
Public Lighting

AMS – Electricity Distribution Network

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Public Lighting

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Public Lighting

Table of Contents

1	Executive Summary	4
1.1	Asset Strategies	4
2	Introduction	6
2.1	Purpose	6
2.2	Scope.....	6
2.3	Asset Management Objectives	6
3	Asset Description.....	7
3.1	Asset Function.....	7
3.2	Asset Population	7
3.3	Asset Age Profile.....	9
3.4	Asset Condition	10
3.5	Asset Criticality	10
3.6	Asset Performance	10
4	Other Issues	14
4.1	Regulatory Obligations.....	14
4.2	Ownership and Service Charges	14
4.3	Service Agreements.....	15
4.4	Minamata Convention on Mercury	15
5	Risk and Options Analysis.....	16
5.1	Minamata Convention on Mercury Replacement.....	16
5.2	High Pressure Sodium in Codified Areas	16
5.3	Reactive Replacement of Lantern.....	16
5.4	Replacement Summary	16
6	Asset Strategies	18
6.1	New Assets.....	18
6.2	Inspection and Monitoring.....	18
6.3	Replacement	18
6.4	Maintenance	18
6.5	Research and Development.....	18

Public Lighting

1 Executive Summary

This document is part of the suite of Asset Management Strategies relating to AusNet Services' electricity distribution network. The purpose of this strategy is to outline the inspection, maintenance, replacement and monitoring activities identified for economic life cycle management of Public Lighting in AusNet Services' Victorian electricity distribution network.

This strategy is focused on the 151,000 public lights located on AusNet Services' distribution network, serving more than 30 local government and state authorities in the north and eastern regions of Victoria. The lights are situated on major roads, minor streets and public recreational areas, and are designated by lantern type and wattage.

Network Service Providers are obligated to comply with the Public Lighting Code, which requires robust systems and procedures to accurately collect, assess and process data to demonstrate a professional approach to public lighting asset management. AusNet Services has in place contractual agreements with third-party service providers to accept, issue, rectify and report on public lighting faults. The condition of the public light is maintained by routine inspection and replacement as outlined in the Public Lighting Code.

Victorian local government authorities desire a reduction in their energy consumption in order to reduce costs as well as benefit the environment and their communities. Moreover, the Minamata Convention on Mercury is a major driver for Mercury Vapour lanterns replacement. Ratification of the Convention by Australia would therefore ban the import and manufacture of Mercury Vapour lamps from January 2021. Ongoing use of existing lamp stocks already in-country would still be permitted. Hence, Mercury Vapour lanterns will need to be progressively replaced with low-energy lanterns such as light emitting diodes (LEDs).

1.1 Asset Strategies

1.1.1 New Assets

- Promote and support approval process for standard and non-standard poles and bracket
- Promote and assist councils initiating bulk retrofitting of lanterns with low-energy lanterns
- Continue to monitor failure and fire trends, and rectify issues as per the Public Lighting Code within 2 business days

1.1.2 Inspection and Monitoring

- Continue current interval of public lighting patrols at 3 times per annum combining data collection of age, condition and specifications
- Inspect and monitor public lighting as per the Public Lighting Code

1.1.3 Replacement

- Replace HP Sodium lantern in Codified areas
- Replace Mercury Vapour lanterns to low-energy lanterns as per the "Minamata Convention on Mercury"

1.1.4 Maintenance

- Maintain public light as per the Public Lighting Code and the Standard Operating Procedure [SOP 30-04](#).

Public Lighting

1.1.5 Research and Development

- Review the maintenance frequency for more reliable low energy lighting alternatives supported by economic and life cycle cost analysis, to assist decisions on accelerating the implementation of LED lamps.
- Explore possibilities to replace Mercury Vapour globe with LED globe on existing Mercury Vapour lantern.

Public Lighting

2 Introduction

2.1 Purpose

The purpose of this document is to outline the inspection, maintenance, replacement and monitoring activities identified for economic life cycle management of Public Lighting in AusNet Services' Victorian electricity distribution network. This document is intended to be used to inform asset management decisions and communicate the basis for activities

In addition, this document forms part of our Asset Management System for compliance with relevant standards and regulatory requirements. This document demonstrates responsible asset management practices by outlining economically justified outcomes.

2.2 Scope

This Asset Management Strategy applies to all public lighting installations located within AusNet Services' electricity distribution network. The strategy focuses on public lighting luminaires, lanterns, PE Cells and electronic ballast.

