a financial reward if service improves and a financial penalty at the same rate as rewards if service declines. In this way it operates in a symmetrical way and provides a direct link between a DNSP's revenue and the standards of service it provides.

When developing our first STPIS in 2008, we sought views on whether the scheme should be symmetrical.<sup>35</sup> In response, several stakeholders expressed support for a symmetrical s-factor scheme. Conversely, some stakeholders considered that factors leading to reliability issues (for example, one-off uncontrollable events) are in fact asymmetrical in nature, and therefore a symmetrical scheme would be inappropriate.<sup>36</sup>

We considered that a symmetrical scheme approximates the operation of a competitive market more closely than an asymmetrical scheme in that consumers are generally prepared to pay more for a higher quality product, and will consider lower quality products if the price is sufficiently low enough. Accordingly, the AER implemented a symmetrical STPIS.<sup>37</sup>

In its submission to the AER's draft revenue decision on NSW DNSPs for the 2015–19 regulatory period, the Energy Users Association of Australia (EUAA) recommended that we should apply an asymmetrical incentive—in terms of the maximum reward/penalty range under the scheme—of +1 per cent to -3 per cent adjustment to the annual revenue requirement. It considered such asymmetrical incentive is needed to take account of the networks' excess capacity the consumers have already paid for and would more appropriately balance the risks to both consumers and the distributors.<sup>38</sup> In response, we noted the s-factor component in the STPIS scheme specifies a symmetrical incentive framework. Hence, we cannot apply an asymmetrical incentive under the current scheme. We also noted when we next review the design of STPIS, we shall also review this aspect of the scheme design.<sup>39</sup>

## Question

18. We would like views on whether the scheme should continue to operate in a symmetrical way, i.e. penalties are incurred at the same rate as rewards.

## 7.4 How to link with distributor customer engagement findings seeking changes to reliability level

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<sup>35</sup> AER, Electricity distribution network service providers, Service target performance incentive scheme - Issues paper, November 2007, p. 12.

<sup>36</sup> AER, Proposed Electricity distribution network service providers service target performance incentive scheme - Explanatory statement and Discussion paper, April 2008, pp. 14-15.

<sup>37</sup> Ibid, pp. 14-15.

<sup>38</sup> EUAA, Submission AER 2015-19 draft revenue decision and NSW DNSPs' revenue proposals, 13 February 2015, p. 50.

<sup>39</sup> AER, Final decision, Ausgrid distribution determination 2015–16 to 2018–19, Attachment 11 – Service target performance incentive scheme, April 2015, p. 13.

Customer engagement is an important aspect for any business and electricity networks are no exception. In addition, distributors have a formal requirement to engage with customers<sup>40</sup> and we have established a guideline for distributor customer engagement<sup>41</sup>.

We have established consumer engagement guidelines that recognise the important relationship between price and service and, in particular, identify that distributors could consult on:<sup>42</sup>

- making price and reliability trade-offs
- setting and designing tariffs (including time of use and critical peak tariffs)
- setting reliability targets and standards when appropriate

The quality of a service provider's consumer engagement will be a factor in how we assess expenditure proposals.<sup>43</sup> Our guidelines also identify that consumer engagement may also result in greater ease (for the distributor) in regulatory approval of expenditure proposals.<sup>44</sup>

To date, the consumer engagement outcomes have not identified any significant results that would argue for improved or reduced reliability outcomes. This suggests that the existing price and reliability trade-offs may broadly reflect consumer expectations.

Should the consumer engagement process identify that consumers are seeking a change in the reliability or quality outcomes provided by the distributors, this may present a challenge to the STPIS process.

For example, if a specific group or area of consumers of a distributor were to seek an improved reliability outcome, how would this be integrated with STPIS? As STPIS incentives are based around the Value of Customer Reliability (VCR), any local or temporal shift in consumer desire for reliability would be reflected in the STPIS incentive rates for rewards or penalties through a higher VCR. Given that the funding criteria for distributors' operating and capital expenditures are to maintain the current level of reliability, safety and security of the distribution system,<sup>45</sup> we seek stakeholders' feedback on the following questions regarding how to use the STPIS to address consumers' expectation.

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<sup>40</sup> NER Cl.6.5.6 and 6.5.7.

<sup>41</sup> Better Regulation, Consumer Engagement Guideline for Network Service Providers, AER. November 2013.

<sup>42</sup> Better Regulation, Consumer Engagement Guideline for Network Service Providers, AER. November 2013, p. 12.

<sup>43</sup> Ibid, p.13.

<sup>44</sup> Ibid.

<sup>45</sup> Rule 6.5.6 and 6.5.7 of the NER.

## Questions

19. Should consumers' preferences be reflected through the capital and operating expenditure funding level, or through the STPIS incentives, or a combination of both measures?

20. Which input factors of the STPIS should be, or could be, made flexible to reflect consumers' preference on reliability level, for example the VCR rate, level of revenue at risk and the major event day exclusion criterion (which determines the coverage of the reliability measures).

## 7.5 Other minor refinements to the scheme

In the current operation of the scheme, we have also identified a number of other issues which we consider require attention. We therefore also propose to consider the following amendments to the STPIS.

### 7.5.1 Simplify the calculation of the s-factor

The reward and penalty under STPIS is currently implemented through "the s-factor" as a percentage term to the price control mechanism—as another multiplier, alongside the CPI minus X adjustments to the revenue (in the case of a fixed revenue cap), prices (in the case of a weighted average price cap), or average revenue (in the case of an average revenue cap). This implementation method creates a few inadvertent steps, which could be simplified if the STPIS outcome is implemented as a fixed monetary amount each year in accordance with the actual performance. This issue is further discussed below.

#### Removing the effect of s-factor to the control mechanism

The s-factor is added to the control mechanism in the following way. The s-factor is incorporated into the general form of a control mechanism as another multiplier, alongside the CPI minus X adjustments to the revenue (in the case of a fixed revenue cap), prices (in the case of a weighted average price cap), or average revenue (in the case of an average revenue cap).<sup>46</sup>

Therefore, the s-factor alters revenues (or prices) in the control mechanism for one regulatory year. Hence a mechanism is required to remove the revenue increment or decrement from the previous regulatory year—as expressed in formula (2) of Appendix C of the STPIS.

#### Overlap between regulatory control periods

A distributor's performance in the last two regulatory years of its regulatory control period will affect its revenues in the first two regulatory years of the next regulatory

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<sup>46</sup> AER, STPIS, November 2009, pp. 28–30.

control period. Since the s-factor is expressed in percentage terms of the average revenue requirement (ARR), it is necessary to account for any step change in revenues (or prices) from one regulatory control period to the next. This process is described in formula (6) of Appendix C of the STPIS.

### **Proposed change**

The s-factor calculation can be simplified if the financial reward or penalty is calculated and included as dollar value rather than a percentage in the control mechanism, using the similar method of recovering the cost pass through in the control mechanism.

### **Question**

**21.** We would like views on the current approach for s-factor calculations. Specifically, should and how the calculation of s-factor be simplified?

## **7.5.2 Rules for Guaranteed Service Level payments**

We propose to improve the clarity of the rules on the obligations to make Guaranteed Service Level (GSL) payments under the STPIS. For example, to clarify that a customer's entitlements to the GSL payments for single long duration outage are separate from the payments for excessive total duration of interruption time in aggregate.

### **Question**

**22.** We would like views from stakeholders on what other clarification is needed for the GSL section of the current STPIS scheme.

