# Electricity Networks Access Code 2004

## Service Standard Performance Report for the year ended 30 June 2020

30 September 2020

westernpower

# Contents

# 1. Executive Summary

Western Power has prepared the Service Standard Performance Report (Report) as requested by the Economic Regulation Authority (ERA) under clause 11(3) of the Electricity Networks Access Code 2004 (Access Code). The report details Western Power's performance against the Service Standard Benchmarks (SSBs) defined in Western Power's current approved Access Arrangement (AA4). This report covers the period 1 July 2019 to 30 June 2020 (2019/20 period).

Of the 19 SSBs specified in AA4, 17 SSBs[1] are included in the Report for the 2019/20 period. During the challenging 2019/20 period, Western Power's overall distribution and transmission network performance was above the required levels for 15 of the 17 SSBs, with Urban and Rural Short System Average Interruption Duration Index (SAIDI) being below the required levels.

The 2019/20 period has highlighted the importance of availability of network services as well as the need to incorporate the impacts of climate change in the definition and evaluation of network services. In 2019 the Australian summer bushfires received global attention, and locally a record four severe weather events were classified as force majeure[2]:

- Yanchep & Two Rocks Bushfire from 12 to 17 December 2019 which occurred during an unusual December four day heatwave;
- Katanning bushfire from 7 to 9 February 2020 which occurred during a heatwave, with strong winds that fanned the fire;
- Abnormal storm events which impacted the North Country area from 26 to 28 February 2020, and consisted of localised strong winds, rain, hail and lightning; and
- The Ex-Tropical Cyclone Mangga storm from 24 to 26 May 2020, which resulted in rain and strong winds and widespread damage over Western Power's network, with four substations significantly affected, three of which were completely blacked out for a period of time.

While the Bureau of Meteorology described Cyclone Mangga as "a once in a decade strong and complex weather system", the number of Total Fire Ban (TFB) days declared by the Department of Fire and Emergency Services (DFES) increased significantly during the 2019/20 summer compared to prior summers. In the period of November 2019 to February 2020 there were 148 district TFB days compared to 90 district TFB days in 2018/19 and just 43 district TFB days in 2017/18. TFB days are declared by the DFES on days of extreme weather. When a TFB day is declared this prohibits activity that may start a fire. This means Western Power should take additional precautions to eliminate or manage potential risks to the public and our people, which can lead to wider and longer power outages.

Whilst it is evident that weather and TFB days have played a part in our network reliability performance response time in 2019/20, understanding how this may shift average performance in the future is a very real challenge. Western Power will continue to monitor these environmental changes and how this will impact on our ability to provide secure and reliable network services into the future.

[1] The Remote De-energise and Remote Re-energise services were not provided in the 2019/20 period, but commenced in July 2020

[2] A Force Majeure event is classified by Western Power in accordance with the Electricity Networks Access Code 2004

## 1.1 Performance summary

Western Power's overall distribution and transmission network performance was above the required levels for 15 of the 17 SSBs during the 2019/20 period:

**Distribution Network -** The reliability performance of the distribution network was lower in 2019/20 compared to the previous period, with both SAIDI and SAIFI being lower for all indicators apart from SAIFI Rural Long which improved by 6.2%. In addition, there were improvements in the Call Centre performance and the Street Lighting repair time.

There have been a number of factors that influenced current performance including outages related to:

- emergency outages to remove hazards
- the increase in total fire ban days
- wind borne debris, birds and vegetation, and
- equipment faults

**Transmission Network -** All transmission SSB's were achieved during the period. The performance of the transmission network was lower in 2019/20 compared to the previous period for all transmission SSBs with the exception of Circuit Availability, which improved marginally. Although the performance was lower compared to 2018/19, the 2019/20 performance is comparable to average performance seen in the last five years for all of the transmission SSBs.

## 1.2 Introduction

As a regulated business, Western Power is required to comply with a broad range of obligations. This Report presents information on Western Power's reliability performance against the Approved Access Arrangement (AA4).

In addition to the 19 SSBs specified in AA4, Western Power is required to report on three additional performance measures in this Report for each financial year:

- Momentary Average Interruption Frequency Index events ($MAIFI_E$) by feeder category as detailed in section 8
- Loss of Supply Event Frequency (LoSEF) – radial as detailed in section 6.3
- LoSEF - meshed as detailed in section 6.3

## 1.3 Service standard performance

The minimum levels of service required of Western Power for the 2019/20 period are defined by the 17 SSBs which applied, covering distribution and transmission reliability and security of supply, call centre performance, street lighting performance, LED replacements, and supply abolishment.

Reliability of supply reflects the service Western Power provides to its customers and is a direct measure of the performance of its transmission and distribution networks. Western Power's performance against the SSBs applicable to the 2019/20 period is provided in section 6.

Western Power's obligations under its transmission and distribution licences require it to comply with the Access Code and meet the service levels defined by the SSBs and prepare a report annually on SSB performance as requested by the ERA.

# 2. Background

In accordance with section 11.1 of the Access Code, Western Power must provide reference services at a service standard at least equivalent to the SSBs set out in the access arrangement. Section 11.2 of the Access Code requires the ERA to annually publish Western Power's actual service standards performance against the SSBs.

The purpose of this Report is to provide information on the actual service standard performance against the SSBs contained in Western Power's AA4, applicable for the 2019/20 period.

The Western Power Network is defined by the Access Code as the portion of the South West Interconnected Network (SWIN) that is owned by the Electricity Network Corporation t/a Western Power. For the purposes of this Report and in referencing the Access Code, the Electricity Distribution Licence (EDL1), the Electricity Transmission Licence (ETL2) and AA4, the terms distribution network and transmission network are used throughout this Report.

The Western Power Network covers a geographic area from Kalbarri to Albany, and from Perth to Kalgoorlie (Figure 2.1) of 255,064 square kilometres. It has a diverse asset base which includes more than 825,000 poles and over 103,000 circuit kilometres of power lines. The distribution network consists of over 820 feeders, connected to the transmission network at 153 terminal and zone substations, providing an electricity supply to over 1,159,000 customers and over 274,000 streetlights.

**Figure 2.1: Map of the Western Power Network**

# 3. The structure of this Report

This Report is structured in accordance with the ERA's Report Template:

- Section 4 outlines and describes the reference services provided by Western Power relevant to the Access Code, section 11.1, within the AA4 period
- Section 5 outlines and describes the SSBs relevant for the AA4 period
- Section 6 outlines and describes the actual performance against the applicable AA4 SSBs for the 2019/20 period
- Section 7 outlines and describes the recognised exclusions defined for the AA4 SSBs
- Section 8 outlines and describes the recognised events known as Momentary Interruptions, or $MAIFI_E$
- Section 9 outlines and describes the application of the Service Standard Adjustment Mechanism (SSAM)
- Appendix A provides charts for each of the SSBs, with the trend of historical performance over a ten-year period
- The figures and tables throughout the Report include data for the following access arrangements:

| AA4 | AA3 | AA2 |
|---|---|---|
| 2019/20 | 2016/17 | 2011/12 |
| 2018/19 | 2015/16 | 2010/11 |
| 2017/18 | 2014/15 | |
| | 2013/14 | |
| | 2012/13 | |

# 4. Reference services

Under AA4 and in accordance with the Access Code sections 5.1 and 11.1, Western Power provides the following reference services:

- Three reference services at entry points for users (entry services)
- 17 reference services at exit points for users (exit services)
- 15 bi-directional reference services at bi-directional points (bi-directional services)
- 10 reference services at connection points (ancillary services)
- 16 standard metering services as reference services

## 4.1 Reference services for entry points

An entry service is a covered service provided by Western Power at an entry point under which the user may transfer electricity into the network at the entry point.

An entry point is a point on a covered network identified as such in an access contract at which, subject to the access contract, electricity is more likely to be transferred into the network than transferred out of the network. Table 4.1 lists the network entry point reference services.

**Table 4.1: Network entry point reference services**

| Reference Service | | Reference Service Description |
|---|---|---|
| B1 | Distribution Entry Service | An entry service combined with a connection service and a reference service (metering) on the distribution system. |
| B2 | Transmission Entry Service | An entry service combined with a connection service and a reference service (metering) at an entry point on the transmission system. |
| B3 | Entry Service Facilitating a Distributed Generation or Other Non-Network Solution<br>*(1 July 2019 commencement)* | An entry service provided on the same basis as entry service B1 in circumstances where this service provides for facilities and equipment connected behind a connection point (including distributed generating plant and other non-network solutions) that results in Western Power's capital-related costs or non-capital costs reducing as a result of the entry point for the distributed generating plant or other non-network solution being located in that particular part of the covered network.<br>Note: a 'thin connection' that involves the export of electricity onto the Western Power Network or the provision of another network support service may be eligible for this reference service. |

## 4.2 Reference services for exit points

An exit service is a covered service provided by Western Power at an exit point under which the user may transfer electricity out of the network at the exit point.

An exit point is a point on a covered network identified as such in an access contract at which, subject to the access contract, electricity is more likely to be transferred out of the network than transferred into the network. Table 4.2 lists the network exit point reference services.

**Table 4.2: Network exit point reference services**

| Reference Service | | Reference Service Description |
|---|---|---|
| A1 | Anytime Energy (Residential) Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A2 | Anytime Energy (Business) Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A3 | Time of Use Energy (Residential) Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A4 | Time of Use Energy (Business) Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A5 | High Voltage Metered Demand Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the high voltage (6.6 kV or higher) distribution system. |
| A6 | Low Voltage Metered Demand Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A7 | High Voltage Contract Maximum Demand Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the high voltage (6.6 kV or higher) distribution system. |
| A8 | Low Voltage Contract Maximum Demand Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A9 | Street lighting Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system for the purpose of public streetlighting, plus the service of the provision and maintenance of the streetlighting assets. |
| A10 | Un-Metered Supplies Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A11 | Transmission Exit Service | An exit service combined with a connection service and a reference service (metering) at an exit point on the transmission system. |
| A12 | 3 Part Time of Use Energy (Residential) Exit Service<br>*(1 July 2019 commencement)* | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A13 | 3 Part Time of Use Energy (Business) Exit Service<br>*(1 July 2019 commencement)* | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A14 | 3 Part Time of Use Demand (Residential) Exit Service<br>*(1 July 2019 commencement)* | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |

| Reference Service | | Reference Service Description |
|---|---|---|
| A15 | 3 Part Time of Use Demand (Business) Exit Service<br>*(1 July 2019 commencement)* | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A16 | Multi Part Time of Use Energy (Residential) Exit Service<br>*(1 July 2019 commencement)* | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |
| A17 | Multi Part Time of Use Energy (Business) Exit Service<br>*(1 July 2019 commencement)* | An exit service combined with a connection service and a reference service (metering) at an exit point on the low voltage (415 volts or less) distribution system. |

## 4.3 Reference services for bi-directional points

A bi-directional service is a covered service provided by Western Power at a bi-directional point under which the user may transfer electricity into and out of the network. A bi-directional point is a point on a covered network identified as such in an access contract at which, subject to the access contract, electricity is both transferred into the network and transferred out of the network. Table 4.3 lists the network bi-directional reference services.

**Table 4.3: Network bi-directional reference services**

| Reference Service | | Reference Service Description |
|---|---|---|
| C1 | Anytime energy (residential) bi-directional service | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C2 | Anytime energy (business) bi-directional service | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C3 | Time of Use Energy (Residential) Bi-directional Service | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C4 | Time of Use Energy (Business) Bi-directional Service | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C5 | High Voltage Metered Demand Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the high voltage (6.6 kV or higher) distribution system. |
| C6 | Low Voltage Metered Demand Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C7 | High Voltage Contract Maximum Demand Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the high voltage (6.6 kV or higher) distribution system. |

| Reference Service | | Reference Service Description |
|---|---|---|
| C8 | Low Voltage Contract Maximum Demand Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C9 | 3 Part Time of Use Energy (Residential) Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C10 | 3 Part Time of Use Energy (Business) Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C11 | 3 Part Time of Use Demand (Residential) Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C12 | 3 Part Time of Use Demand (Business) Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C13 | Multi Part Time of Use Demand (Residential) Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C14 | Multi Part Time of Use Demand (Business) Bi-directional Service<br>*(1 July 2019 commencement)* | A bi-directional service combined with a connection service and a reference service (metering) at a bi-directional point on the low voltage (415 volts or less) distribution system. |
| C15 | Bi-directional Service Facilitating a Distributed Generation or Other Non-Network Solution<br>*(1 July 2019 commencement)* | A bi-directional service provided on the same basis as bi-directional services C1 to C14 (selected by the user) in circumstances where this service provides for facilities and equipment connected behind a connection point (including distributed generating plant and other non-network solutions) that results in Western Power's capital-related costs or non-capital costs reducing as a result of the entry point for the distributed generating plant or other non-network solution being located in that particular part of the covered network.<br>{Note: a 'thin connection' that involves the export of electricity onto the Western Power Network or the provision of another network support service may be eligible for this reference service.} |

## 4.4 Reference services at connection points (ancillary)

Western Power offers 10 services at a connection point as a reference service (ancillary). Table 4.4 lists the reference services at connection points (ancillary).