Public lighting poles are not included in this strategy and are covered by AMS 20-70 Pole Strategy.

2.3 Asset Management Objectives

As stated in [AMS 01-01 Asset Management System Overview](#), the high-level asset management objectives are:

- Comply with legal and contractual obligations;
- Maintain safety;
- Be future ready;
- Maintain network performance at the lowest sustainable cost; and
- Meet customer needs.

As stated in [AMS 20-01 Electricity Distribution Network Asset Management Strategy](#), the electricity distribution network objectives are:

- Improve efficiency of network investments;
- Maintain long-term network reliability;
- Implement REFCL's within prescribed timeframes;
- Reduce risks in highest bushfire risk areas;
- Achieve top quartile operational efficiency; and
- Prepare for changing network usage.

Public Lighting

3 Asset Description

3.1 Asset Function

The performance criteria for road and public space lighting schemes can include any or all of the three basic aims of:

- Facilitation of safe movement
- The discouragement of illegal acts
- Contributing to the amenity of an area through increased aesthetic appeal

Public light distributes, filters or transforms light given by a lamp, which includes all the items necessary for fixing and protecting these lamps.

There are two categories of public lighting:

- Major Roads, or Category V (Vehicle) lighting: Lighting that is applicable to roads on which the visual requirements of motorists are dominant
- Minor Roads, or Category P (Pedestrian) lighting: Lighting that is applicable to roads and other outdoor public spaces on which the visual requirements of pedestrians are dominant

3.1.1 Technical Approval of Luminaires

All types of luminaires (Category P and V) have to undergo a technical approval process before they are allowed to install on AusNet Services' distribution network.

There are two categories of public lighting luminaires approved:

- Standard
- Non-standard

A list of the approved luminaires can be found in:

- [EDS 10-02 – Public Lighting – Non- standard lanterns, Steel Poles and Outreach Arms](#)
- [EDS 10-03 – Public Lighting – Standard lanterns and Poles](#)

3.2 Asset Population

There are approximately 151,000 public lights located on AusNet Services' distribution network serving more than 30 local government and state authorities in the north and eastern regions of Victoria¹. The lights are situated on major roads, minor streets and public recreational areas, and are designated by lantern type and wattage.

3.2.1 Population by Type

Figure 1 shows the percentage of lantern types installed on the network.