## **7.5.3 Line up the definition of year "t" with the price control formula**

The current formula to calculate the s-factor uses the term "t" as the year we receive the performance result of the preceding year "t-1". The s-factor will apply to the following year "t+1" regarding the reward/penalty of the year "t-1". Under the price control formula, however, year "t" refers to year when distribution charges are applied.

As the s-factor will impact on the distribution charges, we propose to amend the term "t" in the STPIS formula to have the same meaning as that of the price control formula to remove the unnecessary confusion of what year "t" means.

## **7.6 Interrelationship with the Demand Management Incentive Scheme**

During our initial consultation with stakeholders regarding the review of the Demand Management Incentive Scheme (DMIS), some stakeholders suggested that we consider modifying the exclusion criteria of the STPIS to "further exclude supply interruptions associated with unexpected underperformance of demand management projects", so as to facilitate the adoption of demand management projects.

The issue of whether to modify the current STPIS exclusion criteria is separately addressed in another consultation process on the review of the Demand Management Incentive Scheme.

## 8 Future of STPIS

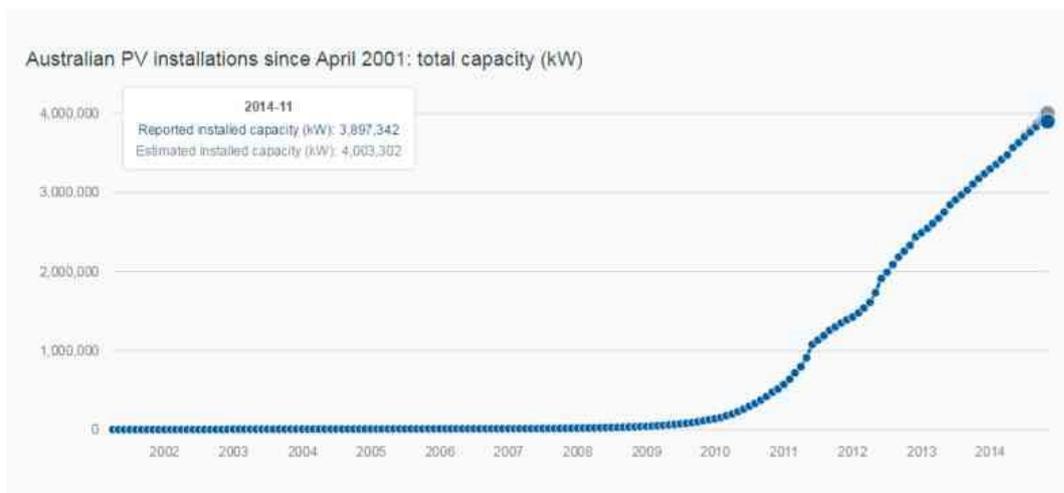
This section sets out our consideration on the likely challenges on how the scheme may operate in future years, given likely industry developments. However it may not be possible to address all these issues in the foreseeable timeframe for this review and may need to be looked at when these trends and developments are clearer.

That said, we still think it is important to seek the views of stakeholders on what these developments may mean on the future operation of the scheme.

### 8.1 Interaction with new technologies

The last 10 years has seen the proliferation of distributed generation, particularly in the form of solar PV.

**Figure 2 - Australian cumulative installed PV capacity<sup>47</sup>**



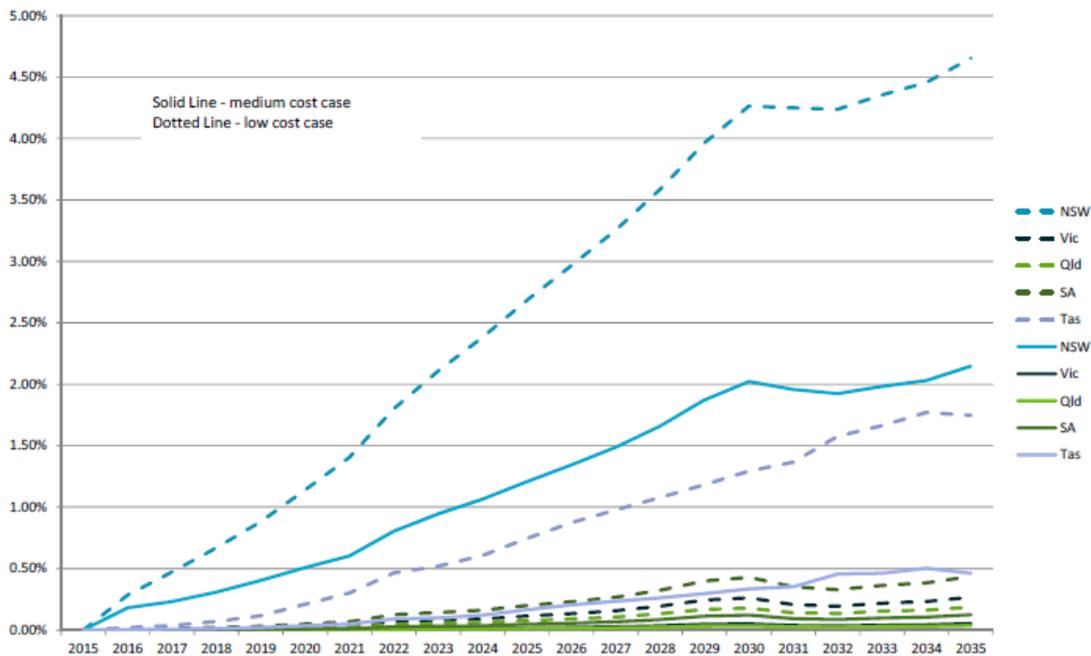
This growth in distributed generation is expected to continue as costs for PV systems decline.

Energy storage has attracted a lot of attention recently as new technologies offer the possibility of storing PV generation for use when it suits the consumer. The forecast decline in the cost of storage suggests that these technologies may soon be on a similar trajectory to that of solar PV.

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<sup>47</sup> <http://reneweconomy.com.au/2014/australia-reaches-4gw-rooftop-solar-pv-44719>

**Figure 3 - Residential battery uptake forecast<sup>48</sup>**



In the near future, customers with energy storage (and the appropriate controls) may not be impacted by network outages of short to medium duration. During a power interruption, homes with energy storage may be able to continue without impact as they draw down on their internal energy stores. As such, DER customers may have a greater tolerance for short-medium duration outages.

This may present a number of challenges for the STPIS.

The STPIS is designed to operate by measuring average outcomes across the major sections of the network. As such, the scheme is not well placed to separately identify consumers who have different needs.

### Question

**23.** In what way could the STPIS be changed to reflect the needs of consumers with storage or other similar technologies?

## 8.2 Should the service quality incentive only focus on measuring SAIDI and SAIFI?

Historically, a network outage almost always resulted in loss of supply. It therefore made sense historically to measure network service quality using measures of service reliability. However, we are in the midst of an important transformation of the electricity industry, involving a rapid increase in the penetration of a range of distributed energy resources. With widely distributed energy resources, network outages do not

<sup>48</sup> CSIRO (September 2015) Future energy storage trends, p. 106

necessarily result in loss of supply. Arguably measures of service quality based on loss of supply events may be out of date. If we continue to base service quality incentives on measures of reliability we may:

- Fail to incentivise improvements in network service quality in situations where network outages raise the cost of serving customers, or reduce the ability of customers to export power, even though there is no loss of supply;
- Over-incentivise the network to install devices which maintain supply to customers in the event of network outages, even though those devices are expensive to operate and/or install.