**Table 4.4: Reference services at connection points (ancillary)**

| Reference Service | | Reference Service Description |
|---|---|---|
| D1 | Supply Abolishment Service<br>*(1 July 2019 commencement)* | A service ancillary to an exit service, entry service or bi-directional service to permanently disconnect electricity supply, remove the meter and abolish the connection point. |

| Reference Service | | Reference Service Description |
|---|---|---|
| D2 | Capacity Allocation Swap (Nominator) (Business) Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• exit services A7, A8 and A11;<br>• entry services B1 and B2; and<br>• bi-directional services C7 and C8<br>under which a user's contracted capacity is decreased at one or more connection points under its access contract and there is a corresponding increase in contracted capacity at one or more connection points under its own access contracts or connection points under another user's access contract for one or more intraday periods for a clearly specified period of time nominated by the user following which the contracted capacity under the user's access contract is reinstated. |
| D3 | Capacity Allocation Swap (Nominee) (Business) Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• exit services A7, A8 and A11;<br>• entry services B1 and B2; and<br>• bi-directional services C7 and C8<br>under which a user's contracted capacity is increased at one or more connection points under its access contract and there is a corresponding decrease in contracted capacity at one or more connection points under its own access contracts or connection points under another user's access contract for one or more intraday period for a clearly specified period of time nominated by the user following which the contracted capacity under the user's access contract is reinstated. |
| D4 | Capacity Allocation Same Connection Point (Nominator) (Business) Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• exit services A7, A8 and A11;<br>• entry services B1 and B2; and<br>• bi-directional services C7 and C8<br>under which a user's contracted capacity at a connection point is decreased under its access contract (expressed as a percentage of that contracted capacity (DSOC or CMD)) for a clearly specified period of time and there is a corresponding increase in contracted capacity to another user at the same connection point under its access contract.<br>The allocated capacity is not further transferable or otherwise delegable.<br>At the end of the specified period the contracted capacity under the user's access contract is reinstated. |

| Reference Service | | Reference Service Description |
|---|---|---|
| D5 | Capacity Allocation Same Connection Point (Nominee) (Business) Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• exit services A7, A8 and A11;<br>• entry services B1 and B2; and<br>• bi-directional services C7 and C8<br>under which a user's contracted capacity is increased at a connection point under its access contract (expressed as the percentage of contracted capacity (DSOC or CMD) nominated pursuant to reference service D4) for a clearly specified period of time and there is a corresponding decrease in contracted capacity to the nominator user at the same connection point under its access contract.<br>The allocated contracted capacity is not further transferable or otherwise delegable.<br>At the end of the specified period the contracted capacity under the user's access contract is reinstated. |
| D6 | Remote Direct Load Control Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• exit services A1 to A8 and A12 to A17; and<br>• bi-directional services C1 to C15<br>to send a command to an activated device for the control of a load at a connection point from a remote locality. The service does not include any site visits by Western Power. |
| D7 | Remote Load Limitation Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• exit services A1 to A8 and A12 to A17; and<br>• bi-directional services C1 to C15<br>to remotely limit the load at a connection point through a Western Power meter. The service does not include any site visits by Western Power. |
| D8 | Remote De-energise Service<br>*(1 July 2020 commencement)* | A service ancillary to:<br>• exit services A1 to A8 and A12 to A17;<br>• entry service B1; and<br>• bi-directional services C1 to C15<br>to de-energise a meter by removing supply voltage from all outgoing circuits on a non-permanent basis by a command sent to a meter from a remote locality. The service does not include any site visits by Western Power. |
| D9 | Remote Re-energise Service<br>*(1 July 2020 commencement)* | A service ancillary to:<br>• exit services A1 to A8 and A12 to A17;<br>• entry service B1; and<br>• bi-directional services C1 to C15<br>to re-arm a previously de-energised meter by a command sent to a meter from a remote locality. The service does not include any site visits by Western Power. |

| Reference Service | | Reference Service Description |
|---|---|---|
| D10 | Streetlight LED Replacement Service<br>*(1 July 2019 commencement)* | A service ancillary to:<br>• Reference Service A9 – Streetlighting Exit Service<br>to replace an existing streetlight luminaire with one of the LED luminaires specified in the price list. |

## 4.5 Reference services for Metering services

Western Power offers 16 metering services as reference services. Table 4.5 provides a list of these metering services.

**Table 4.5: Reference services at connection points (ancillary)**

| Reference Service | | Reference Service Description |
|---|---|---|
| M1 | Unidirectional, accumulation, bi-monthly, manual | Provision of accumulated energy data from an accumulation meter (uni-directional) or interval meter derived by way of a manual read on a bi-monthly basis. |
| M2 | Unidirectional, accumulation (TOU), bi-monthly, manual | Provision of accumulated energy data for the time bands of the reference tariff for the underlying exit service from an accumulation meter (uni-directional) or interval meter derived by way of a manual read on a bi-monthly basis. |
| M3 | Unidirectional, interval, bi-monthly, manual | Provision of interval energy data from an interval meter (uni-directional) derived by way of a manual read on a bi-monthly basis. |
| M4 | Unidirectional, interval, monthly, manual | Provision of interval energy data from an interval meter (uni-directional) derived by way of a manual read on a monthly basis. |
| M5 | Unidirectional, interval, bi-monthly, remote | Provision of interval energy data from an interval meter (uni-directional) derived via a communications network on a bi-monthly basis. |
| M6 | Unidirectional, interval, monthly, remote | Provision of interval energy data from an interval meter (uni-directional) derived following the collection of the interval energy data via a communications network on a monthly basis. |
| M7 | Unidirectional, interval, daily, remote | Provision of interval energy data from an interval meter (uni-directional) derived following the collection of the interval energy data via a communications network on a daily basis. |
| M8 | Bidirectional, accumulation, bi-monthly, manual | Provision of accumulated energy data from an accumulation meter (bi-directional) or interval meter (bi-directional) derived by way of a manual read on a bi-monthly basis. |
| M9 | Bidirectional, accumulation (TOU), bi-monthly, manual | Provision of accumulated energy data for the time bands of the reference tariff for the underlying bi-directional service from an accumulation meter (bi-directional) or interval meter (bi-directional) derived by way of a manual read on a bi-monthly basis. |
| M10 | Bidirectional, interval, bi-monthly, manual | Provision of interval energy data from an interval meter (bi-directional) derived by way of a manual read on a bi-monthly basis. |
| M11 | Bidirectional, interval, monthly, manual | Provision of interval energy data from an interval meter (bi-directional) derived by way of a manual read on a monthly basis. |

| Reference Service | | Reference Service Description |
|---|---|---|
| M12 | Bidirectional interval, bi-monthly, remote | Provision of interval energy data from an interval meter (bi-directional) derived following the collection of the interval energy data via a communications network on a bi-monthly basis. |
| M13 | Bidirectional, interval, monthly, remote | Provision of interval energy data from an interval meter (bi-directional) derived following the collection of the interval energy data via a communications network on a monthly basis. |
| M14 | Bidirectional, interval, daily, remote | Provision of interval energy data from an interval meter (bi-directional) derived following the collection of the interval energy data via a communications network on a daily basis. |
| M15 | Unmetered supply, accumulation, bi-monthly, manual | Provision of the metering services set out in the Metering Code for a type 7 connection point. |
| M16 | One off manual interval read | Provision upon request of interval energy data collected as a manual read from an accumulation meter. |

# 5. Current Service Standard Benchmarks

In Western Power's approved Access Arrangement and in accordance with the Access Code section 11.2, Western Power has SSBs which it is required to monitor and meet each financial year. Of the 19 SSBs specified in AA4, 17 SSBs applied for the 2019/20 period and are reported on in this Report. This information is published in accordance with the Electricity Networks Access Code 2004 (Access Code).

In addition, Western Power is required to report on three additional performance measures in this Report:

- $MAIFI_E$ by feeder category
- LoSEF disaggregated by radial
- LoSEF disaggregated by meshed

## 5.1 Distribution network service standards

For the reference services A1 to A10, A12 to A17, B1 and B3, C1 to C15 and any applicable ancillary reference service D2 to D7, the SSBs are expressed in terms of:

- System Average Interruption Duration Index (SAIDI)
- System Average Interruption Frequency Index (SAIFI)
- Call centre performance: – percentage of fault calls responded to in 30 seconds or less (after exclusions).

The SAIDI and SAIFI metrics are defined in accordance with the National Regulatory Reporting Requirements[3] (NRRR) and can be described as:

- SAIDI –Total number of minutes, on average, that a customer on a distribution network is without electricity in a year
- SAIFI – The average number of times a customer's electricity supply is interrupted per year.

### 5.1.1 SAIDI

SAIDI, measured over a 12-month period, by NRRR definition is the sum of the duration of each customer interruption (customer minutes interrupted) - lasting more than one minute, attributable solely to the distribution network (after exclusions), divided by the average of the total number of connected customers at the beginning and the end of the reporting period.

The unit of measure is minutes per year and the lower the minutes per year, the higher the level of service performance.

The following exclusions apply to SAIDI:

- A Major Event Day (MED) in accordance with the AA4 description
- Interruptions shown to be caused by a fault or other event on the transmission network or a third-party system (for instance, without limitation interruptions caused by an inter-trip signal, generator unavailability or a customer installation)
- Planned interruptions

[3] National Regulatory Reporting for electricity distribution and retail businesses, Utility Regulators Forum discussion paper, March 2002 © Commonwealth of Australia

- Force majeure events affecting the distribution system.

The SSBs expressed in terms of SAIDI for each year of the AA4 period are shown in Table 5.1.

**Table 5.1: SAIDI SSBs for each year ending 30 June**

| SAIDI | Minutes per year |
|---|---|
| | SSB |
| CBD | 33.7 |
| Urban | 130.6 |
| Rural Short | 215.4 |
| Rural Long | 848.3 |

### 5.1.2 SAIFI

SAIFI, measured over a 12-month period, by NRRR definition is the total number of customer interruptions, lasting more than one minute, attributable solely to the distribution network (after exclusions), divided by the average of the total number of connected customers at the beginning and the end of the reporting period.

The unit of measure is interruptions per year and the lower the number of interruptions per year, the higher the level of service performance. The exclusions for SAIDI discussed in section 5.1.1, also apply to SAIFI. The SSBs expressed in terms of SAIFI for each year of the AA4 period are shown in Table 5.2.

**Table 5.2: SAIFI SSBs for each year ending 30 June**

| SAIFI | Interruptions per year |
|---|---|
| | SSB |
| CBD | 0.21 |
| Urban | 1.27 |
| Rural Short | 2.34 |
| Rural Long | 5.70 |

### 5.1.3 Distribution network feeder classifications

The feeder classification, consistent with the NRRR, applied to Western Power's distribution network and used to report service standards performance in accordance with AA4, include: CBD, Urban, Rural Short and Rural Long. Definitions are provided in Table 5.3.

**Table 5.3: Feeder classifications**

| Feeder Category | Description |
|---|---|
| CBD | 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 |

| Feeder Category | Description |
|---|---|
| Urban | 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 |
| Rural Short | A feeder which is not a CBD or urban feeder with a total feeder route length less than 200 km |
| Rural Long | A feeder which is not a CBD or urban feeder with a total feeder route length greater than 200 km |

### 5.1.4 Call centre performance

Call centre performance, measured over a 12-month period, is the number of fault calls responded to in 30 seconds or less (after exclusions), divided by the total number of fault calls.

The unit of measure is percentage of calls per year and the higher the percentage of calls per year, the higher the level of service performance.

The following exclusions apply to call centre performance:

- Calls abandoned by a caller in four seconds or less of their postcode being automatically determined or when a valid postcode is entered by the caller
- Calls abandoned by a caller in 30 seconds or less of the call being placed in the queue to be responded to by a human operator
- All telephone calls received on a MED which is excluded from SAIDI and SAIFI
- A fact or circumstance beyond the control of Western Power affecting the ability to receive calls to the extent that Western Power could not contract on reasonable terms to provide for the continuity of service.

The SSB expressed in terms of call centre performance for each year of the AA4 period is shown in Table 5.4.

**Table 5.4: Call centre performance SSB for each year ending 30 June**

| Call centre performance | Percentage of calls per year |
|---|---|
| | SSB |
| | 86.8% |

## 5.2 Transmission network service standards

In respect of the reference services A11 and B2 available to users directly connected to the transmission network, the SSBs are described below.

### 5.2.1 Circuit Availability

Circuit Availability is the availability of the transmission network and is measured by the actual number of hours the transmission network circuits are available, divided by the total possible hours available (after exclusions).

The unit of measure is percentage of hours per year and the higher the percentage of hours per year, the higher the level of service performance.

The following exclusions apply to circuit availability:

- Interruptions affecting the transmission system shown to be caused by a fault or other event on a third-party system (for instance, without limitation interruptions caused by an inter-trip signal, generator unavailability or a customer installation)
- Force majeure events affecting the transmission system
- Duration of planned interruptions for major construction work, including periods where availability is temporarily restored, is to be capped at 14 days in calculating transmission line availability.

The SSB expressed in terms of Circuit Availability for each year of the AA4 period is shown in Table 5.5.

**Table 5.5: Circuit Availability SSB for each year ending 30 June**

| Circuit Availability | Percentage of hours per year |
|---|---|
| | SSB |
| | 97.8% |

### 5.2.2 LoSEF

LoSEF is the frequency of unplanned customer interruption events where the loss of supply:

- exceeds 0.1 but less or equal to 1.0 System Minutes Interrupted
- exceeds 1.0 System Minutes Interrupted.

The unit of measure is the number of events per year and the lower the number of events per year, the higher the level of service performance.

When calculating LoSEF for the financial year ending 30 June 2020 and each financial year thereafter, "System Peak MW" is the maximum peak demand recorded for the South West Interconnected System for the previous year, excluding the coincident demand for those customers receiving a non-reference service where the impact of an Unplanned Customer outage event is excluded for the purpose of this measure.

The following exclusions apply to System Minutes Interrupted:

- Planned interruptions
- Momentary interruptions (less than one minute)
- Unregulated transmission assets
- Interruptions affecting the transmission system shown to be caused by a fault or other event on a third-party system (for instance, without limitation interruptions caused by an inter-trip signal, generator unavailability or a consumer installation)
- Force majeure events affecting the transmission system.

The SSBs expressed in terms of LoSEF for each year of the AA4 period are shown in Table 5.6.

**Table 5.6: LoSEF SSBs for each year ending 30 June**

| LoSEF | Number of events per year |
|---|---|
| | SSB |
| >0.1 & ≤1.0 System Minutes Interrupted | 26 |
| > 1.0 System Minutes Interrupted | 7 |

### 5.2.3 Average Outage Duration

Average Outage Duration is the total number of minutes duration of all unplanned interruptions on the transmission network divided by the number of unplanned interruption events (after exclusions). The unit of measure is minutes per year and the lower the minutes per year, the higher the level of service performance.

The exclusions that apply to LoSEF also apply to Average Outage Duration. In addition, the exclusion applies for reactive compensation plant, and any event contributing to Average Outage Duration is capped at 14 days.