¹ 2018 AusNet Services (distribution) Category Analysis

Public Lighting

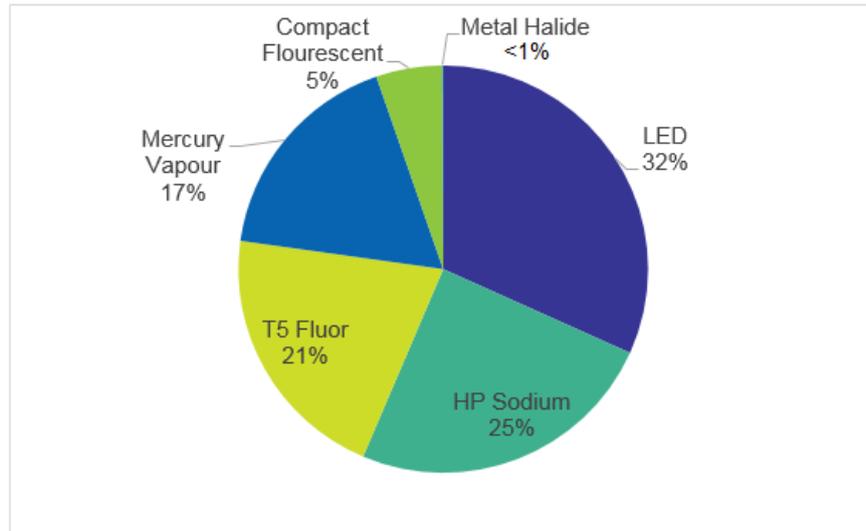
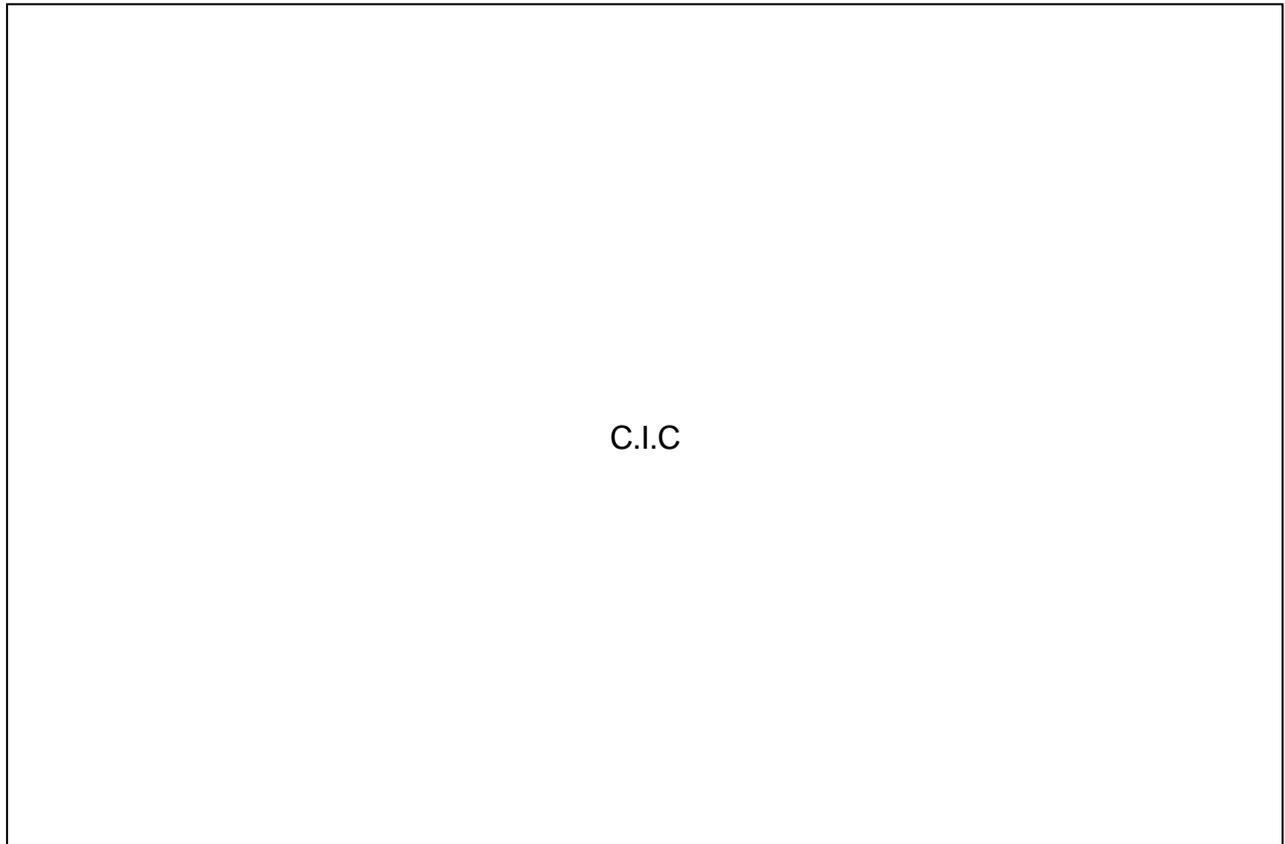


Figure 1 - Type of Lanterns

As shown in Figure 1, the Mercury Vapour contributes to 17% of the total public light fleet, which typically function as minor street lights (Category P). For major road lighting (Category V), the High Pressure Sodium is utilised and contributes 25% of the total population of public lights. LEDs currently represent 32% of installations and they are primarily Category P (residential) types.

3.2.2 Population by Council

Type of public light lanterns currently installed within each local government area is shown in Figure 2.



Public Lighting

3.3 Asset Age Profile

3.3.1 Expected Service Lives

The typical replacement intervals and nominal lives of various types of luminaires is tabulated in Table 1.

Table 1 - Expected service lives for public lighting components

Luminaire	Consumable Replacement Interval			Nominal Life (Housing)
	Lantern	PE Cell	Electronic Ballast	
80W MV	4 years	8 years	n/a	20 years
Sustainable 14W and 28W T5	4 years	8 years	8 years	20 years
Sustainable 32W & 42W CF	4 years	8 years	8 years	20 years
Sustainable LED Luminaire	20 years	8 years	n/a	20 years

The luminaire in-service life is based on a calculation of the expected hours of duty of the luminaire component in Table 1 and rated direct energy. The rated direct energy consumption consists of energy usage which is directly attributable to the luminaire and other components as set out in the AEMO National Electricity Market (NEM) load table².