Ideally, the service quality incentive should be directly related to (that is, proportional to, but not necessarily equal to, the economic harm caused by loss of supply events. This ensures that the network business has the right incentive to trade-off the benefits of increased service quality against the cost of increased expenditure. This raises the question: How should we measure the economic harm from loss of supply events?

In principle, the economic harm arising from a loss of supply event is related to the end-customer's willingness-to-pay to avoid that loss of supply at that point in time. The willingness-to-pay to avoid an outage could, of course, vary over time, and would be expected to vary across customers (with the willingness-to-pay of some large industrial customers significantly larger than small commercial customers which is, in turn, larger than residential customers).

In general, the economic harm from loss of supply could be expected to depend on a range of factors such as:

- The volume of electricity not supplied
- The identity of the customer
- The number of loss of supply events
- The duration of the loss of supply events
- The time of day; and so on.

Comparing the existing STPIS with the theoretical scheme above, we can identify the following issues:

- The existing STPIS is not directly based on energy not supplied. Instead the energy-not-supplied is estimated, for the SAIDI, as the product of the average outage duration and the forecast average customer energy consumption. This approach ignores the fact that outages at times when the customer's load is high are more likely to have a larger social cost than outages at times when the customer is hardly consuming at all. Presumably it would not be too difficult to estimate the lost load directly. This could improve the extent to which the financial penalty reflects the true social cost of outages.
- The existing STPIS values each additional loss of supply event by the average value of load shed per event. This seems to be double counting the cost of load shedding (since the cost of load shedding is also directly reflected in the penalty for

each additional kWh of lost load). It would be preferable for the fixed cost of loss of supply events to be directly estimated.

### **Questions**

**24.** The existing STPIS is not based directly on the energy-not-supplied. Do you think it would be preferable to base the financial reward or penalty directly on the energy not supplied? How shall we measure the social harm associated with network outages?

**25.** The existing STPIS is estimated as the product of the outage duration (and frequency) of an average customer and the incentive rates for the SAIDI (and SAIFI). Do you think it would be preferable to base the average outage duration and frequency on energy not supplied (KWH) or load (KVA)?

**26.** Should the AER move away from service quality measures mainly based on SAIDI and SAIFI measures? If not, how do we know when we have reached that point? What other measures should be considered?

## Appendix A. History of the STPIS scheme development

The scheme was first published in June 2008 and was designed to operate under a price cap control framework. There have been two modifications to the scheme prior to its first application in July 2010 for the Qld/SA distributors.

The first modification was made in May 2009 and the key changes were:

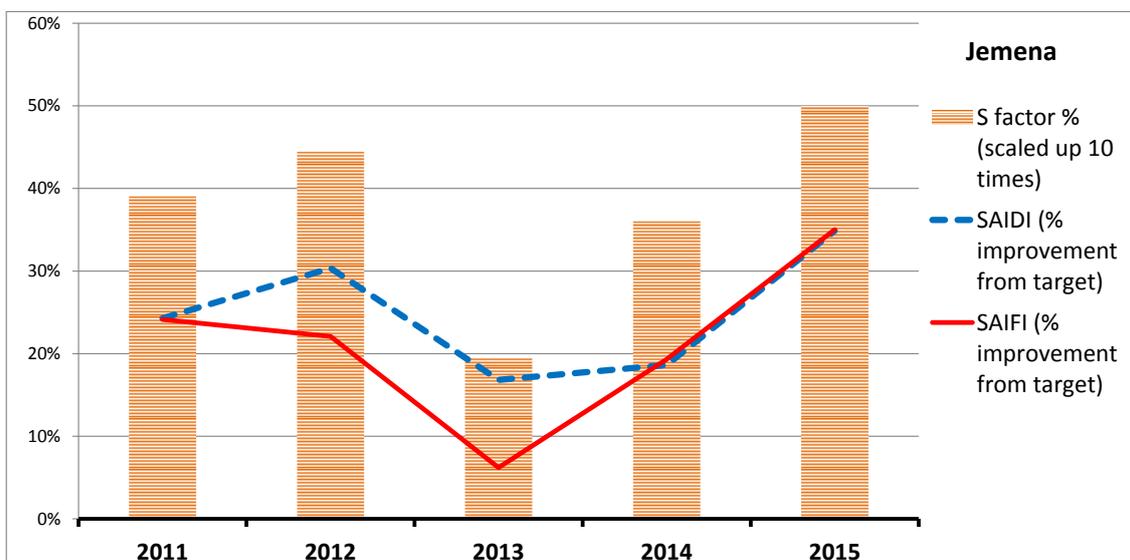
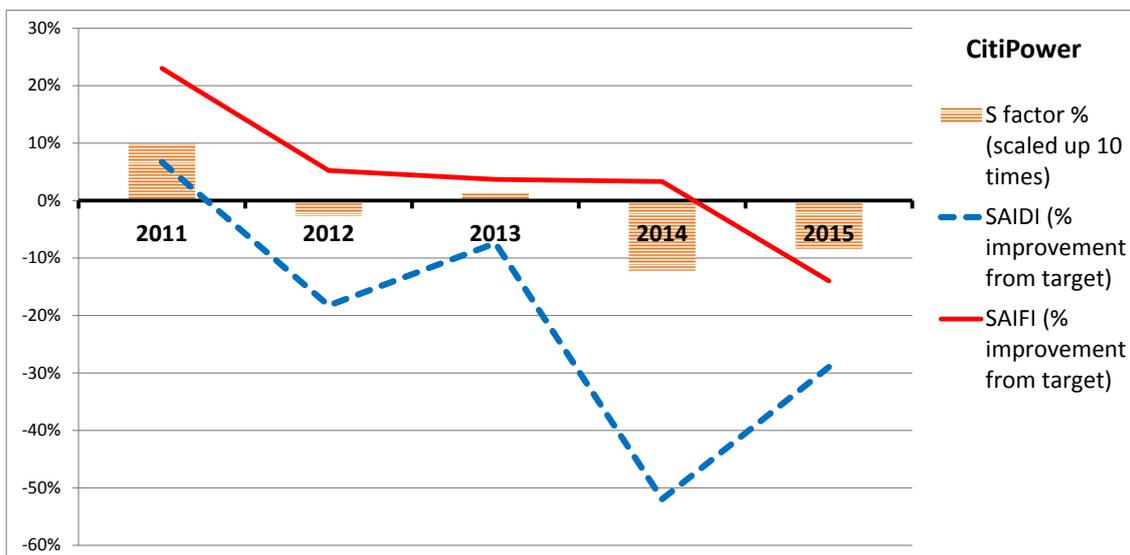
- Amending the s-factor calculation: from cumulatively “year to the next” basis to the current form of comparing reported performance against the historical average target. Under the original scheme the reward/penalty of each year is based on the performance improvement/deterioration from the prior year with no specific target. The effects of each year’s results are applied cumulatively until the end of the regulatory control period.
- Amending the revenue at risk cap—from the previous year-on-year of  $\pm 3$  per cent to a fixed annual cap of  $\pm 5$  per cent, with the option for a distributor to propose an alternate cap.
- Clarifying how to calculate the major event day threshold.

The STPIS was further modified in November 2009 in response to submission by South Australian and Victorian distributors to:

- Allow other statistical methods to calculate the major event day threshold, where the historical data does not exhibit a log normal distribution.
- Allow a distributor to propose a major event day boundary greater than the scheme standard of 2.5 standard deviation from the mean.