The SSB expressed in terms of Average Outage Duration for each year of the AA4 period is shown in Table 5.7.

**Table 5.7: Average Outage Duration SSB for each year ending 30 June**

| Average Outage Duration | Minutes per year |
|---|---|
| | SSB |
| | 1,234 |

## 5.3 Street lighting repair time

For the reference service A9, the SSBs are expressed in terms of street lighting repair time.

Street lighting repair time is the average number of business days to repair a faulty streetlight. The unit of measure is average number of business days and the lower the average number of business days, the higher the level of service performance.

The following exclusions apply to street lighting repair time:

- Force majeure events
- Streetlights for which Western Power is not responsible for maintenance.

The SSBs expressed in terms of street lighting repair time for each year of the AA4 period are shown in Table 5.8.

**Table 5.8: Street lighting repair time SSBs for each year ending 30 June**

| Street lighting repair time | SSB – average number of business days |
|---|---|
| Metropolitan area | 5 |
| Regional area | 9 |

### 5.3.1 Areas defined

The areas for street lighting repair times are defined as follows:

**Metropolitan area**

Areas of the State defined in the *Code of Conduct for the Supply of Electricity to Small Use Customers 2018*.

**Regional area**

All areas in the Western Power Network other than the metropolitan area.

## 5.4 Supply abolishment

For the reference service D1, the SSB is expressed in terms of response time.

Supply abolishment response time is the average number of business days to abolish supply. The unit of measure is average number of business days and the lower the average number of business days, the higher the level of service performance.

The following exclusions apply to supply abolishment response time:

- Supply abolishment requests that:
  - are cancelled or are requested to be deferred;
  - relate to non-whole current meters or non-standard technical configurations, site access issues or safety issues;
  - require external approvals or actions beyond the control of Western Power as a *reasonable and prudent person*; or
- A fact or circumstance beyond the control of Western Power as a *reasonable and prudent person* affecting the ability to abolish supply.
- Force majeure events affecting the ability to abolish supply.

The SSB expressed in terms of supply abolishment response time for each year of the AA4 period is shown in Table 5.9.

**Table 5.9: Supply abolishment response time SSB for each year ending 30 June**

| Supply abolishment response time | SSB – average number of business days |
|---|---|
| Supply abolishment response time | 15 |

## 5.5 Streetlight LED replacement service

For the reference service D10 the SSB is the LED replacement, requested by the user, will be completed as soon as reasonably practicable in accordance with good electricity industry practice.

During the 2019/20 period, Western Power was not requested to perform this service. Due to rising interest and technological advancement in LEDs, this service will continue to be offered in 2020/21 and 2021/22, for users seeking streetlight LED replacement services.

# 6. Actual service standard performance

## 6.1 Summary of service standard performance

The service standard performance is detailed in Table 6.1.

**Table 6.1: Service Standard performance summary for the 2019/20 period[4]**

| | | | SSB 2018/19 onwards | 2015/16 actual AA3 | 2016/17 actual AA3 | 2017/18 actual AA4 | 2018/19 actual AA4 | 2019/20 AA4 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Actual | SSB met |
| Distribution | SAIDI | CBD | ≤ 33.7 | 22.6 | 13.8 | 1.3 | 14.7 | 22.8 | ✓ |
| | | Urban | ≤ 130.6 | 91.3 | 104.4 | 104.5 | 106.1(108.2) | 134.3 | × |
| | | Rural Short | ≤ 215.4 | 168.4 | 175.6 | 151.9 | 179.3 (183) | 218.3 | × |
| | | Rural Long | ≤ 848.3 | 582.6 | 626.2 | 718.1 | 712.3(731.8) | 737.7 | ✓ |
| | SAIFI | CBD | ≤ 0.21 | 0.1 | 0.11 | 0.04 | 0.11 | 0.20 | ✓ |
| | | Urban | ≤ 1.27 | 0.91 | 1.02 | 1.03 | 0.97 (0.99) | 1.14 | ✓ |
| | | Rural Short | ≤ 2.34 | 1.75 | 1.76 | 1.59 | 1.79 (1.83) | 2.11 | ✓ |
| | | Rural Long | ≤ 5.70 | 3.99 | 3.95 | 3.96 | 4.02 (4.13) | 3.77 | ✓ |
| | Call Centre Performance - % | | ≥ 86.80 | 91.40 | 91.80 | 91.70 | 91.70 | 92.60 | ✓ |
| Transmission | Circuit Availability - % | | ≥ 97.80 | 98.66 | 98.90 | 99.10 | 98.70 | 98.80 | ✓ |
| | Loss of Supply Events | >0.1 & ≤1.0 SMI | ≤ 26 | 15 | 16 | 11 | 13 | 15 | ✓ |
| | | >1.0 SMI | ≤ 7 | 1 | 2 | 6 | 2 | 3 | ✓ |
| | Average Outage Duration | | ≤ 1,234 | 1,265 | 653 | 560 | 523 | 751 | ✓ |
| Streetlights | Metropolitan area - business days | | ≤ 5 | 1.55 | 2.47 | 3.06 | 4.82 | 4.53 | ✓ |
| | Regional area - business days | | ≤ 9 | 0.89 | 4.59 | 7.00 | 8.15 | 6.77 | ✓ |
| | | | | | | | | | |
| | LED Replacements | | Note[5] | | | | | N/A | |
| | Supply Abolishment - business days | | ≤ 15 | N/A | N/A | N/A | N/A | 3.36 | ✓ |

[4] Some comparative numbers have been adjusted to account for a small number of feeders not included in the reporting for the prior period. The previous numbers are shown in red text

[5] For the reference service D10 the service standard benchmark is the LED replacement, requested by the user, will be completed as soon as reasonably practicable in accordance with good electricity industry practice. During the 2019/20 period, Western Power was not requested to perform this service.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Remote de-energise - business day** | ≤ 1 | | | | | N/A | |
| | **Remote re-energise - business day** | ≤ 1 | | | | | N/A | |

The Supply Abolishment service reporting commenced on 1 July 2019 and the performance exceeded the required level.

Two SSBs were not reported on in 2019/20, metering remote de-energise and remote re-energise, as these services commenced in July 2020.

## 6.2 Distribution network

During the 2019/20 period, Western Power's overall distribution performance was above the required levels for seven of the nine distribution SSBs. The two measures below the required levels were SAIDI Urban and SAIDI Rural Short.

The reliability performance of the distribution network was lower in 2019/20 compared to the previous period, with both SAIDI and SAIFI declining for all indicators apart from SAIFI Rural Long which improved by 6.2%.

There have been a number of factors that influenced current performance including outages related to:

- emergency outages to remove hazards
- the increase in total fire ban days
- wind borne debris, birds and vegetation, and
- equipment faults

Interruptions attributed to emergency outages to remove hazards have been increasing since the start of the AA4 period and is a significant cause of Urban SAIDI and Rural Short SAIDI performance not meeting the prescribed benchmarks.

Western Power has also observed a step change in the number of Total Fire Ban (TFB) days compared to prior summers. The number of TFB days declared by the Department of Fire and Emergency Services (DFES) increased significantly during the 2019/20 summer compared to prior summers. In the period of November 2019 to February 2020 there were 148 district TFB days compared to 90 district TFB days in 2018/19 and just 43 district TFB days in 2017/18. TFB days are declared by the DFES on days of extreme weather. When a TFB day is declared this prohibits activity that may start a fire. This means Western Power should take additional precautions to eliminate or manage potential risks to the public and our people, which can lead to wider and longer power outages.

Whilst it is evident that weather and total fire ban days have played a part in our network reliability performance response time in 2019/20, understanding how this may shift average performance in the future is a very real challenge and yet to be fully understood. Western Power will continue to monitor these environmental changes and how this will impact on our ability to provide a secure and reliable network service into the future.

### 6.2.1 Distribution network – areas of focus

Key strategies and activities continued to be implemented during the 2019/20 period to maintain reliability of supply.

**Routine maintenance**

This activity involves Western Power's routine and targeted asset inspection, maintenance programs, and monitoring of assets. This is done in conjunction with vegetation management plans, as well as the replacement of deteriorating assets and defective assets, such as poles and conductors. The objective of routine and targeted maintenance is to maintain reliability performance and reduce public safety risk.

**Grid augmentation**

This activity involves additional capital work such as network modification or installation of new assets. Specific areas may be targeted based on their long-term reliability performance and underlying reliability risk factors. The nature of augmentation will depend on systemic factors that negatively affect reliability and the suitability of options at that location on the network. Possible options under this strategy include:

- installing interconnections between parts of the network to facilitate the transfer of customer connections to different points on the network (reducing supply interruption duration)
- replacing overhead power lines with covered conductor or underground cables (to reduce the risk of a live electrical conductor contacting a foreign body and causing a supply interruption)
- augmenting or upgrading the distribution feeders, to ensure there is sufficient load carrying capacity, and that the assets are in an adequate (serviceable) condition to meet customer needs
- investigating and utilizing new technology that is expected to improve the customer experience, such as microgrids, automation, standalone power systems and battery energy storage systems.

**Targeted activities**

In anticipation of the lower reliability performance, a number of targeted activities commenced in the second half of 2019/20:

- A change in equipment repair processes was implemented to increase the speed and operability of automated fault restoration systems. The expected performance improvements were visible at the end of 2019/20 and expected to be realised in the 2020/21 financial year.
- Engagement with Western Power customers to review the process of updating keys and contacts of commercial tenants of CBD buildings which contain Western Power equipment. This will allow Western Power staff to readily access equipment in fault situations.
- Deployment of Fuse Saver technology which may considerably diminish sustained outages on radial spurs.
- Temporary deployment of generators for selected reliability hot spots. In 2019/20 temporary islanded networks were created (as required) in the towns of Port Denison and Mullewa.

A number of network reconfiguration and optimisation projects are being investigated for implementation during 2020/21, but due to the time lag in impacting performance, would result in network performance benefits not being realised before 2022/23.

The Underground Cable Asset Management Strategy is currently under review. The current and past performance will be used to inform this strategy review. Equipment failure rates will continue to be monitored.

**Table 6.2: Distribution performance and commentary for the AA4 2019/20 period**

| Service Standard | SSB | 2018/19 | 2019/20 | Comments |
|---|---|---|---|---|
| | | Actual | Actual | |
| CBD SAIDI | 33.7 | 14.7 | 22.8 | Performance was better than the AA4 benchmark but lower than the 2018/19 period.<br>The primary contributors to the reduction in performance were unplanned interruptions where the cause could not be determined, and an interruption due to vegetation impacting an overhead network that was connected to the CBD network at the time of the fault.<br>Note: The CBD SAIDI performance is volatile over a short period of time due to the combined effects of fewer connections and the relatively long repair time for fault in an underground CBD network.<br>To limit this volatility and to ensure the expected high performance of the CBD network, customers have been engaged to improve Western Power access to equipment in private buildings. Targeted equipment repair has been executed in 2019/20 and further automation of equipment is underway to enhance automated restoration of customers (to be continued throughout the AA4 period). |
| Urban SAIDI | 130.6 | 106.1<br>(108.2) | 134.3 | Performance was lower than both the AA4 benchmark and the 2018/19 period.<br>The primary contributors to the reduction in performance were underground cable, overhead switchgear and overhead conductor faults, as well as emergency outages to remove hazards.<br>In anticipation of the reduction in performance, network reconfigurations were actioned in the latter part of 2019/20 to minimise the impact of outages on customers. Further network reconfiguration and augmentation are being investigated for 2020/21, and their benefits will be realised in 2022/23.<br>A change in equipment repair process took place in the second half of 2019/20 to increase the speed and operability of automated fault restoration systems. Whilst performance improvements were visible at the end of 2019/20, their benefits will be realised in 2020/21. The Underground Cable Asset Management Strategy is currently under review and a focus for 2020/21.<br>The root-cause analysis of emergency outages to remove hazards includes (but not limited to) vegetation, equipment failure and third-party impact on the network. |
| Rural Short SAIDI | 215.4 | 179.3<br>(183) | 218.3 | Performance was lower than both the AA4 benchmark and the 2018/19 period. |

| | | | | |
|---|---|---|---|---|
| | | | | The primary contributor to the reduction in performance was emergency outages to remove hazards.<br>In anticipation of the performance reductions, immediate network reconfigurations were actioned in 2019/20 to minimise the impact of outages on customers. Further network reconfiguration and augmentation are being investigated for 2020/21, and their benefits will be realised in 2022/23.<br>A change in equipment repair process took place in the second half of 2019/20 to increase the speed and operability of automated fault restoration systems. Whilst performance improvements were visible at the end of 2019/20, their benefits will be fully realised in 2020/21.<br>Similar to the Urban area, the root-cause analysis of emergency outages to remove hazards includes (but not limited to) vegetation, equipment failure and third-party impact on the network. |
| Rural Long SAIDI | 848.3 | 712.3<br>(731.8) | 737.7 | Performance was better than the AA4 benchmark but lower than the 2018/19 period.<br>The primary contributor to the reduction in performance was overhead equipment failure. |
| CBD SAIFI | 0.21 | 0.11 | 0.20 | Performance was better than the AA4 benchmark but lower than the 2018/19 period.<br>The primary contributors to the reduction in performance were interruptions on the underground cable system and where cause could not be determined.<br>Note: The CBD SAIFI performance is volatile over a short period of time due to the combined effects of fewer connections and the relatively long repair time for fault in an underground CBD network. The Underground Cable Asset Management Strategy is currently under review. The current and past performance will be used to inform this strategy review. |
| Urban SAIFI | 1.27 | 0.97<br>(0.99) | 1.14 | Performance was better than the AA4 benchmark but lower than the 2018/19 period.<br>The primary contributors to the reduction in performance were overhead equipment failure and interruptions where cause could not be determined. |
| Rural Short SAIFI | 2.34 | 1.79<br>(1.83) | 2.11 | Performance was better than the AA4 benchmark but lower than the 2018/19 period.<br>The primary contributor to the reduction in performance was emergency outages to remove hazards. |
| Rural Long SAIFI | 5.70 | 4.02<br>(4.13) | 3.77 | Performance was better than the AA4 benchmark and the 2018/19 period.<br>The primary contributors to the improved performance were reductions in unplanned outages where the cause could not be determined and reductions in equipment failure. |

| | | | | |
|---|---|---|---|---|
| Call centre performance | 86.8% | 91.7% | 92.6% | The 2019/20 performance of 92.6% of fault calls answered within 30 seconds was better than the AA4 benchmark, and also the 91.7% achieved in 2018/19.<br>The ability to respond to calls was supported by increasing the number of 'reserve call takers' that were available for extreme weather events and better use of the automated systems and alerts. |

## 6.3 Transmission network

All transmission SSBs were achieved in the 2019/20 period. The performance of the transmission network was lower during this period compared to the previous period for all transmission SSBs with the exception of Circuit Availability, which improved marginally.