3.3.2 Age by Lantern Types

The age profile of various types of public lighting installed on the electricity distribution network is shown in Figure 3.

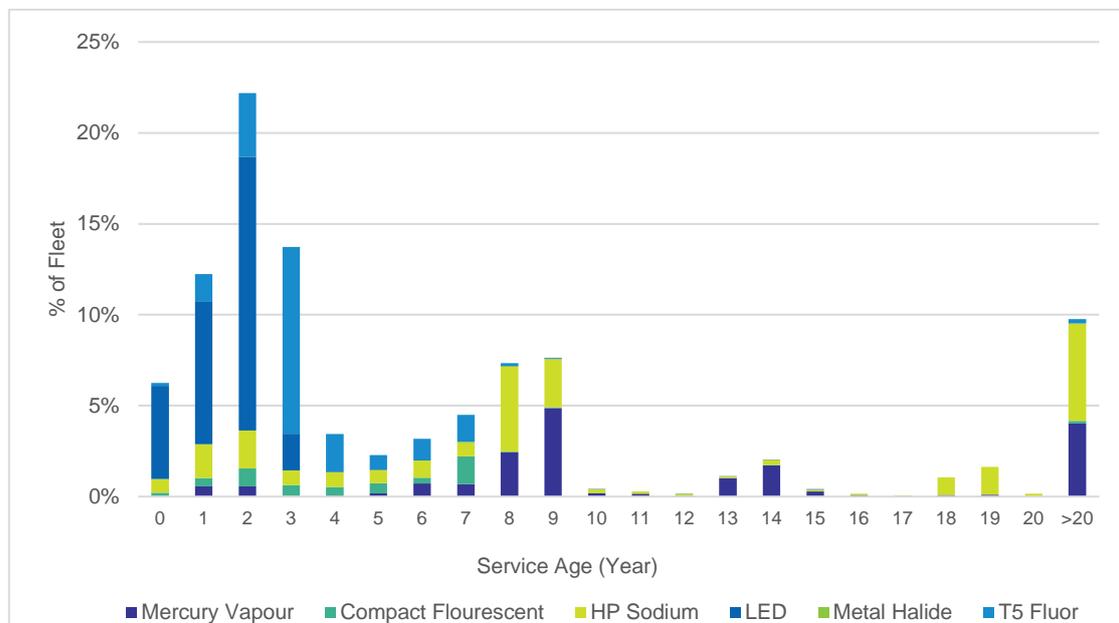


Figure 2 - Lantern Age Profile

Approximately 9% of the lanterns have the service age greater than 20 years. This is a legacy data issue which will be addressed under current process reviews.

² National Electricity Market Load Tables: AEMO (2019).

Public Lighting

3.4 Asset Condition

The condition of the public light is maintained by routine inspection and replacement as outlined in the Public Lighting Code and Section 3.3.1.

Detail of the Public Light Code is discussed in Section 4.1.

3.5 Asset Criticality

3.5.1 Public light Criticality

Below factors were taken into consideration to assess the asset criticality of the public lights:

- Bushfire start impact
- Health and safety impact

Section 3.6.5 discussed about the fire starts attributed to public lighting failure. Figure 4 below shows the criticality of the HP Sodium Public Light.