## Appendix B. Distributors' overall SAIDI and SAIFI outcomes

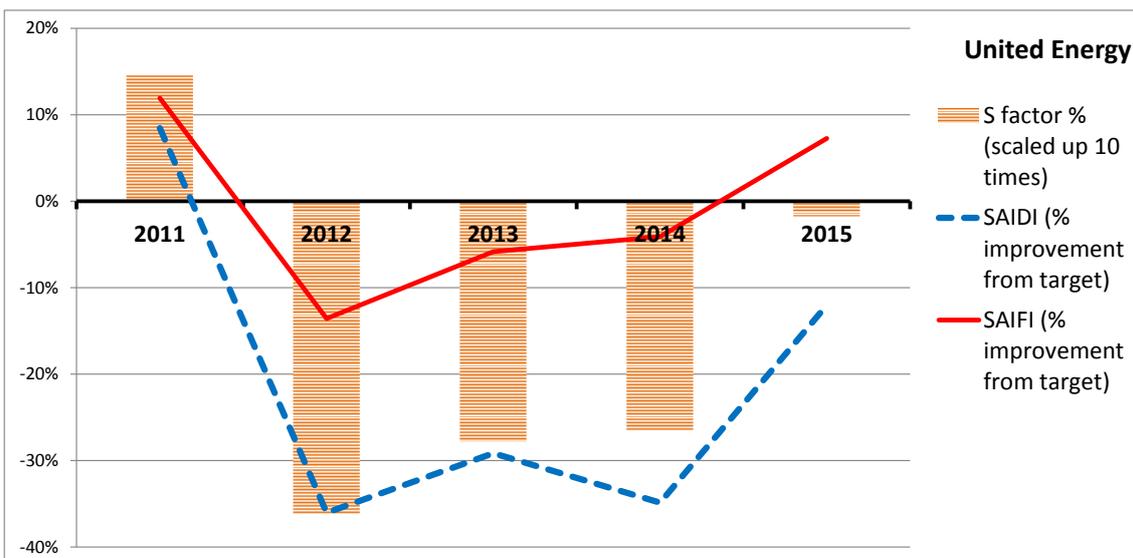
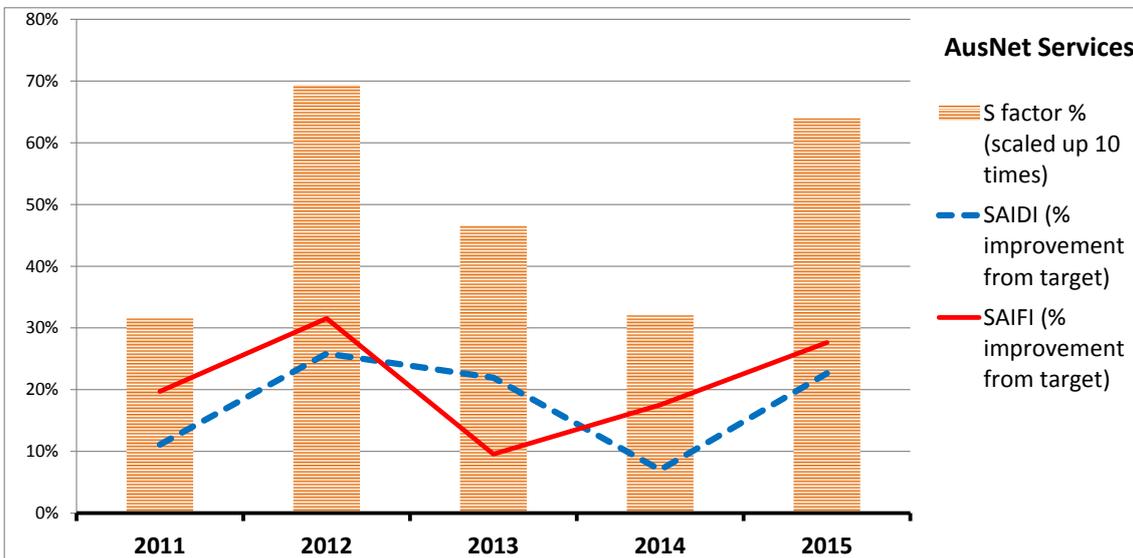
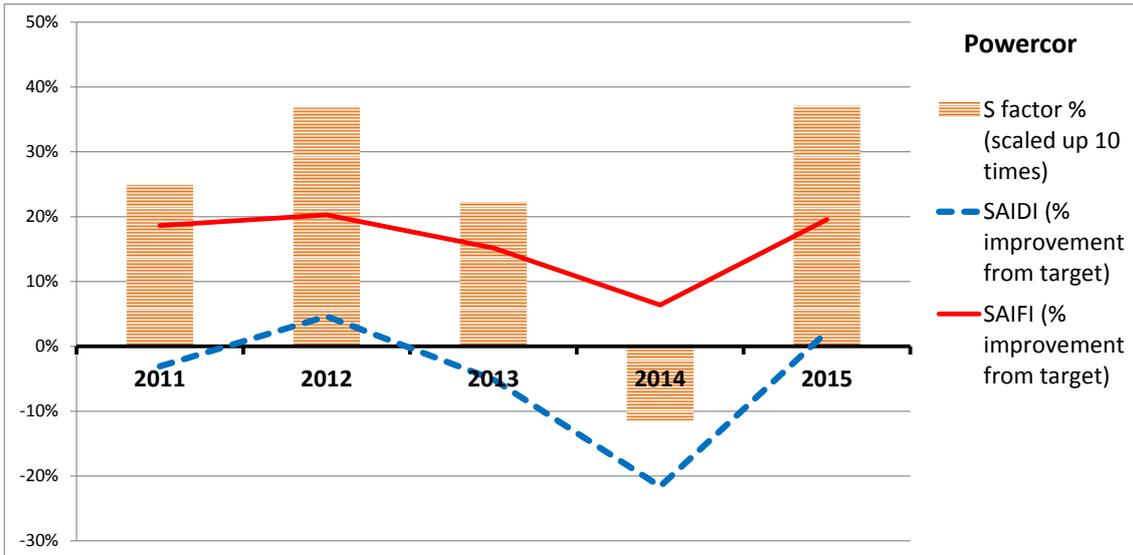
The charts below show distributors' SAIDI and SAIFI against the performance targets) in normalised form for 2011–15<sup>49,50</sup>