Factors primarily contributing to performance are detailed in Table 6.3. All transmission measures performed within their prescribed service standard benchmarks.

### 6.3.1 Transmission network – areas of focus

Key strategies and activities continued to be implemented during the 2019/20 period to maintain or deliver targeted improvements in the performance of the transmission network.

**Routine and targeted maintenance**

This activity involves Western Power's routine and targeted asset inspection, maintenance programs, and monitoring of assets. This is done in conjunction with vegetation management plans, as well as the replacement of deteriorating assets and defective assets, such as poles and conductors. The objective of routine and targeted maintenance is to positively influence reliability performance and reduce public safety risk.

Western Power has worked to improve maintenance planning and coordination across planned outages to reduce adverse impacts on transmission circuit availability.

**Operational response**

Western Power expedites the restoration of faulted regulated circuits by employing proactive measures such as on-call network switching resources and/or additional resources.

The restoration of customers via the distribution system, where available, helps to maintain performance within the relevant benchmarks.

**Table 6.3: Transmission performance and commentary for the 2019/20 period**

| Service Standard | SSB | 2018/19 | 2019/20 | Comments |
|---|---|---|---|---|
| | | Actual | Actual | |
| Circuit Availability | 97.8% | 98.7% | 98.8% | Performance was better than both the AA4 benchmark and the 2018/19 period. |

| Service Standard | SSB | 2018/19 | 2019/20 | Comments |
|---|---|---|---|---|
| | | Actual | Actual | |
| LoSEF >0.1 and ≤1.0<br>System Minutes Interrupted | 26 | 13 | 15 | Performance was better than the AA4 benchmark but lower than the 2018/19 period record of 13 LOSEF>0.1SMI <=1.0SMI events.<br>The restoration of customers via the distribution system helped to maintain performance within the benchmark. |
| LoSEF >1.0<br>System Minutes Interrupted | 7 | 2 | 3 | Performance was better than AA4 benchmark but lower than the 2018/19 period of 2 LOSEF>1.0SMI events. |
| Average Outage Duration | 1,234 | 523 | 751 | Performance was better than AA4 benchmark but lower than the 2018/19 period of 523 average outage minutes duration.<br>Although the performance was lower compared to 2018/19, the 2019/20 performance is consistent with the average performance over the last five years. |

The significant events under the LoSEF for the 2019/20 period are detailed in Table 6.4 and 6.5.

**Table 6.4: LoSEF >1.0 SMI for the 2019/20 period**

| Events | Date | Load Area | Network Configuration | System Minutes | Connected Load MW | Contributing Factor |
|---|---|---|---|---|---|---|
| 1 | 27/01/20 | PIC | Mesh | 1.676 | 34.78 | TX Overload (Thermal/Overcurrent) |
| 2 | 06/02/20 | EC | Radial | 3.060 | 8.56 | Bushfire |
| 3 | 26/04/20 | EC | Mesh | 1.237 | 8.23 | Cable Failure |
| EC=East Country, EGF=Eastern Goldfields, GSR=Great Southern Region, NC=North Country, PIC=Picton, CT=Cannington, SF=South Fremantle, NT=Northern Terminal, WT=Western Terminal | | | | | | |

**Table 6.5: LoSEF >0.1 & ≤1.0 SMI for the 2019/20 period**

| Events | Date | Load Area | Network Configuration | System Minutes | Connected Load MW | Contributing Factor |
|---|---|---|---|---|---|---|
| 1 | 04-Jul-19 | EC | Radial | 0.551 | 1.87 | Crossarm Failure |
| 2 | 05-Jul-19 | NT | Mesh | 0.566 | 13.55 | Protection Failure |
| 3 | 14-Jul-19 | EGF | Mesh | 0.155 | 31.81 | Secondary Equipment |
| 4 | 02-Aug-19 | WT | Mesh | 0.945 | 47.44 | Wind Borne Material |
| 5 | 09-Sep-19 | EC | Radial | 0.903 | 8.08 | Crossarm Failure |
| 6 | 17-Sep-19 | NT | Mesh | 0.158 | 16.84 | WP Protection Error |
| 7 | 12-Nov-19 | GSR | Mesh | 0.351 | 7.84 | TX Failure |

| Events | Date | Load Area | Network Configuration | System Minutes | Connected Load MW | Contributing Factor |
|---|---|---|---|---|---|---|
| 8 | 05-Dec-19 | EC | Mesh | 0.225 | 5.74 | Bird/Animal/Insect |
| 9 | 13-Dec-19 | CT | Mesh | 0.224 | 13.3 | TX Failure |
| 10 | 25-Dec-19 | EC | Radial | 0.224 | 3.70 | Lightning/Thunderstorms |
| 11 | 09-Feb-20 | EC | Radial | 0.132 | 4.37 | Bushfire |
| 12 | 11-Feb-20 | EC | Mesh | 0.231 | 3.43 | CB Pole Top Fire |
| 13 | 13-Mar-20 | EGF | Mesh | 0.332 | 15.12 | Unknown |
| 14 | 06-May-20 | GSR | Mesh | 0.380 | 2.42 | TX Oil/Gas/Pressure |
| 15 | 21-May-20 | NT | Mesh | 0.297 | 10.64 | Vandalism |
| EC=East Country, EGF=Eastern Goldfields, GSR=Great Southern Region, NC=North Country, PIC=Picton, CT=Cannington, SF=South Fremantle, NT=Northern Terminal, WT=Western Terminal | | | | | | |

### 6.3.2 LoSEF for radial and meshed circuits

Western Power does not have SSB measures for LoSEF for radial and meshed circuits.

As shown in Table 6.4, two events for LoSEF >1.0 SMI were in the meshed transmission networks whilst only one was in the radial transmission network. Also, as illustrated in Table 6.5, for LoSEF >0.1 SMI and ≤1.0 SMI in the 2019/20 period, 11 were in the meshed transmission network and four were in the radial transmission network.

In the classification of radial and meshed transmission networks for the purposes of this Report, the 220kV circuit between Muja Terminal and Merredin Terminal is classified as a radial transmission network circuit due to the protection scheme installed which results in a trip to the whole 220kV line in the event of any fault on the Muja to Merredin lines.

## 6.4 Street lighting repair time

**Table 6.6: Street lighting repair time performance and commentary for the 2019/20 period**

| Service Standard | 2019/20 | | Comments |
|---|---|---|---|
| | SSB | Actual | |
| Metropolitan area | ≤ 5 business days | 4.53 | Performance in the metropolitan area was better than the 2018/19 period (4.82 average business days), and within the SSB target of 5 business days. |
| Regional area | ≤ 9 business days | 6.77 | Performance in regional areas was better than the 2018/19 period (8.15 average business days), and within the SSB target of 9 business days. |

## 6.5 Supply abolishment

**Table 6.7: Supply abolishment response time performance and commentary for the 2019/20 period**

| Service Standard | 2019/20 | | Comments |
|---|---|---|---|
| | SSB | Actual | |
| All areas | ≤ 15 business days | 3.36 | This is the first time this benchmark has been reported by Western Power and the average performance was 3.36 business days, compared to the SSB target of 15 business days. |

## 6.6 Western Power Network Performance

Western Power does not have an SSB measure for the total network. As shown in Table 6.8 and Figures 6.1 and 6.2, the reliability performance of the Western Power distribution network for the 2019/20 period was lower compared to the previous year, with the duration of outages and the frequency of interruptions increasing.

**Table 6.8: Overall reliability performance of the network**

| | | 2018/19 | 2019/20 |
|---|---|---|---|
| Distribution | SAIDI | 175.7 | 208.8 |
| | SAIFI | 1.44 | 1.63 |

**Figure 6.1: Distribution network SAIDI (10-year history)**

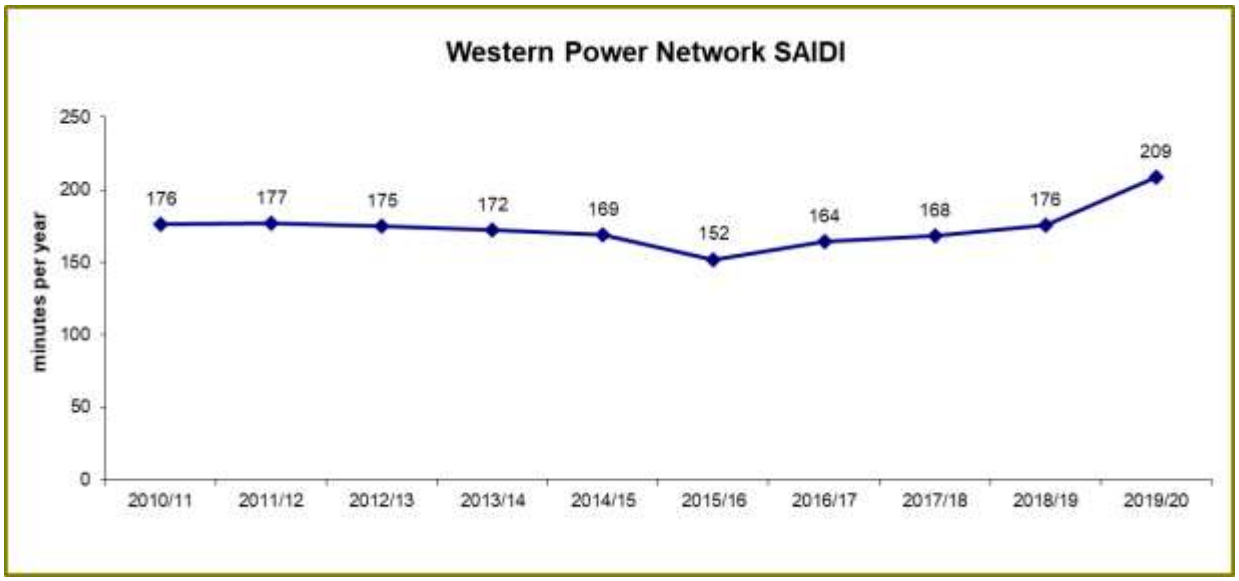
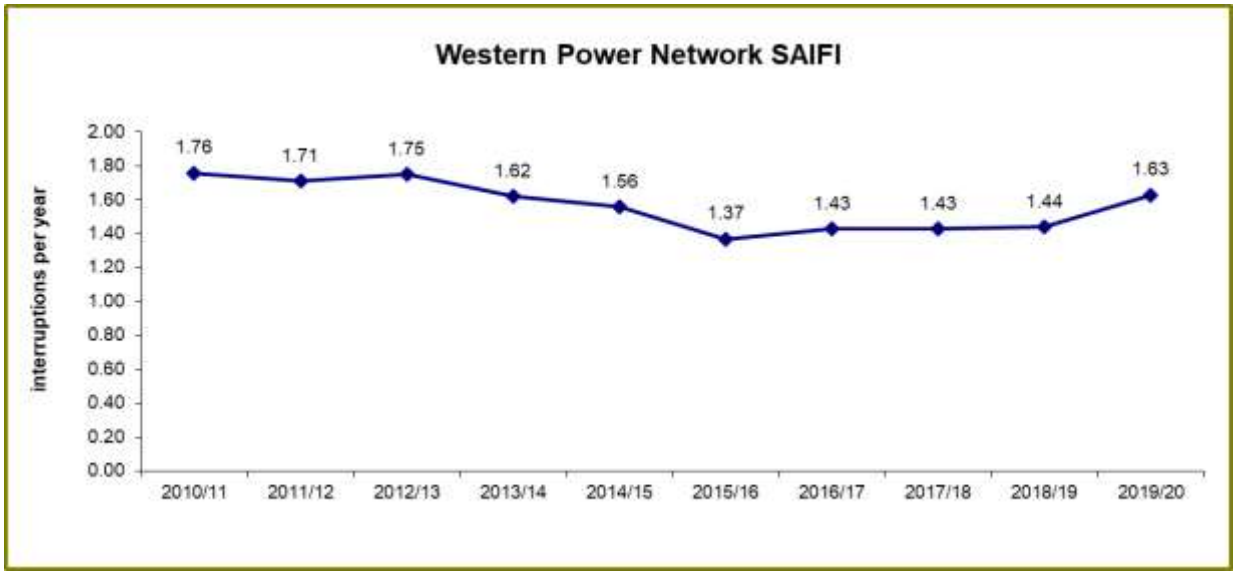


**Figure 6.2: Distribution network SAIFI (10-year history)**



# 7. Exclusions from SSB performance

As outlined in section 5, the service standards provide for certain events to be excluded from the distribution and transmission reference service performance.

## 7.1 Distribution performance – SAIDI, SAIFI

Based on the exclusions described in section 5.1.1, for the 2019/20 period, the distribution performance service standards in terms of SAIDI and SAIFI excluded the interruptions described below.

### 7.1.1 Major Event Days (MEDs)

The MEDs excluded are classified in accordance with the description provided in the Approved Access Arrangement (AA4).

There were eight days during the 2019/20 period that exceeded the daily MED threshold of 5.74 minutes.

Table 7.1 illustrates:

- SAIDI (minutes per year) and SAIFI (interruptions per year), which have been excluded from the 2019/20 period due to these eight MEDs
- Call centre performance (percentage calls per year), which is the percentage number of fault calls responded to in 30 seconds or less against the total number of fault calls during these eight MEDs.