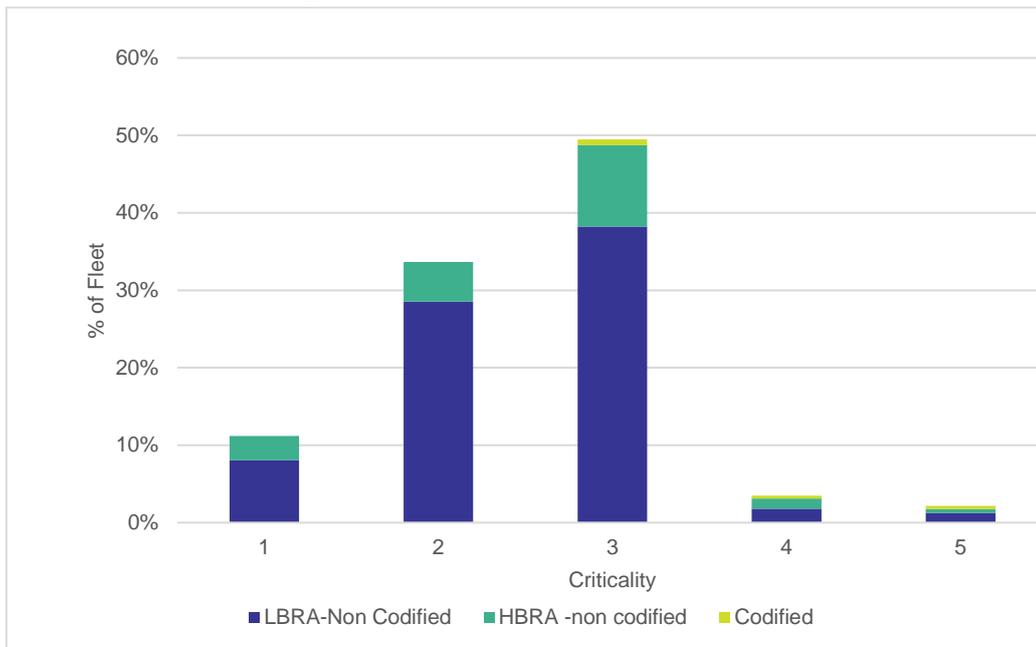


Figure 3 - Criticality for the HP Sodium Public Light

As the result of the criticality analysis, the volume for lanterns' replacement in the next EDPR reset is proposed in Section 5.4.

3.6 Asset Performance

3.6.1 Asset Failure

From 2012 to 2017, approximately 8,658 public lightning failures per annum is recorded in the PowerOn Fusion Distribution and Outage Management System (DOMS). With the current population, it is estimated that public lights have the failure rate of 5.6% per annum.

Public Lighting

The breakdown of the failure parts is shown in Figure 5 .

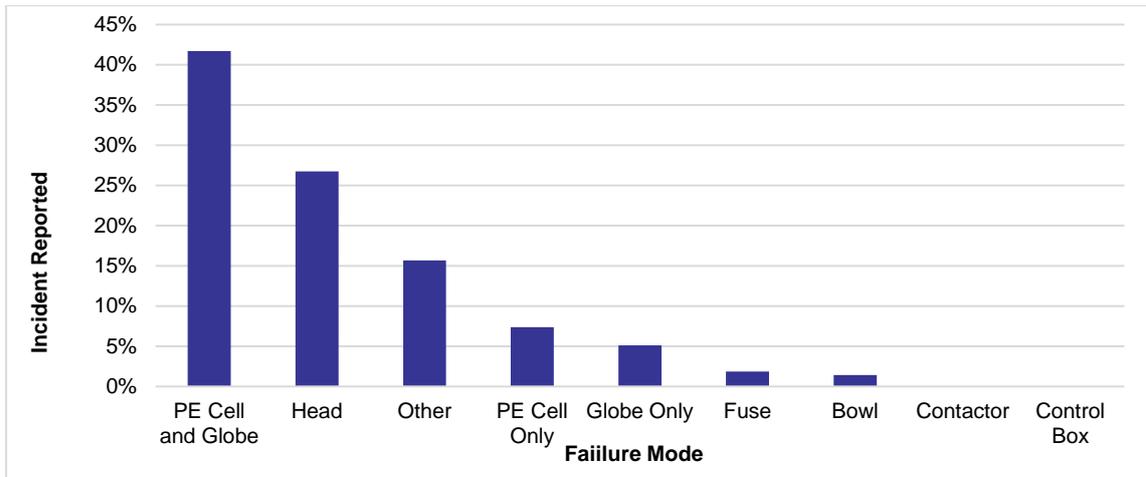


Figure 4 - Public Light Failures

Figure 6 shows the failure by luminaires per year.