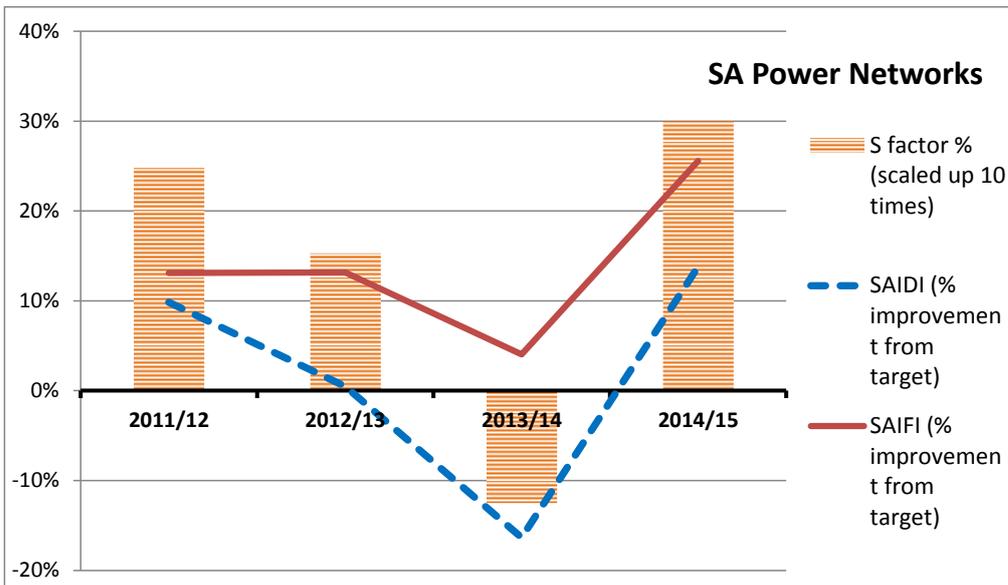
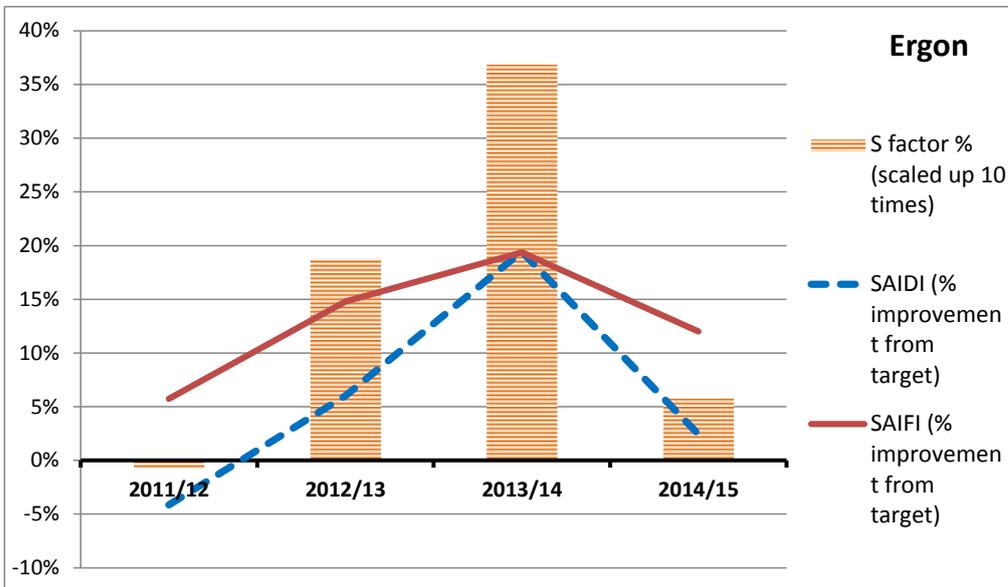
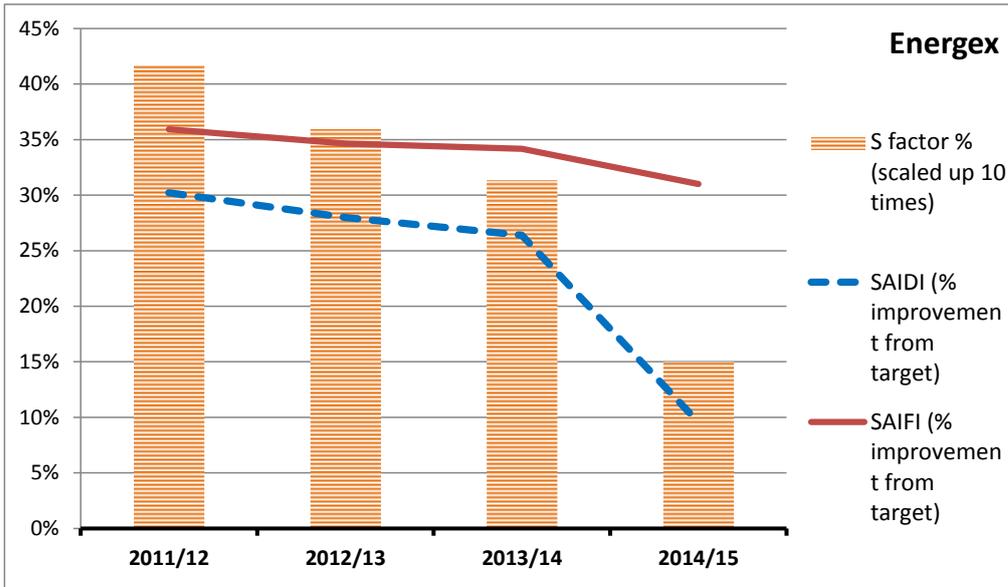


<sup>49</sup> Notes:

- SAIDI and SAIFI overall charts are normalised by scaling different network type performance by the relevant incentive rates so that the charts are reflective of the s-factor impacts of these measures.
- The MAIFI and call centre performances (both have effect on the s-factor) not shown on the charts.
- Charts show improvement from targets (improvements are shown as above the base line).
- The s factor outcomes are scaled up by a factor of 10 for easy presentation.

<sup>50</sup> Historical performance for TasNetworks not shown because its STPIS measures were on per kVA capacity base instead of the STPIS scheme standard of per customer base.





## Appendix C. The ratio between SAIFI and SAIDI incentive rates

Clauses 3.2.2 and 5.3.2 of the STPIS set out how incentive rates are to be determined for the reliability of supply and customer service components of the scheme.

The incentive rate formulae for the unplanned SAIDI and unplanned SAIFI parameters are shown below:

$$ir_{SAIFI,urban} = \frac{\left( \frac{\left( \frac{VCR_n * (1 + CPI)}{1 + W_n} \right) * C_n}{R} \right)}{(365.25 * 24 * 60)} * \frac{SAIDI_n}{SAIFI_n} * 100 \dots\dots\dots (1)$$

$$ir_{SAIDI,urban} = \frac{\left( \frac{VCR_n * (1 + CPI) * \left( 1 - \left( \frac{1}{1 + W_n} \right) \right) * C_n}{R} \right)}{(365.25 * 24 * 60)} * 100 \dots\dots\dots (2)$$

Where

- $ir$  is the incentive rate (expressed in a percentage per unit of the parameter)
- $n$  is the network type
- $VCR_n$  is the VCR for network type  $n$  escalated to the start of the relevant regulatory control period
- $CPI$  the consumer price index used to adjust VCR from the September quarter 2008 to the start of the relevant regulatory control period, calculated in accordance with clause 3.2.2(b) and the relevant distribution determination
- $W_n$  is the network type weighting for the unplanned SAIDI or unplanned SAIFI parameter. The  $W_n$  values for CBD, urban and rural networks are 1.13, 0.97 and 0.92 respectively. Hence, the factor of  $[1/(1 + W_n)]$  equals 0.47, 0.51 and 0.52 respectively (roughly half the value).
- $C_n$  is the average annual energy consumption for network type  $n$

- $R$  is the average of the smoothed annual revenue requirement for the relevant regulatory control period
- $SAIDI_n$  is the average of the unplanned SAIDI targets in the regulatory control period for network type  $n$
- $SAIFI_n$  is the average of the unplanned SAIFI targets in the regulatory control period for network type  $n$ .

## A worked example

The following example demonstrates the effect of the SAIFI/SAIDI incentive rate ratio on a distributor's reward or penalty under STPIS. The following steps are applied:

- A – Derive the STPIS targets using the SAIDI and SAIFI formulas.
- B – Derive the STPIS outcomes using the SAIDI and SAIFI formulas.
- C – Derive the incentive rates using A the incentive formulas in the STPIS.
- D – Determine the reward and penalty using B and C.
- E – Demonstrate the significance of the SAIFI/SAIDI incentive rate ratio on capex verses opex investments.

### **(A) Derive the STPIS target**

The following demonstration distribution feeder is representative of a typical rural feeder of a typical medium size distributor.