**Table 7.1: SAIDI, SAIFI and call centre performance exclusions due to MEDs[6]**

| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|
| SAIDI | CBD | 6 | 0 | 0 | 0 | 0 |
| | Urban | 39 | 35 | 52 | 11 | 117 |
| | Rural Short | 175 | 30 | 157 | 28 (29) | 192 |
| | Rural Long | 152 | 133 | 330 | 130 (132) | 629 |
| SAIFI | CBD | 0 | 0 | 0 | 0 | 0 |
| | Urban | 0.17 | 0.13 | 0.08 | 0.07 | 0.44 |
| | Rural Short | 0.40 | 0.12 | 0.40 | 0.12 | 0.49 |
| | Rural Long | 0.61 | 0.23 | 0.61 | 0.36 (0.37) | 1.53 |
| Call centre performance | | 90.0% | 91.8% | 96.1% | 92.1% | 89.9% |

[6] Some comparative numbers have been adjusted to account for a small number of feeders not included in the reporting for the prior period. The previous numbers are shown in red text

### October 4, 2019

(SAIDI = 11.0 minutes, SAIFI = 0.042 interruptions, call centre performance = 88.7%)

Around 49,000 customers were interrupted for an average of nearly four hours across the Western Power network (most of the affected customers were in the Perth Metropolitan, Wheatbelt and Mid-West regions). There was inclement weather in the form of strong winds.

### January 30, 2020

(SAIDI = 24.5 minutes, SAIFI = 0.062 interruptions, call centre performance = 92.8%)

Around 62,000 customers were interrupted for an average of 6 hours and 30 minutes across the Western Power network (most of the affected customers were in the Perth Metropolitan, Mid-West, Wheatbelt and South West regions). The main cause of customer interruptions was pole top fire activity.

### February 24, 2020

(SAIDI = 6.5 minutes, SAIFI = 0.260 interruptions, call centre performance = 89.0%)

Around 26,000 customers were interrupted for an average of around 4 hours across the Western Power network (most of the affected customers were in the Perth Metropolitan and Wheatbelt regions). There was inclement weather in the form of strong winds.

### February 25, 2020

(SAIDI = 11.7 minutes, SAIFI = 0.021 interruptions, call centre performance = 84.1%)

Around 32,000 customers were interrupted for an average of around 6 hours across the Western Power network (most of the affected customers were in the Perth Metropolitan and Wheatbelt regions). There was inclement weather in the form of strong winds.

### May 5, 2020

(SAIDI 44.1 minutes, SAIFI = 0.102 interruptions, call centre performance = 91.5%)

Around 100,000 customers were interrupted for an average of over 7 hours across the Western Power network. (Customers across most areas of the Western Power Network were affected, although less so in the Mid-West and Goldfields regions). The main cause of customer interruptions was predominantly due to storm activity.

### May 6, 2020

(SAIDI 11.8 minutes, SAIFI = 0.074 interruptions, call centre performance = 85.7%)

Around 66,000 customers were interrupted for an average of nearly 3 hours across the Western Power network. (Customers across most areas of the Western Power network were affected, although less so in the Mid-West and Goldfields regions). The main cause of customer interruptions was predominantly due to storm activity.

### May 24, 2020

(SAIDI 36.7 minutes, SAIFI = 0.085 interruptions, call centre performance = 92.9%)

Around 115,000 customers were interrupted for an average of nearly 8 hours across the Western Power network. (Customers across most areas of the Western Power network were affected, although less so in the Great Southern and Peel regions). The main cause of customer interruptions was major storm activity from ex-Tropical Cyclone Mangga**.**

### May 25, 2020

(SAIDI 18.2 minutes, SAIFI = 0.080 interruptions, call centre performance = 93.3%)

Around 81,000 customers were interrupted for an average of around 3 hours and 30 minutes across the Western Power network. (Customers across most areas of the Western Power network were affected, although less so in the Great Southern and Peel regions). The main cause of customer interruptions was major storm activity from ex-Tropical Cyclone Mangga.

### 7.1.2 Transmission network interruptions

The SAIDI (minutes per year) and SAIFI (interruptions per year) that were excluded due to supply interruptions caused by the transmission network are outlined in Table 7.2.

**Table 7.2: SAIDI and SAIFI exclusions due to transmission network interruptions**[7]

| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|
| SAIDI | CBD | 0 | 0 | 0 | 0 | 2 |
| | Urban | 8 | 18 | 8 | 3 | 20 |
| | Rural Short | 24 | 17 | 50 | 9 | 44 |
| | Rural Long | 40 | 70 | 74 | 32 | 236 |
| SAIFI | CBD | 0 | 0 | 0 | 0 | 0.10 |
| | Urban | 0.13 | 0.27 | 0.18 | 0.11 | 0.24 |
| | Rural Short | 0.29 | 0.32 | 0.33 | 0.13 (0.14) | 0.18 |
| | Rural Long | 0.75 | 0.57 | 0.29 | 0.43 (0.44) | 0.63 |

### 7.1.3 Other third-party network interruptions

The SAIDI (minutes per year) and SAIFI (interruptions per year) that were excluded due to supply interruptions caused by generator unavailability or customer equipment are outlined in Table 7.3.

[7] Some comparative numbers have been adjusted to account for a small number of feeders not included in the reporting for the prior period. The previous numbers are shown in red text t

**Table 7.3: SAIDI and SAIFI exclusions due to other third-party network interruptions**

| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|
| SAIDI | CBD | 2 | 1 | 0 | 2 | 1 |
| | Urban | 3 | 5 | 4 | 1 | 10 |
| | Rural Short | 2 | 5 | 2 | 1 | 6 |
| | Rural Long | 4 | 5 | 7 | 5 | 8 |
| SAIFI | CBD | 0.02 | 0 | 0 | 0.01 | 0 |
| | Urban | 0.02 | 0.13 | 0.02 | 0.01 | 0.12 |
| | Rural Short | 0.02 | 0.13 | 0.01 | 0.01 | 0.07 |
| | Rural Long | 0.06 | 0.09 | 0.03 | 0.01 | 0.04 |

There were 2,441 faults attributed to customer installations or other third-party equipment. There were no faults attributed to generator failure.

### 7.1.4 Planned interruptions

The SAIDI (minutes per year) and SAIFI (interruptions per year) that were excluded due to planned supply interruptions required to undertake safe work activities on the distribution network and mitigate the risk of unplanned interruptions, are outlined in Table 7.4.

**Table 7.4: SAIDI and SAIFI exclusions due to planned interruptions[8]**

| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|
| SAIDI | CBD | 21 | 9 | 10 | 3 | 27 |
| | Urban | 44 | 79 | 97 | 49 (48) | 71 |
| | Rural Short | 148 | 186 | 126 | 64 (65) | 87 |
| | Rural Long | 448 | 253 | 376 | 156 (157) | 277 |
| SAIFI | CBD | 0.06 | 0.02 | 0.03 | 0.01 | 0.05 |
| | Urban | 0.14 | 0.24 | 0.30 | 0.16 | 0.25 |
| | Rural Short | 0.41 | 0.50 | 0.38 | 0.21 | 0.28 |
| | Rural Long | 1.26 | 0.94 | 1.08 | 0.48 (0.47) | 0.90 |

### 7.1.5 Force Majeure

There were three force majeure events which impacted the distribution network during the 2019/20 period:

[8] Some comparative numbers have been adjusted to account for a small number of feeders not included in the reporting for the prior period. The previous numbers are shown in red text

- **Yanchep & Two Rocks Bushfire** - The Yanchep-Two Rocks bushfire event impacted the distribution network from 12 to 17 December 2019 and occurred during an unusual December four day heatwave. External site access restrictions by the Department of Fire and Emergency Services (DFES) hindered Western Power's ability to respond, prohibiting Western Power access to its network assets. Repairs could not occur until it was safe to do so under the direction of the DFES.
- **Katanning Bushfire** - The Katanning bushfire event impacted on the distribution network from 7 to 9 February 2020 and occurred during a heatwave, with strong winds that fanned the fire. Work force restrictions put in place resulted in Western Power not being able to resolve the faults on the network. Repairs could not occur until it was safe to do so under the direction of the local Fire Incident Control Captain.
- **North Country Abnormal Storm Events** – The impact of the storms on the distribution network from 26 to 28 February 2020 has been classified as force majeure. The storms occurred during an abnormal February weather event consisting of localised strong winds, rain, hail and lightning.

**Table 7.5: Distribution network force majeure events**

| Force Majeure Event | Incident Date | Customers Interrupted | SAIDI Impact (Minutes) | SAIFI Impact (Interrupt) | Distribution Area |
|---|---|---|---|---|---|
| Yanchep/Two Rocks Bushfire | 12-17 Dec 2019 | 8,478 | 9.3 | 0.03 | Rural Short |
| Katanning Bushfire | 7-9 Feb 2020 | 1,230 | 8.5 | 0.01 | Rural Long |
| North Country Abnormal Storm Events | 26-28 Feb 2020 | 12,116 | 48.6 | 0.23 | Rural Long |

**Table 7.6: SAIDI and SAIFI exclusions due to force majeure**

| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|
| SAIDI | CBD | 0 | 0 | 0 | 0 | 0 |
| | Urban | 0 | 0 | 0 | 0 | 0 |
| | Rural Short | 0 | 0 | 0 | 0 | 9 |
| | Rural Long | 0 | 0 | 0 | 0 | 57 |
| SAIFI | CBD | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Urban | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Rural Short | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| | Rural Long | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 |

## 7.2 Distribution performance – Call centre performance

Based on the exclusions described in section 5.1.4, for the 2019/20 period, the distribution performance service standards in terms of call centre performance exclude the fault call non-compliances as indicated below:

### 7.2.1 Abandoned calls – four seconds or less

These calls are currently not captured or recorded within Western Power's systems.

### 7.2.2 Major Event Days

See section 7.1.1 for the details of the MEDs for the 2019/20 period.

### 7.2.3 Extraordinary events

There were no extraordinary events on the distribution network affecting the call centre performance.

## 7.3 Transmission performance

Based on the exclusions described in section 5.2, the transmission performance for the AA4 period excludes the interruptions described below.

### 7.3.1 Force Majeure

There were two events on the transmission network that were classified as force majeure.

- **North Country Abnormal Storm Events** - The impact of the storms on the transmission network from 26 to 28 February 2020 has been classified as force majeure. The storms occurred during an abnormal February weather event consisting of localised strong winds, rain, hail and lightning.
- **Ex-Tropical Cyclone Mangga** - from 24 to 26 May 2020, the impact of ex-Tropical Cyclone Mangga resulted in rain and strong winds and widespread damage over a large area of the Western Power network. Four substations were significantly affected, three of which were completely blacked out for a period of time. The Bureau of Meteorology described Cyclone Mangga as "a once in a decade strong and complex weather system".

**Table 7.7: Transmission network force majeure events**

| Force Majeure Event | Incident Date | Circuit Availability | LoSEF >0.1 and ≤1.0 SMI | LoSEF >1.0 SMI | Average Outage Duration |
|---|---|---|---|---|---|
| North Country Abnormal Storm Events | 26-28 Feb 2020 | 0.013% | 1 | 1 | 66 |
| Ex-Tropical Cyclone Mangga | 24-26 May 2020 | 0.008% | 0 | 2 | 37 |

### 7.3.2 Planned interruptions - major construction work exceeding 14 days

In calculating circuit availability, planned interruptions for major construction work is capped at 14 days. Table 7.8 shows the number of planned interruptions for major construction works that exceeded the 14-day cap in each of the last five financial years.

**Table 7.8: Planned interruptions for major construction work exceeding 14 days**

| | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|
| Number of planned interruptions | 19 | 24 | 14 | 17 | 21 |

# 8. $MAIFI_E$

During the 2019/20 period, there were approximately 3,400 momentary interruptions recorded on the network. Most of these interruptions occurred on the Rural Long network.

Table 8.1 shows the $MAIFI_E$ for the AA4 period for each of the distribution feeder classifications. This data is inclusive of all momentary interruptions on the distribution network.

**Table 8.1: $MAIFI_E$ during the AA4 period[9]**

| | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|
| CBD | 0.37 | 0.12 | 0.12 |
| Urban | 0.74 | 0.64 (0.65) | 0.73 |
| Rural Short | 2.23 | 2.15 (2.19) | 2.19 |
| Rural Long | 6.03 | 6.61 (6.80) | 5.48 |

[9] Some comparative numbers have been adjusted to account for a small number of feeders not included in the reporting for the prior period. The previous numbers are shown in red text

# 9. Service standard adjustment mechanism

## 9.1 Overview

The ERA applies a financial reward or penalty to Western Power in relation to the actual performance for 13 SSBs through the Service Standard Adjustment Mechanism (SSAM). This is the first year the SSAM has applied for AA4.

The SSAM applies to the SSAM SSBs for SAIDI, SAIFI, circuit availability, call centre performance, loss of supply event frequency and average outage duration. A reward or penalty is calculated based on the difference between the actual performance and the Service Standard Target (SST) which is capped, as outlined in AA4.

## 9.2 Actual performance

Western Power has met or exceeded the expected level of performance for the SSAM target for five out of the 13 SSB measures subject to this financial incentive scheme. Table 9.1 shows the results of the SSAM performance for the 2019/20 period.

All values are expressed in real dollars as at 30 June 2017.