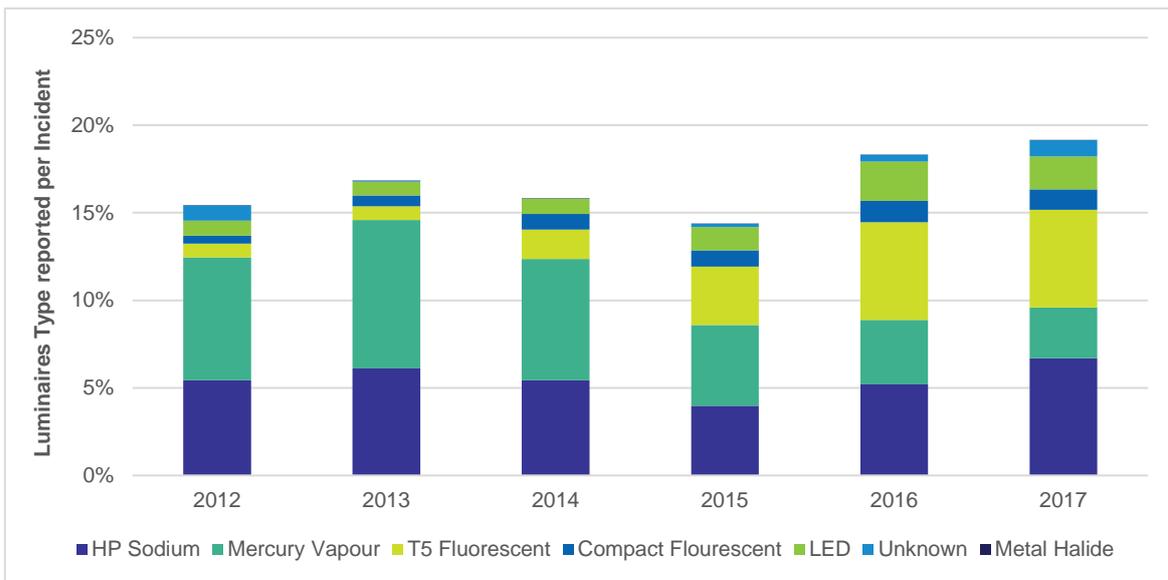


Figure 5 - Public Lighting Incidents

3.6.2 Customer Impact

3.6.2.1. Guaranteed Service Level

Failure criticality for public lights is measured by the impact of guaranteed service levels (GSL). In accordance with the GSL, where a distributor does not repair a public light within 2 business days of a fault report or a period otherwise agreed between the distributor and the person, it must pay the first person who reported the fault if that person is the occupier of an immediately neighbouring residence or is the proprietor of an immediately neighbouring business³.

³In accordance with SOP 30-04 Public Lighting Reporting.

Public Lighting

AusNet Services is obligated to report annual GSL payment⁴ to the AER. Historical reported figures are shown in Table 2.

Table 2 - Public Light GSL payment

	2014	2015	2016	2017
Street lights – GSL Payment (number)	131	94	43	33
Street lights – GSL Payment	\$1,310	\$940	\$1,075	\$825

3.6.2.2. Low Lighting Levels

Street light repair response times are reported to AER⁴ annually (Table 3).

Table 3 - Response to Street Light Repairs

(Number incurred)	2010	2011	2012	2013	2014	2015	2016	2017
Not repairing streetlights within five days	n/a	n/a	n/a	178	188	-	-	-
Not repairing streetlights within two days	663	514	1,321	549	456	400	1,622	625
Number of business days to repair	-	-	-	-	-	1.23	2	1.76

As shown in Table 3, streetlight repair time peaked in 2016 with 1,622 lights not repaired within 2 days is being reported.

3.6.3 Traffic Accidents

To date there have been no reports or evidence that failed street lighting has caused a traffic accident or injury to pedestrians. The DNSP is obligated to comply with the Public Lighting Code to rectify faults within 2 days of the fault being reported or identified where the public light is outside the reporting person's house or business. In this instance the DNSP may also negotiate a suitable alternate repair date with the reporting persons.

Alternatively, the DNSP has seven working days to repair other standard lights and use best endeavours to repair non-standard lights in seven working days.

3.6.4 Electrical Shock

From 2009 to 2017, one electrical shock incident was reported.

3.6.5 Lantern Fire Ignitions

The majority of street light asset and ground fires are ignited during the burnout of the globe. The potential effect of an asset failing leading to a fire start needs to be analysed in perspective to the number of fire starts that have occurred for all assets.

Fire starts attributed to public lighting failures is shown in Figure 7. No ground fire has been reported since 2007.