Assumptions:

- A long rural feeder has 10,000 customers.
- The 10,000 customers on the rural feeder are distributed evenly along the length of the feeder from the origin.
- On average, there are 3 supply interruptions per year (total number of customer interruptions or 3 SAIFI events).
- The average restoration time to restore supply is 80 minutes (CAIDI).
- Mathematically SAIDI, SAIFI and CAIDI are expressed as:
- $SAIDI = \frac{\text{sum of all customer interruption duration}}{\text{total number of customers served}}$
- $SAIFI = \frac{\text{total number of customer interruptions}}{\text{total number of customers served}}$
- $CAIDI = \frac{\text{sum of all customer interruption duration}}{\text{total number of customer interruptions}} = \frac{SAIDI}{SAIFI}$

Using the above assumptions and formulas, we can calculate the STPIS targets being:

$$\text{SAIFI} = 3 \text{ interruptions}$$

$$\text{SAIDI} = \frac{\text{sum of all customer interruption duration}}{\text{total number of customers served}} = \frac{80 * 3 * 10000}{10000}$$

$$= 240 \text{ minutes}$$

$$\text{CAIDI} = 240/3 = 80 \text{ minutes}$$

### **(B) Derive the STPIS outcomes**

Assumptions

- An auto-recloser is installed at a distance 40% of the length of the feeder from its origin. The feeder has 10,000 customers spread evenly along its length. The auto-recloser can automatically attempt to reclose a feeder after a supply interruption, in an attempt to restore supply very quickly to customers.
- As per average, there are 3 network faults leading to supply interruptions during the year or 3 SAIFI events.
- Two of the outages occurred near the origin. Hence, the auto-recloser was unable to have an effect. Both outages lasted 80 minutes.
- The third fault occurred at the end of the feeder. For this event the auto-recloser was successful in isolating the healthy part of the feeder from the fault. Hence, the 4,000 customers between the feeder origin and the auto-recloser only experience a momentary interruption. The supply to the other 6,000 customers was restored at 80 minutes.

Mathematically the STPIS performance outcomes may be calculated formulas follows

- SAIFI

$$\text{SAIFI} = \frac{\text{total number of customer interruptions}}{\text{total number of customers served}}$$

$$\text{SAIFI (all events)} = \text{SAIFI (event 1)} + \text{SAIFI (event 2)} + \text{SAIFI (event 3)}$$

$$\text{SAIFI} = \frac{10000}{10000} + \frac{10000}{10000} + \frac{6000}{10000}$$

$$\text{SAIFI} = 2.6$$

- SAIDI

$$\text{SAIDI} = \frac{\text{sum of all customer interruption duration}}{\text{total number of customers served}}$$

$$\text{SAIDI (all events)} = \text{SADFI (event 1)} + \text{SAIDI (event 2)} + \text{SAIDI (event 3)}$$

$$SAIDI = \frac{10000 * 80}{10000} + \frac{10000 * 80}{10000} + \frac{6000 * 80}{10000}$$

$$SAIDI = 208 \text{ minutes}$$

**(C) Derive the SAIFI and SAIDI incentive rates**

In order to calculate the reward or penalty under STPIS, the incentive rates for SAIFI and SAIDI must be derived as follows.

Under the STPIS, the incentive rate formulae for the unplanned SAIDI and unplanned SAIFI parameters are expressed as:

$$ir_{SAIFI,rural} = \frac{\left( \frac{\left( \frac{VCR_n * (1 + CPI)}{1 + w_n} \right) * C_n}{R} \right)}{(365.25 * 24 * 60)} * \frac{SAIDI_n}{SAIFI_n} * 100 \dots\dots\dots (1)$$

$$ir_{SAIDI,rural} = \frac{\left( \frac{VCR_n * (1 + CPI) * \left( 1 - \left( \frac{1}{1 + w_n} \right) \right) * C_n}{R} \right)}{(365.25 * 24 * 60)} * 100 \dots\dots\dots (2)$$

Where

- $ir$  is the incentive rate (expressed in a percentage per unit of the parameter)
- $n$  is the network type (rural)
- $VCR_n$  is the Value of Customer Reliability for network type  $n$  escalated to the start of the relevant regulatory control period. For this example we use the current typical VCR value of \$37,000/MWh.
- $CPI$  the consumer price index used to adjust VCR from the initial value to the present day value. For this example, we use the value of 3%.
- $W_n$  is the network type weighting for the unplanned SAIDI or unplanned SAIFI parameter. The  $W_n$  values for CBD, urban and rural networks are 1.13, 0.97 and 0.92 respectively.
- $C_n$  is the average annual energy consumption for network type  $n$  (say 1,250,000)

- R is the average of the smoothed annual revenue requirement for the relevant regulatory control period (say \$ 600,000,000)
- SAIDI<sub>n</sub> is the average of the unplanned SAIDI targets in the regulatory control period for network type n
- SAIFI<sub>n</sub> is the average of the unplanned SAIFI targets in the regulatory control period for network type n.
- Using the above equations with the following we derive:

$$ir_{SAIFI, Rural} = \frac{\left( \frac{\left( \frac{37,000 * (1 + 0.03)}{1 + .92} \right) * 1,250,000}{600,000,000} \right)}{(365.25 * 24 * 60)} * \frac{240}{3} * 100 = 0.628976 \%$$

$$ir_{SAIDI, Rural} = \frac{\left( \frac{37,000 * (1 + 0.03) * \left( 1 - \left( \frac{1}{1 + 0.92} \right) \right) * 1,250,000}{600,000,000} \right)}{(365.25 * 24 * 60)} * 100 = 0.007233 \%$$

With the incentive rates it is now possible to calculate the reward or penalty of the STPIS outcome being.

#### **(D) Determine the STPIS reward or penalty**

The STPIS Outcomes and Incentive Rates can then be used to determine STPIS rewards/penalties, which are expressed as a percentage of the distributor's annual revenue terms. Using the outcomes of SAIFI = 2.6 and SAIDI = 208 minutes, the rewards under STPIS are:

$$SAIFI = (3 - 2.6) * 0.628976 = 0.2516\%$$

$$SAIDI = (240 - 208) * 0.007233 = 0.2315\%$$

$$\text{Total reward} = 0.4831\% \text{ (of the annual revenue of the distributor)}$$

This is equivalent to about \$80,000 reward under STPIS for this sample distributor.

It should also be noted that the ratio between the incentive rates for SAIFI and SAIDI is:

- $0.2516/0.007233 = 87$  minutes, or 1 SAIFI improvement is equivalent to 87 minutes of SAIDI improvement (about the value of CAIDI)

### ***Significance of the SAIFI/SAIDI incentive rate ratio in investment returns***

An alternative to the capex approach of installing an auto-recloser to improve the overall supply reliability, is for a distributor to spend additional opex to restore supply faster.

By comparison with the capex approach, the above total reward is equivalent to:

0.4831% of annual revenue of the distributor, divided by the SAIDI incentive rate of 0.007233

= 66.8 minutes in SAIDI improvement

This means that, if the distributor needs to achieve the same result as the auto-recloser, it needs to be able to improve the supply restoration time significantly, from 80 to 13.2 minutes.

We estimate the reward to be about \$80,000 under STPIS for this improvement, which is typically more than the cost for the installation of an auto-recloser (~\$50,000). However, it should be noted that, once installed, the improvement to reliability will be retained forever; whereas, the reward to the distributor only lasts for 5 years.

This example demonstrates the relative effect between capex expenditure (installing auto-recloser) and increasing opex expenditure (without auto-recloser) under STPIS.