**Table 9.1: Service Standard Adjustment Mechanism results for the 2019/20 period**

| Service Standard | | | Incentive Rate | | | SST | SSB | SSA | SSD | SSAM Reward \| Penalty ($M) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $ Unit Rate | Reward | Penalty | | | | | |
| Distribution | SAIDI | CBD | per SAIDI minute | $30,215 | $30,215 | 17.7 | 33.7 | 22.8 | -5.10 | -154,097 |
| | | Urban | | $446,660 | $446,660 | 106.8 | 130.6 | 134.3 | -23.80 | -10,630,508 |
| | | Rural Short | | $143,118 | $143,118 | 188.6 | 215.4 | 218.3 | -26.80 | -3,835,562 |
| | | Rural Long | | $52,503 | $52,503 | 677.7 | 848.3 | 737.7 | -60.00 | -3,150,180 |
| | SAIFI | CBD | per 0.01 SAIFI event | $29,224 | $29,224 | 0.12 | 0.21 | 0.20 | -0.08 | -233,792 |
| | | Urban | | $290,697 | $290,697 | 1.09 | 1.27 | 1.14 | -0.05 | -1,453,485 |
| | | Rural Short | | $91,819 | $91,819 | 1.96 | 2.34 | 2.11 | -0.15 | -1,377,285 |
| | | Rural Long | | $55,341 | $55,341 | 4.29 | 5.70 | 3.77 | 0.52 | 2,877,732 |
| | Call Centre Performance | | % calls per year | $38,059 | $12,442 | 92.0 | 86.8 | 92.63 | 0.63 | 239,772 |
| Total Distribution Penalty / Reward (capped at 2.5% for Penalties, and 1% for Rewards) | | | | | | | | | | -17,717,405 |
| Transmission | Circuit Availability | | % hours per year | $449,344 | $256,768 | 98.5 | 97.8 | 98.8 | 0.3 | 1,289,617 |
| | Loss of Supply Event Frequency | 0.1 < System Minute <=1 | number of events per year | $89,869 | $59,912 | 17 | 26 | 15 | 2 | 179,738 |
| | | System Minute > 1 | | $179,737 | $134,803 | 3 | 7 | 3 | 0 | 0 |
| | Average Outage Duration | | minutes per year | $5,661 | $1,598 | 784 | 1,234 | 751 | 33 | 186,813 |
| Total Transmission Penalty / Reward (capped at 1% for Penalties, and 1% for Rewards) | | | | | | | | | | 1,656,168 |
| Total SSAM Penalty / Reward | | | | | | | | | | -16,061,237 |

# Appendix A

## Service standard performance graphs – 2008/09 to 2019/20

# A.1 Service standard performance graphs – 2008/09 to 2019/20

The following graphs illustrate the actual performance of the service standards for the 12 financial years up to the 2019/20 period. The Service Standard Target (SST) applied for AA3 from 2012/13 to 2016/17. As the AA4 commencement was delayed to 1 July 2019, the SSTs did not apply for 2017/18 and 2018/19, but will apply for 2019/20 to 2021/22.

- Figure A.1 to Figure A.8 show the SAIDI and SAIFI of the CBD, Urban, Rural Short and Rural Long networks.
- Figure A.9 illustrates Call Centre performance