⁴ Annual RIN Response Non-Financial – STPIS GSL

Public Lighting

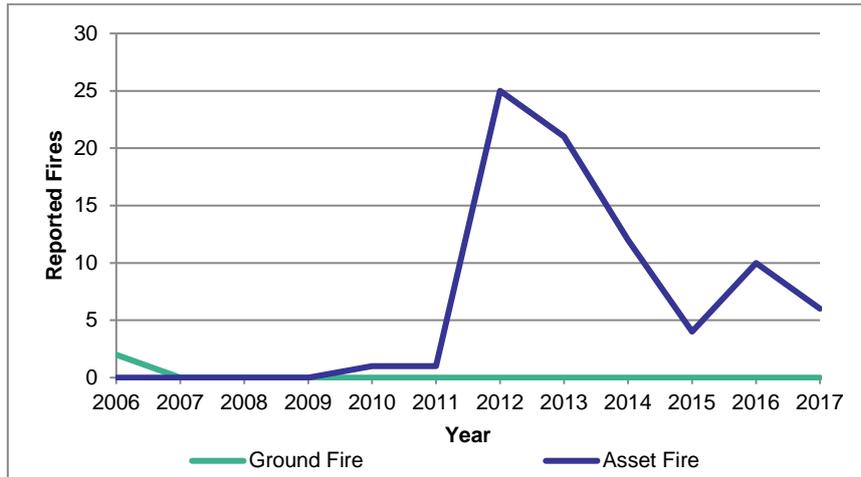


Figure 6 - Fire Starts Attributed to Public Lighting Failures

61% of the public light asset fire reported since 2012 were related to HP Sodium lanterns (Category V).

Public Lighting

4 Other Issues

4.1 Regulatory Obligations

The purpose of the Public Lighting Code, issued by the Essential Services Commission in 2015, is to regulate the provision of public lighting by specifying minimum standards and certain obligations of distributors and public lighting customers. The objective of the regulation is to provide a safe visual environment for pedestrian and vehicular movement during times of inadequate natural light.

The Code applies to a Network Service Provider under its distribution licence only in respect of the public lighting assets owned by the Business (i.e. not councils or private customers).

The Business must use best endeavours to:

- a) record the type, rated power and location of its luminaires and identify the relevant public lighting customer(s) for each luminaire;
- b) assess and monitor the condition and performance of public lighting assets;
- c) develop and implement plans for the operation, maintenance, refurbishment, replacement, repair and disposal of its public lighting assets:
 - to comply with the laws and other performance obligations which apply to the provision of public lighting services including those contained in the Code;
 - to minimise the risks associated with the failure or reduced performance of public lighting assets; and
 - in a way which minimises costs to public lighting customers.

The Code proceeds to outline the following topics:

- the minimum standards for performance of public lighting
- application of management charges
- qualifications for Guaranteed Service Levels (GSLs)
- process for management of new public lighting
- alterations to existing public lighting
- provision of data for reporting and billing information
- dispute resolution

The Code generally implies, and is further supported through AER audits, that the Network Service Provider must have robust systems and procedures to accurately collect, assess and process data to demonstrate a professional approach to public lighting asset management.

The Network Service Provider has a regulatory obligation to report annually the number of streetlights on the network, the number of faults reported, the average time to repair the faults and the number of missed GSLs and associated payments to customers. This reporting is managed through the Regulatory Information Notice (RIN) process.

4.2 Ownership and Service Charges

Apart from designated Council-installed non-standard lights, ownership of all public lighting is attributed to AusNet Services. This includes minor road lanterns less than 125W in residential streets to major road lanterns up to 400W, although some major road lanterns are owned by Vic Roads.

Public Lighting

Lanterns owned by Vic Roads are not covered under AusNet Services' Public Lighting Policy. These Installations are owned and operated by Vic Roads and AusNet Services does not provide any services to these lighting installations other than Network Use of System (NUoS) charges. These installations are metered and charges for NUoS for VicRoads are like any other network customer charges.

Service charges to councils are for operation, maintenance and replacement (OMR) of lanterns on a routine basis. These routine activities are regulated by the Australian Energy Regulator (AER).

4.3 Service Agreements

AusNet Services has contractual agreements in place with third-party service providers to deliver the public lighting services obligations. The contractual agreements include requirements to accept, issue, rectify and report on public lighting faults. The Service Delivery division of AusNet Services manages the third party service provider contractual agreements through the procurement process. The third party contractor is responsible for:

- Accepting and deciphering public lighting incidents issued by the DOMs system following the reporting of a fault.
- Allocating resources and materials to attend to the fault, and where possible, rectifying the fault within 2 business days.
- Accurately closing out public lighting incidents in DOMs.
- Carrying out routine patrols of major roads across the AusNet Services network during lighting service hours to identify faulty lights, and report them through DOMs as incidents.
- Following up any incidents that require more than 2 business days to rectify, such as pole replacement works, underground faults, non-standard lights and fuse panel repairs, and report them to the relevant Service Delivery co-ordinators.
- Issuing a monthly report detailing the number of hours worked, any safety incidents that were encountered, the number of repairs and replacements completed, the number of lights and PE cells changed on the Bulk Change program and the kilometres patrolled for the month by area. A proforma template is to be used that tracks this information annually.