It appears that the current STPIS scheme design tends to favour capex investments over opex responses. However, we are also concerned that the improvements would tend to favour those customers nearer to the zone substations.

All else being equal, it should also be noted that the total CAIDI should remain unchanged, because:

The CAIDI = SAIDI / SAIFI = 208 SAIDI minutes / 2.6 SAIFI events = 80 minutes

## Appendix D. Detailed result of the first application of STPIS

(as reflected in the changes of the SAIFI and SAIDI targets of the current period from the previous period)

Note:

CAIDI is not a STPIS measure, but a combination of SAIDI and SAIFI

CAIDI = SAIDI/SAIFI

### CitiPower

Parameter	Previous period (2011-15)	Current period (2016-20)	Change
Unplanned SAIDI - CBD	11.271	9.130	19% improvements
Unplanned SAIDI - urban	22.360	32.696	46% deterioration
Unplanned SAIFI - CBD	0.186	0.129	31% improvements
Unplanned SAIFI - urban	0.450	0.484	7% deterioration
Unplanned CAIDI - CBD	60.597	70.851	17% deterioration
Unplanned CAIDI - urban	49.689	67.612	36% deterioration

### Jemena

Parameter	Previous period (2011-15)	Current period (2016-20)	Change
Unplanned SAIDI - urban	68.498	55.401	19% improvements
Unplanned SAIDI - short rural	153.15	91.955	40% improvements
Unplanned SAIFI - urban	1.127	0.954	15% improvements
Unplanned SAIFI - short rural	2.588	1.238	52% improvements
Unplanned CAIDI - urban	60.779	58.099	4% improvements
Unplanned CAIDI - short rural	59.177	74.257	25% deterioration

## Powercor

Parameter	Previous period (2011-15)	Current period (2016-20)	Change
Unplanned SAIDI - urban	82.467	83.111	1%
Unplanned SAIDI - short rural	114.807	113.191	-1%
Unplanned SAIDI - long rural	233.759	273.091	17% deterioration
Unplanned SAIFI - urban	1.263	1.047	17% improvements
Unplanned SAIFI - short rural	1.565	1.357	13% improvements
Unplanned SAIFI - long rural	2.54	2.369	7% improvements
Unplanned CAIDI - urban	65.295	79.398	22% deterioration
Unplanned CAIDI - short rural	73.359	83.439	14% deterioration
Unplanned CAIDI - long rural	92.031	115.254	25% deterioration

## AusNet Services

Parameter	Previous period (2011-15)	Current period (2016-20)	Change
Unplanned SAIDI - urban	101.803	81.860	20% improvements
Unplanned SAIDI - short rural	208.542	188.504	10% improvements
Unplanned SAIDI - long rural	256.578	234.597	9% improvements
Unplanned SAIFI - urban	1.448	1.105	24% improvements
Unplanned SAIFI - short rural	2.632	2.299	13% improvements
Unplanned SAIFI - long rural	3.317	2.838	14% improvements
Unplanned CAIDI - urban	70.306	74.111	5% deterioration
Unplanned CAIDI - short rural	79.233	82.002	3% deterioration
Unplanned CAIDI - long rural	77.352	82.662	7% deterioration

## United Energy

Parameter	Previous period (2011-15)	Current period (2016-20)	Change
Unplanned SAIDI - urban	55.085	61.188	11% deterioration
Unplanned SAIDI - short rural	99.151	151.602	53% deterioration
Unplanned SAIFI - urban	0.899	0.896	0%
Unplanned SAIFI - short rural	1.742	2.018	16% deterioration
Unplanned CAIDI - urban	61.240	68.284	12% deterioration
Unplanned CAIDI - short rural	56.933	75.110	32% deterioration

## Ergon Energy

Parameter	Previous period (2011/12-15/16)	Current period (2016/17-20/21)	Change
Unplanned SAIDI - urban	129	126.73	2% improvements
Unplanned SAIDI - short rural	296	317.06	7% deterioration
Unplanned SAIDI - long rural	699	742.47	6% deterioration
Unplanned SAIFI - urban	1.69	1.503	11% improvements
Unplanned SAIFI - short rural	3.06	3.019	-1% s
Unplanned SAIFI - long rural	5.59	5.348	4% improvements
Unplanned CAIDI - urban	76.331	84.318	10% deterioration
Unplanned CAIDI - short rural	96.732	105.022	9% deterioration
Unplanned CAIDI - long rural	125.045	138.831	11% deterioration

## Energex

Parameter	Previous period (2011/12-15/16)	Current period (2016/17-20/21)	Change
Unplanned SAIDI - CBD	3.3	3.897	18% deterioration
Unplanned SAIDI - urban	69.4	60.118	-13% improvements
Unplanned SAIDI - short rural	173.2	144.475	17% improvements
Unplanned SAIFI - CBD	0.032	0.0352	10% deterioration
Unplanned SAIFI - urban	1.044	0.9081	13% improvements
Unplanned SAIFI - short rural	2.285	1.8747	18% improvements
Unplanned CAIDI - CBD	103.125	110.710	7% deterioration
Unplanned CAIDI - Urban	66.475	66.202	0%
Unplanned CAIDI - short rural	75.799	77.066	2% deterioration

## SA Power Networks

Parameter	Previous period (2011/12-15/16)	Current period (2016/17-20/21)	Change
Unplanned SAIDI - CBD	27.1	12.48	54% improvements
Unplanned SAIDI - urban	104.4	121.5	16% deterioration
Unplanned SAIDI - short rural	184.0	231.1	26% deterioration
Unplanned SAIDI - long rural	270.2	311.7	15% deterioration
Unplanned SAIFI - CBD	0.263	0.132	50% improvements
Unplanned SAIFI - urban	1.292	1.353	5% deterioration
Unplanned SAIFI - short rural	1.736	1.93	11% deterioration
Unplanned SAIFI - long rural	2.111	2.027	4% improvements
Unplanned CAIDI - CBD	103.042	94.545	8% improvements
Unplanned CAIDI - Urban	80.805	89.800	11% deterioration
Unplanned CAIDI - short rural	105.991	119.720	13% deterioration
Unplanned CAIDI - long rural	127.996	153.774	20% deterioration