## A.1.1 Distribution performance

**Figure A.1: CBD SAIDI**

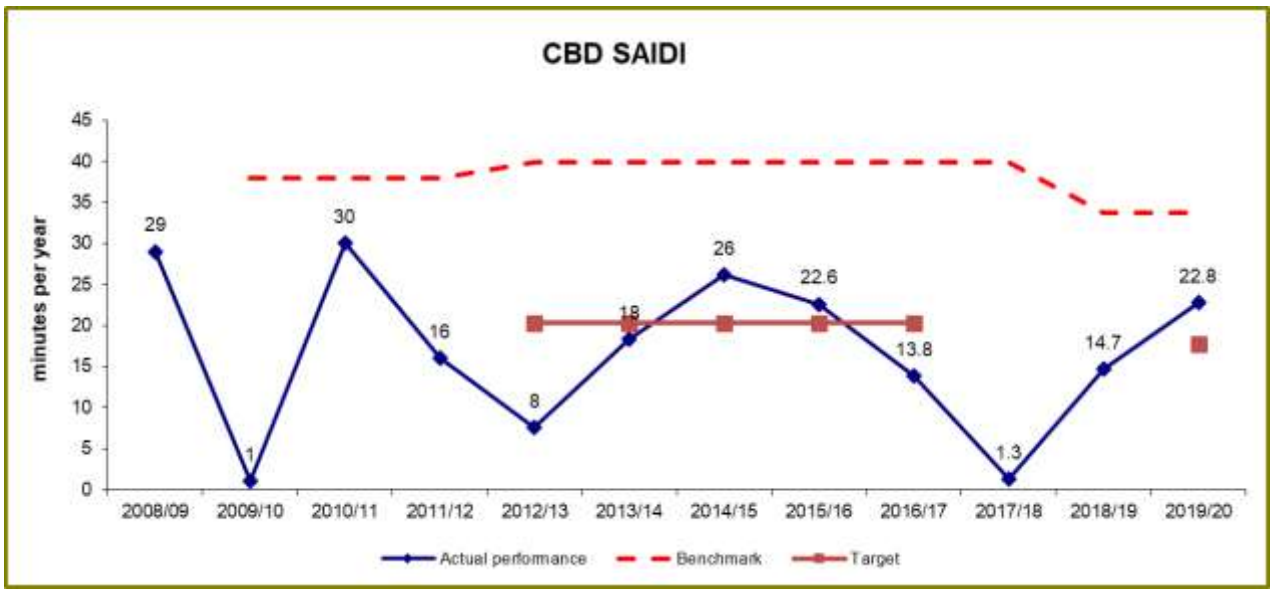



**Figure A.2: CBD SAIFI**

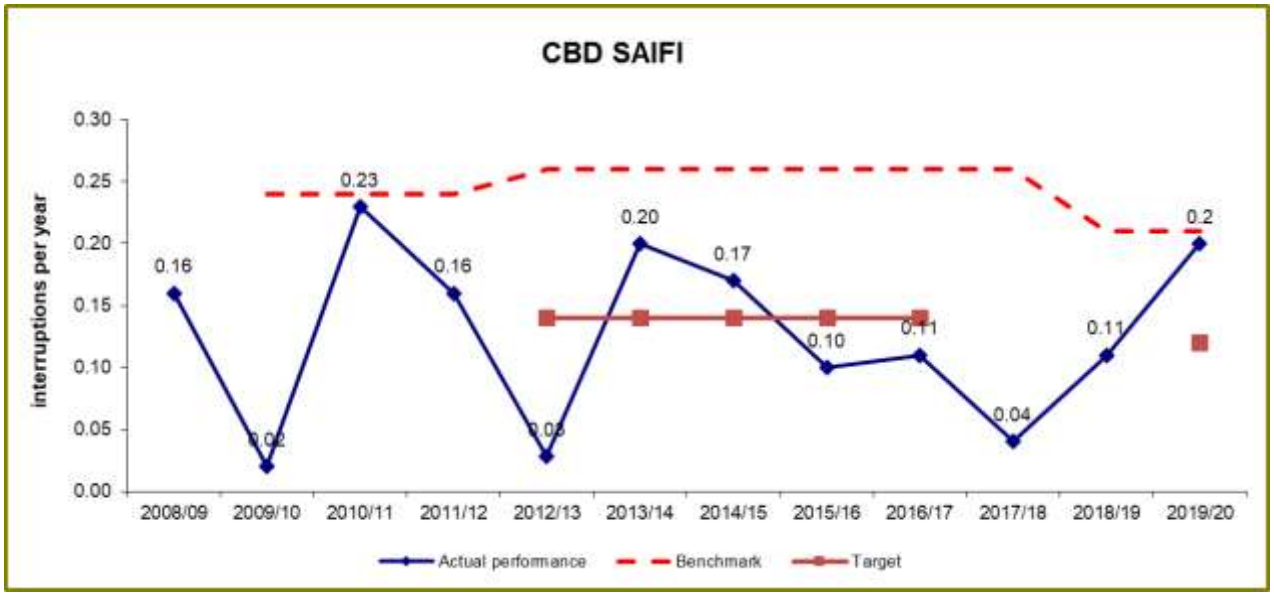


**Figure A.3: Urban SAIDI**

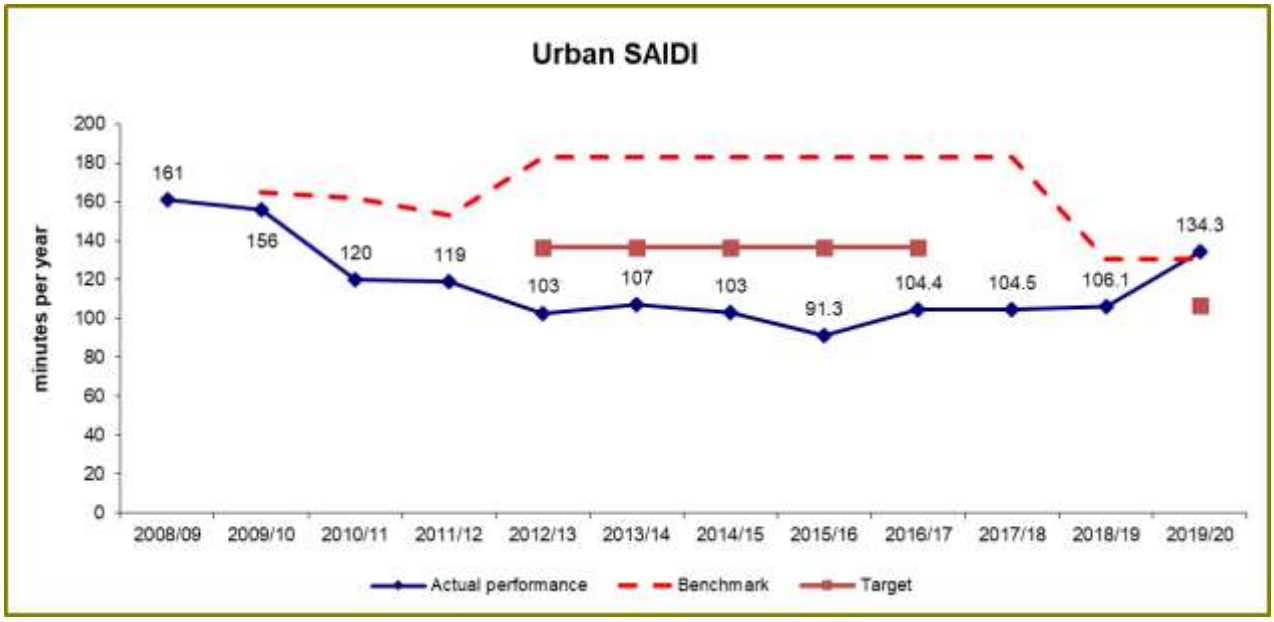



**Figure A.4: Urban SAIFI**

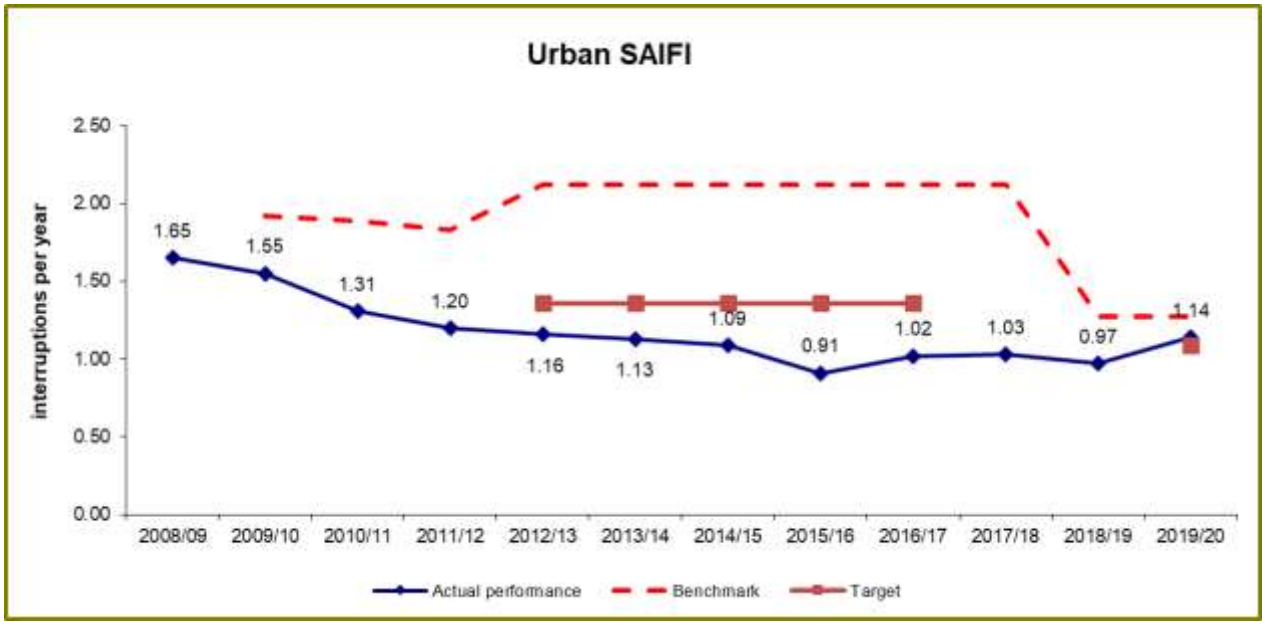


**Figure A.5: Rural Short SAIDI**

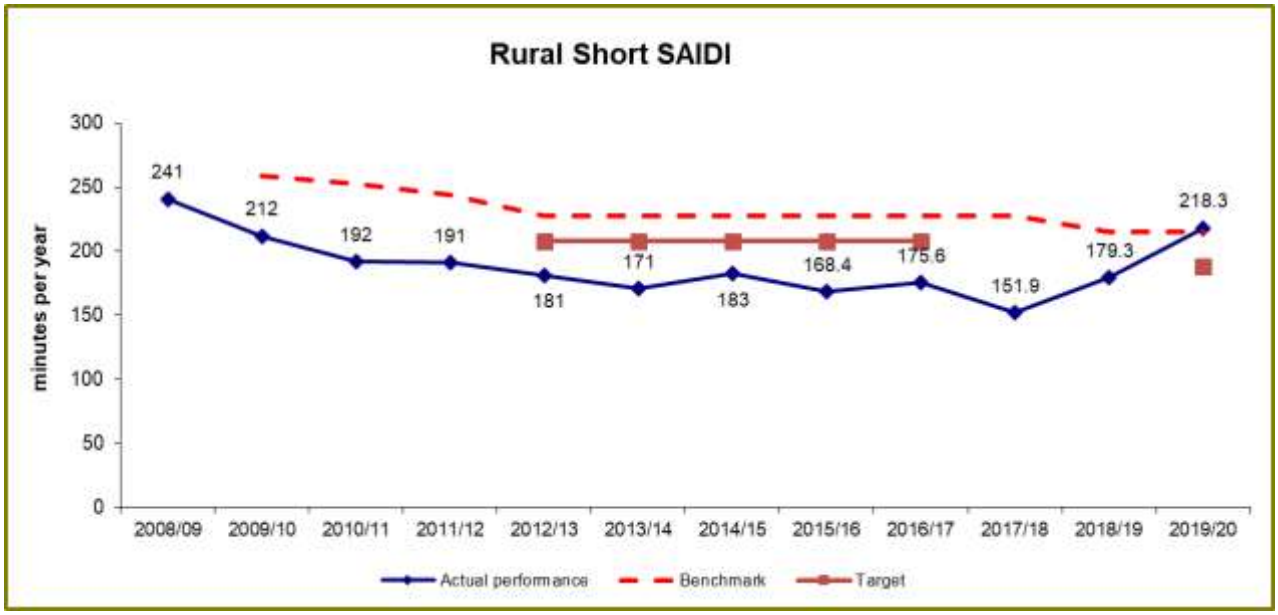



**Figure A.6: Rural Short SAIFI**

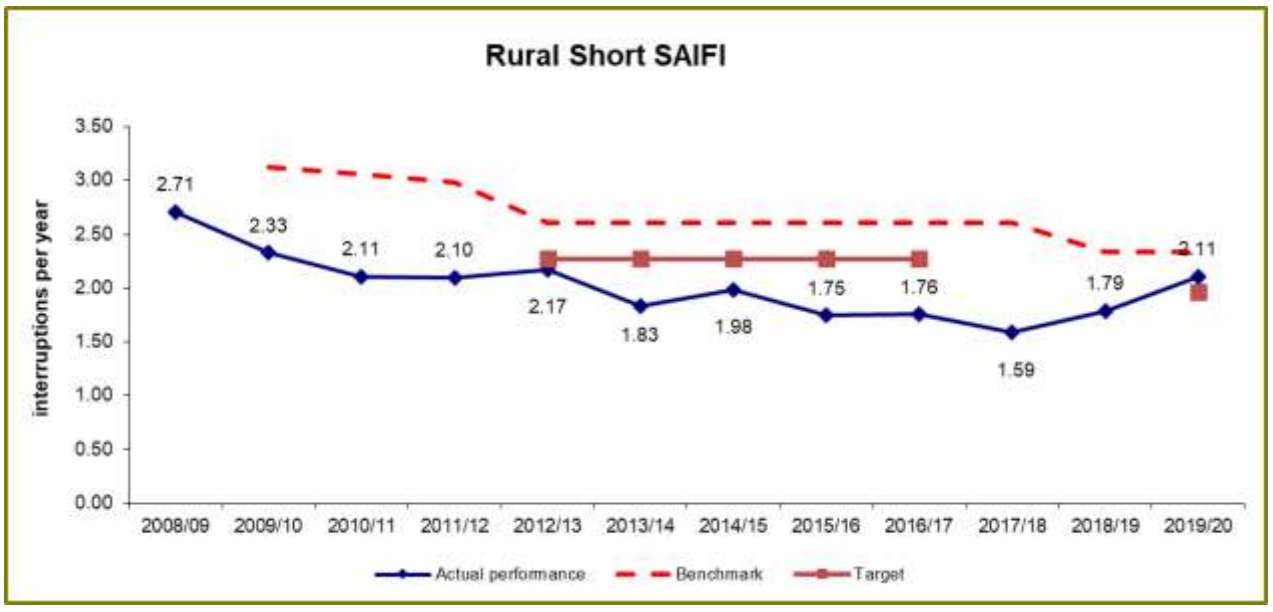


**Figure A.7: Rural Long SAIDI**

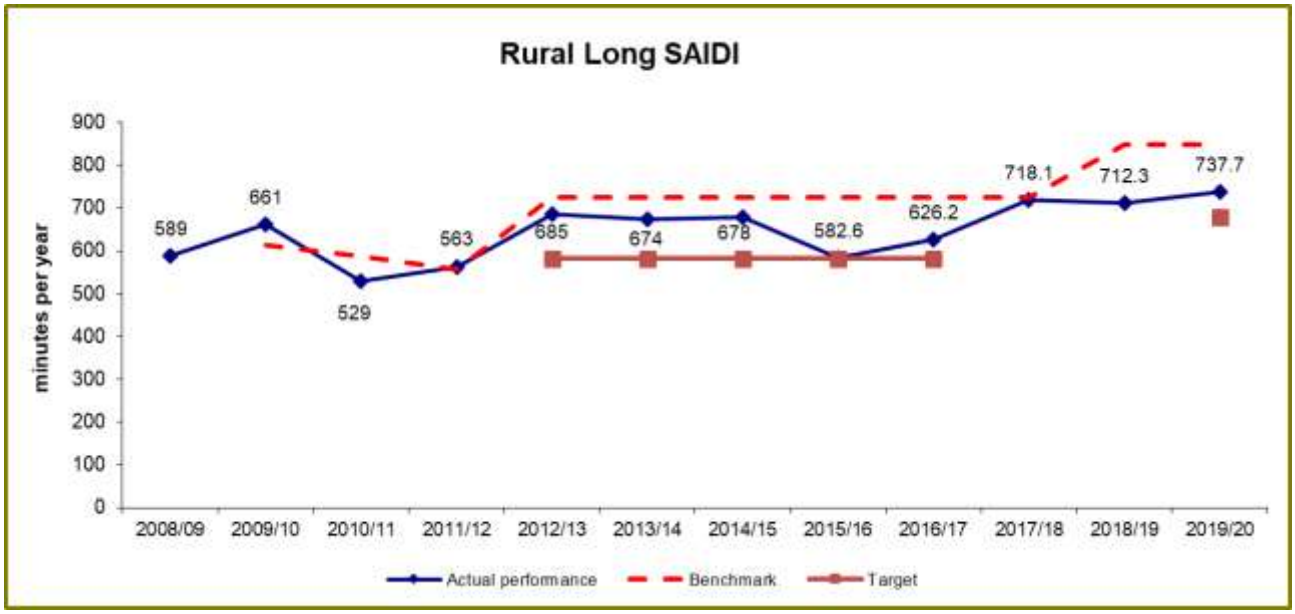



**Figure A.8: Rural Long SAIFI**

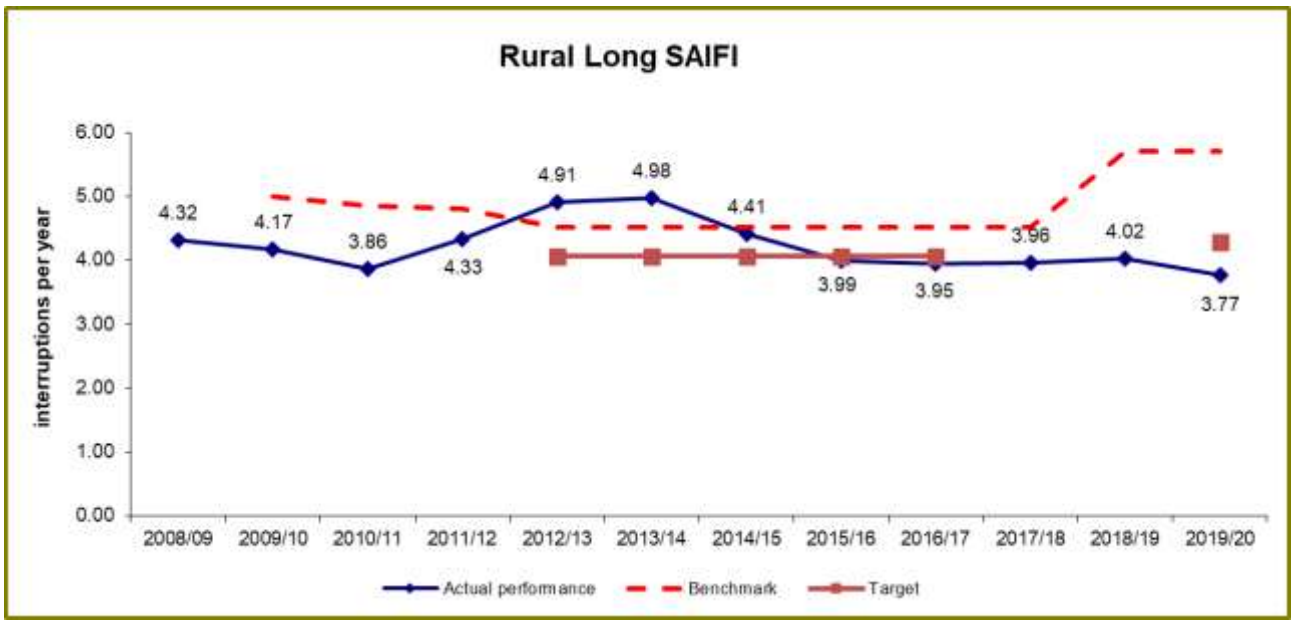
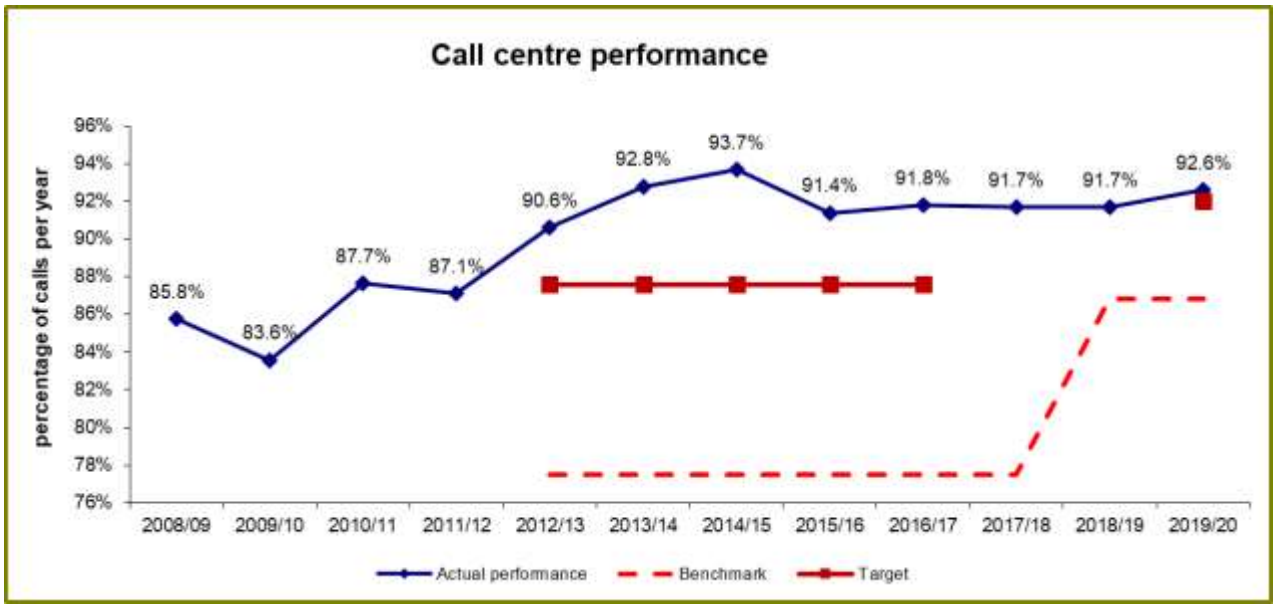


**Figure A.9: Call Centre performance**



## A.1.2 Transmission performance

- Figure A.10 shows the circuit availability
- Figure A.11 and Figure A.12 show the LoSEF for > 0.1 & ≤1.0 and > 1.0 System Minutes
- Figure A.13 shows the average outage duration