4.4 Minamata Convention on Mercury

The Minamata Convention on Mercury (the Convention) is a global treaty to protect human health and the environment from the adverse effects of mercury through practical actions.

The Convention aims to protect human health and the environment by addressing releases of mercury through its lifecycle: mining, import and export; manufacture into products and associated emissions and releases; contaminated sites, waste management, and recovery and reuse.

The Convention came into force on 16 August 2017 and over 90 countries have so far ratified it. Specifically, the Minamata Convention calls for banning the import, export and manufacture of HPMV lamps by 2020. Ratification of the Convention by Australia would therefore ban the import and manufacture of HPMV lamps here from 1 January 2021. Ongoing use of existing lamp stocks already in-country would still be permitted.

Public Lighting

5 Risk and Options Analysis

Lanterns' replacement is driven by the below 3 factors:

- Minamata Convention on Mercury Replacement
- High Pressure Sodium in Codified Areas
- Reactive Replacement of Lantern

5.1 Minamata Convention on Mercury Replacement

27,035 Mercury Vapour lanterns are recorded in the Spatial Data Management Environment (SDME) as of 2018.

5.2 High Pressure Sodium in Codified Areas

82 public light fires were reported since 2012 and 61% of them were related to HP sodium lantern.

Replacement forecast is derived from a semi-quantitative risk assessment method and geospatial analysis. The result of the analysis is tabulated as below:

Table 4 - HP Sodium Risk Matrix

Criticality Band	Bushfire Effect Cost	HP Sodium Lantern			
		LBRA (Non-Codified Area)	HBRA (Non-Codified Area)	Codified Area	Quantity
5	>\$100000	487	175	165	827
4	<= \$100000	684	507	138	1329
3	<= \$30000	14581	4008	285	18874
2	<= \$1000	10879	1959	0	12838
1	<= \$300	3079	1189	0	4268
	Quantity	29710	7838	588	38136

In Table 4, it is highlighted that:

- 588 HP Sodium lanterns locate in the codified area;
- 175 HP Sodium lanterns locate in the HBRA area which have the bushfire effect cost exceeded \$100K.

Hence, it is proposed that an estimated count of 763 HP Sodium will require replacement due to the high bushfire risk.

5.3 Reactive Replacement of Lantern

Reactive replacement of lantern is recorded in the Distribution and Outage Management System (DOMS). Since 2012, an average of 1,731 heads replacement per annum is observed (Reactive Replacement).

5.4 Replacement Summary

Estimated Count of lanterns requires replacement in the EDPR reset of 2022-2026 is tabulated as below:

Public Lighting

Table 5 - Replacement Summary

Replacement Category	Total Replacement Count
Mercury Vapour Replacement	27,035
HP Sodium in High Bushfire Risk Regions	763
Reactive Replacement	8,655

Public Lighting

6 Asset Strategies

6.1 New Assets

- Promote and support approval process for standard and non-standard poles and bracket
- Promote and assist councils initiating bulk retrofitting of lanterns with low-energy lanterns
- Continue to monitor failure and fire trends, and rectify issues as per the Public Lighting Code within 2 business days

6.2 Inspection and Monitoring

- Continue current interval of public lighting patrols at 3 times per annum combining data collection of age, condition and specifications
- Inspect and monitor public lighting as per the Public Lighting Code

6.3 Replacement

- Replace HP Sodium lantern in Codified areas
- Replace Mercury Vapour lanterns to low-energy lanterns as per the “Minamata Convention on Mercury” and associated targeted replacement of HP Sodium lanterns

6.4 Maintenance

- Maintain public light as per the Public Lighting Code and the Standard Operating Procedure [SOP 30-04](#).

6.5 Research and Development

- Review the maintenance frequency for more reliable low energy lighting alternatives supported by economic and life cycle cost analysis, to assist decisions on accelerating the implementation of LED lamps.