# Appendix E. Common reliability measures definitions and AER's preliminary views

AEMC's recommended definitions	AER preliminary views
<b>Part 1 Measurements – SAIDI, SAIFI, MAIFI and MAIFLe</b>	
<p>SAIDI or System Average Interruption Duration Index in respect of a relevant period, means the sum of the durations of all the Sustained Interruptions (in minutes) that have occurred during the relevant period, divided by the Customer Base.</p>	<p>The AER supports this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.</p>
<p>SAIFI or System Average Interruption Frequency Index in respect of a relevant period, means the total number of Sustained Interruptions that have occurred during the relevant period, divided by the Customer Base.</p>	<p>As above.</p>
<p>MAIFI or Momentary Average Interruption Frequency Index in respect of a relevant period, means the total number of Momentary Interruptions that have occurred during the relevant period, divided by the Customer Base, provided that Momentary Interruptions that occur within the first three minutes of a Sustained Interruption are excluded from the calculation.</p>	<p>As above.</p>
<p>MAIFLe or Momentary Average Interruption Frequency Index event in respect of a relevant period, means the total number of Momentary Interruption Events that have occurred during the relevant period divided by the Customer Base for the relevant period, provided that Momentary Interruptions that occur within the first three minutes of a Sustained Interruption are excluded from the calculation.</p>	<p>As above.</p>
<p>When calculating SAIDI, SAIFI, MAIFI and MAIFLe:</p> <ol style="list-style-type: none"> <li>1. Exclusions – One or more of the circumstances numbered 1 to 7 in Part 3 of this Appendix B may be excluded from such calculations.</li> <li>2. Interruptions – The Interruptions used to calculate such measurements may be limited to Planned Interruptions or Unplanned Interruptions.</li> <li>3. Major Event Days – Interruptions that occur on a Major Event Days may be excluded from such calculations.</li> <li>4. Feeders – The calculations may be limited to CBD feeders, urban feeders, short rural feeders, long rural feeders or a combination of such feeders.</li> </ol>	<p>The AER broadly supports adopting these criteria for the distribution reliability measures guidelines.</p> <ol style="list-style-type: none"> <li>1. The AER supports the exclusions for the STPIS.</li> <li>2. The AER supports this definition for STPIS.</li> <li>3. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.</li> <li>4. The AER supports these limitations under STPIS.</li> </ol>
<b>Part 2 - Definitions</b>	
<p>Catastrophic event means a large scale event (such as a cyclone, flood or bushfire) that is identified by:</p> <ul style="list-style-type: none"> <li>- applying a 4.15 multiple to the log standard deviation used in the statistical method set out in section 3.5 of the IEEE Guide; or</li> <li>- such other statistical method determined by the regulator to more accurately identify large scale events.</li> </ul>	<p>The AER supports this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.</p>
<p>CBD feeder means a feeder in one or more geographic areas that have been determined by the relevant participating jurisdiction as supplying electricity to predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection and redundancy when compared to urban areas.</p>	<p>The AER supports this definition for the distribution reliability measures guidelines and STPIS.</p>

Customer means an end user of electricity who purchases electricity supplied through a distribution system to a connection point.	As above.
Customer Base in respect of a relevant period, means: - the number of Distribution Customers as at the start of the relevant period; plus - the number of Distribution Customers as at the end of the relevant period, divided by two.	As above.
Distribution Customer means a connection point between a distribution network and Customer that has been assigned a NMI, including energised and de-energised connection points but excluding unmetered connection points.	As above.
feeder means a power line, including underground cables, that is part of a distribution network.	As above.
IEEE Guide means the 'IEEE Guide for Electric Power Distribution Reliability Indices, IEEE Standard 1366-2012' published by the Institute of Electrical and Electronic Engineers on 31 May 2012.	As above.
Interruption means any loss of electricity supply to Distribution Customers associated with an outage of any part of the network, including outages affecting a single Customer's premises but excluding disconnections caused by a retailer or a fault in electrical equipment owned by a Customer, provided that:  the start of an Interruption is taken to be when the Interruption is initially automatically recorded by equipment such as SCADA or, where such equipment does not exist, at the time of the first Customer reports that there has been an outage in the network; and  the end of an Interruption is taken to be when the Interruption is automatically recorded as ending by equipment such as SCADA or, where such equipment does not exist, the time when electricity supply is restored to affected Distribution Customers	The AER supports this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.
long rural feeder means a feeder with a total feeder route length greater than 200 km, which is not a CBD feeder or urban feeder.	The AER supports this definition for the distribution reliability measures guidelines and STPIS.
Major Event Day has the meaning given in the IEEE Guide, provided that:  for the purposes of applying an economic incentive scheme, the regulator may apply a different multiple of log standard deviation than the 2.5 multiple used in the statistical method set out in section 3.5 of the IEEE Guide should such multiple be determined by the regulator to more accurately reflect the normal operation of the distribution network; and  Catastrophic events may be excluded from the statistical method used to classify Major Event Days.	The AER broadly supports adopting this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.
Momentary Interruption means an Interruption to a Distribution Customer's electricity supply with a duration of 3 minutes or less, provided that the end of each Momentary Interruption is taken to be when electricity supply is restored for any duration	The AER broadly supports adopting this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.
Momentary Interruption Event means one or more Momentary Interruptions that occur within a continued duration of 3 minutes or less, provided that the successful restoration of electricity supply after any number of Momentary Interruptions is taken to be the end of the Momentary Interruption Event.	As above.

<p>National electricity legislation has the meaning given in the National Electricity Law.</p>	<p>The AER supports adopting this definition for the distribution reliability measures guidelines and STPIS.</p>
<p>outage means the loss of ability of a component to deliver electrical power.</p>	<p>As above.</p>
<p>Planned Interruption means an Interruption resulting from a Distribution Network Service Provider's intentional interruption of electricity supply to a Customer's premises where the Customer has been provided with prior notification of the Interruption in accordance with all applicable laws, rules and regulations.</p>	<p>The AER broadly supports adopting this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.</p>
<p>SCADA or Supervisory Control and Data Acquisition means a system employed to gather and analyse real-time data in respect of network related infrastructure.</p>	<p>The AER supports adopting this definition for the distribution reliability measures guidelines and STPIS.</p>
<p>Short rural feeder means a feeder with a total feeder route length less than 200 km, which is not a CBD feeder or urban feeder.</p>	<p>As above.</p>
<p>Sustained Interruption means an Interruption to a Distribution Customer's electricity supply that has a duration longer than 3 minutes, provided that the successful restoration of supply to the Distribution Customer is taken to be the end of the Sustained Interruption.</p>	<p>The AER broadly supports adopting this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.</p>
<p>Unplanned Interruption means an Interruption that is not a Planned Interruption.</p>	<p>The AER broadly supports adopting this definition for the distribution reliability measures guidelines. The AER proposes to undertake a more detailed review order to implement this definition under the STPIS.</p>
<p>Urban feeder is a feeder which is not a CBD feeder and has a maximum demand (which can be weather normalised) over the feeder route length greater than 0.3 MVA/km.</p>	<p>The AER supports adopting this definition for the distribution reliability measures guidelines and STPIS.</p>
<p><b>Part 3 - Exclusions</b></p>	
<p>Interruptions that result from the following circumstances may be excluded from the calculation of SAIDI, SAIFI, MAIFI and MAIFLe:</p> <ol style="list-style-type: none"> <li>1. Load shedding due to a generation shortfall.</li> <li>2. Automatic load shedding due to the operation of under-frequency relays following the occurrence of a power system under-frequency condition.</li> <li>3. Load shedding at the direction of AEMO or a System Operator.</li> <li>4. Load interruptions caused by a failure of the shared transmission network.</li> <li>5. Load interruptions caused by a failure of transmission connection assets except where the interruptions were due to inadequate planning of transmission network connections points and the Distribution Network Service Provider is responsible for the planning of transmission network connection points.</li> <li>6. Load interruptions caused by the exercise of any obligation, right or discretion imposed upon or provided for under jurisdictional electricity legislation and national electricity legislation applying to a Distribution Network Service Provider.</li> </ol>	<p>The AER supports these exclusions for the distribution reliability measures guidelines and STPIS.</p> <ol style="list-style-type: none"> <li>1. Support. This is consistent with the STPIS.</li> <li>2. Support. This is consistent with the STPIS.</li> <li>3. Support. This is consistent with the STPIS.</li> <li>4. Support. This is consistent with the STPIS.</li> <li>5. Support. This is consistent with the STPIS.</li> <li>6. Support. This is consistent with the STPIS.</li> <li>7. Support. The AER intend to amend the STPIS to reflect this exclusion.</li> </ol>

7. Load interruptions caused or extended by a direction from state or federal emergency services, provided that a fault in, or the operation of, the network did not cause, in whole or part, the event giving rise to the direction.

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