**Figure A.10: Circuit availability**

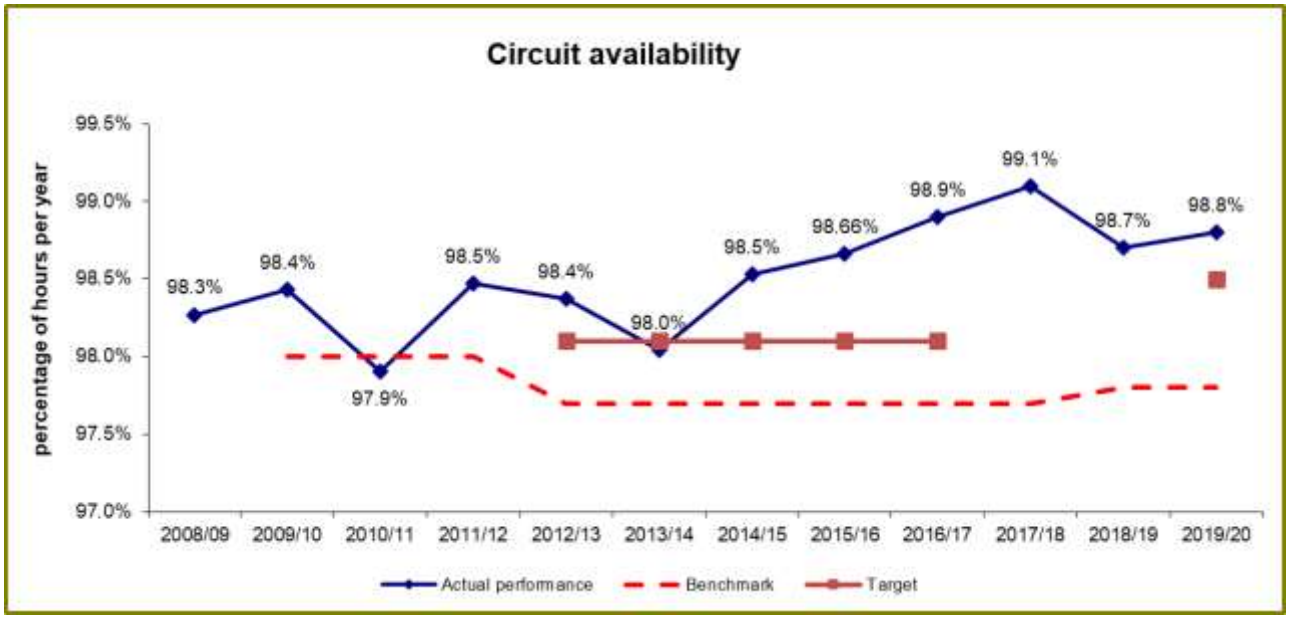



**Figure A.11: Loss of supply event frequency > 0. 1 & ≤ 1.0 System Minutes Interrupted**

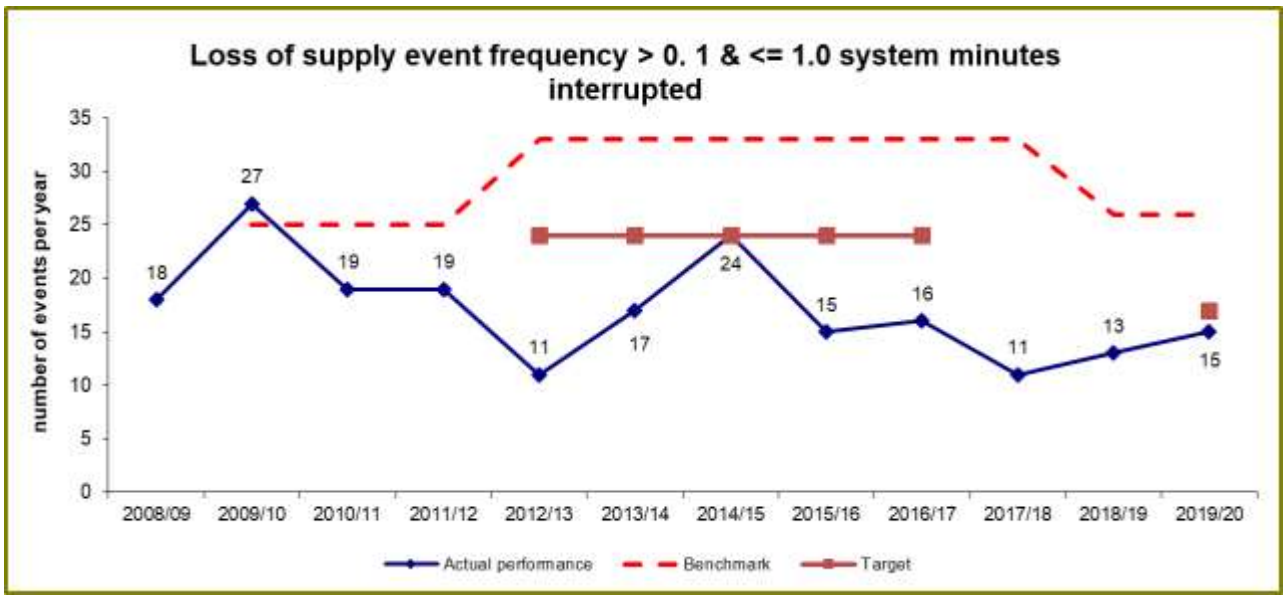


**Figure A.12: Loss of supply event frequency > 1 System Minutes Interrupted**

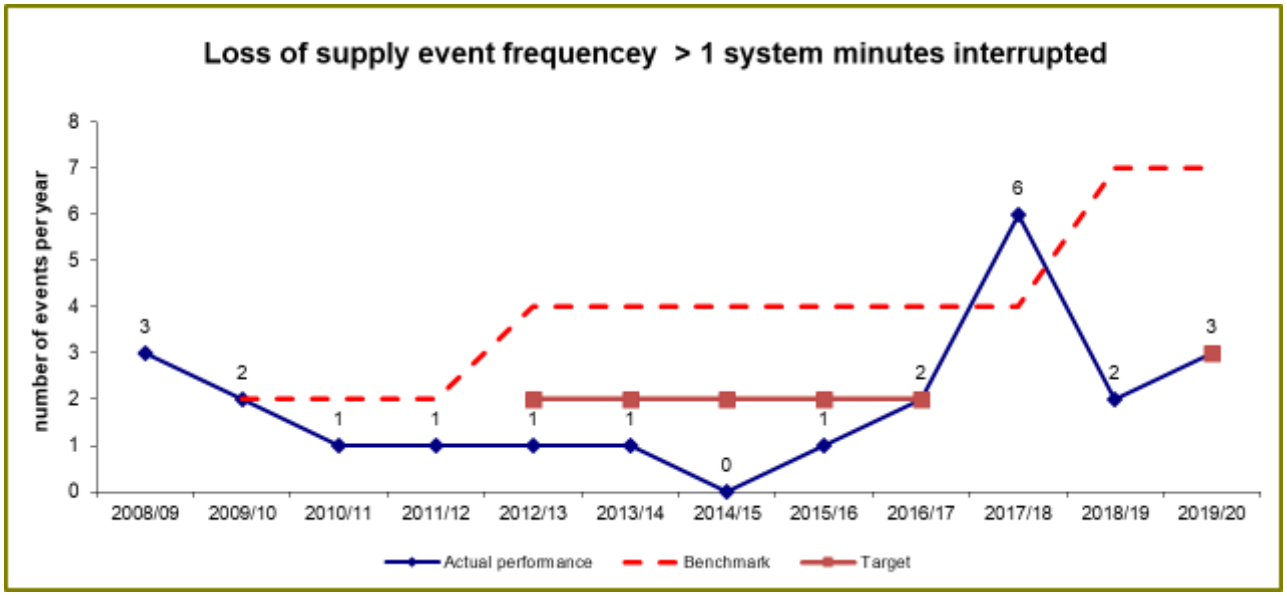
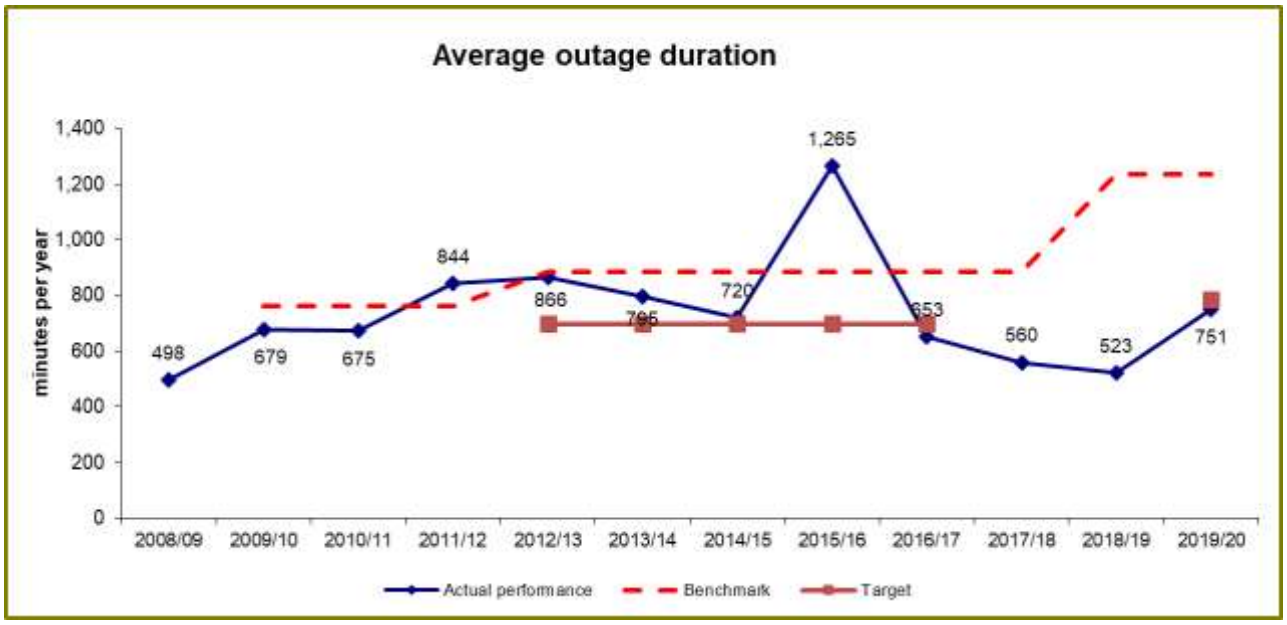



**Figure A.13: Average outage duration**



### A.1.3 Street lighting repair time

Figure A.14 and Figure A.15 show the street lighting repair time for the metropolitan and regional areas

**Figure A.14: Street lighting repair time – Metropolitan area**

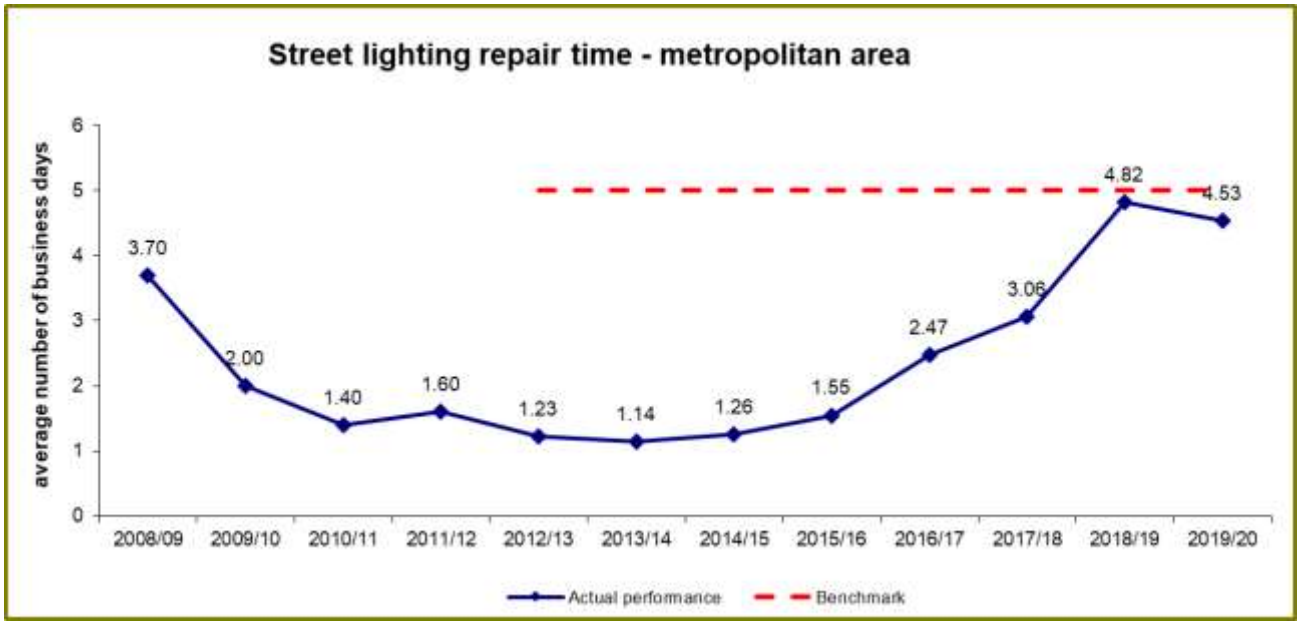
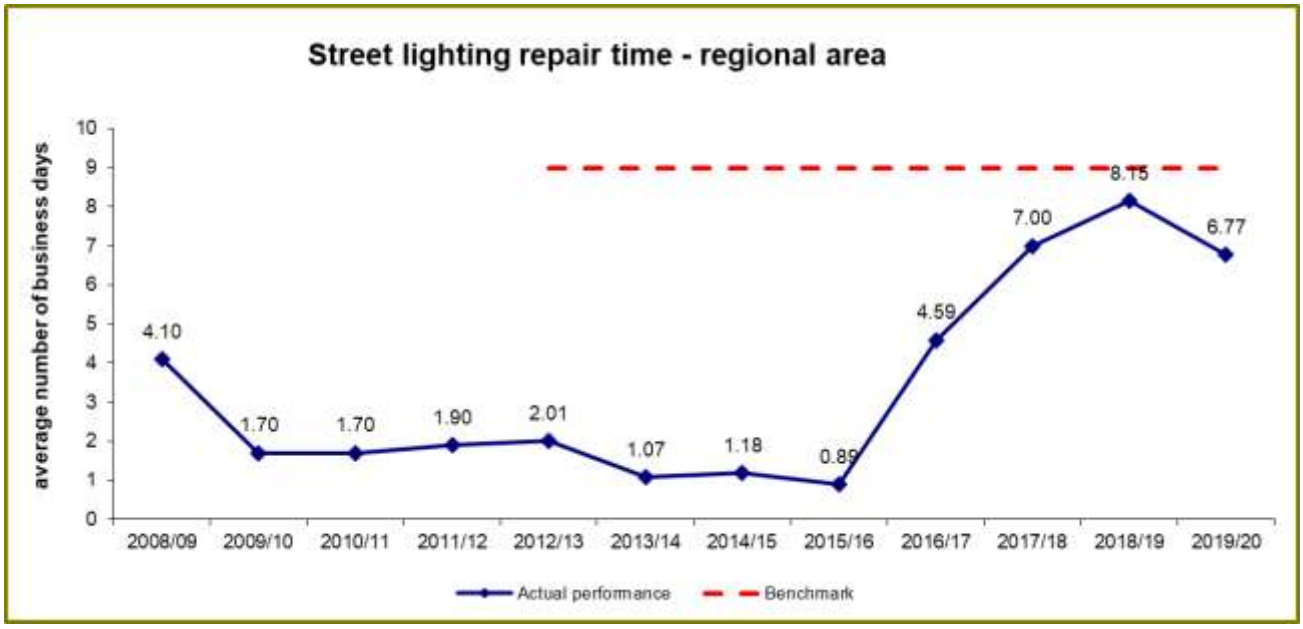



**Figure A.15: Street lighting repair time – Regional area**



### A.1.4 Supply abolishment

**Figure A.16: Supply abolishment (This service commenced on 1 July 2019)**