OTSI Office of Transport Safety Investigations

BUS SAFETY REPORT

BUS FIRES IN NEW SOUTH WALES IN 2016

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THE OFFICE OF TRANSPORT SAFETY INVESTIGATIONS

The Office of Transport Safety Investigations (OTSI) is an independent NSW agency whose purpose is to improve transport safety through the investigation of incidents and accidents in the rail, bus and ferry industries. OTSI investigations are independent of regulatory, operator or other external entities.

Established on 1 January 2004 by the *Transport Administration Act 1988 (NSW)*, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI is responsible for determining the contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence. Importantly, however, OTSI does not confine itself to the consideration of just those matters that contributed to a particular accident; it also seeks to identify any transport safety matters which, if left unaddressed, might contribute to other accidents.

OTSI's investigations are conducted under powers conferred by the *Transport Administration Act 1988 (NSW)* and *Passenger Transport Act 1990 (NSW).* Additionally, all OTSI publications that are considered investigation reports are also conferred by these Acts. OTSI also conducts rail investigations on behalf of the Australian Transport Safety Bureau under the *Transport Safety Investigation Act 2003* (*Cwlth*). OTSI investigators normally seek to obtain information cooperatively when conducting an accident investigation. However, where it is necessary to do so, OTSI investigators may exercise statutory powers to interview persons, enter premises and examine and retain physical and documentary evidence.

It is not within OTSI's jurisdiction, nor an object of its investigations, to apportion blame or determine liability. At all times, OTSI's investigation reports strive to reflect our balanced approach to the investigation, in a manner that properly explains what happened, and why, in a fair and unbiased manner.

Once OTSI has completed an investigation, its report is provided to the NSW Minister for Transport and Infrastructure for tabling in Parliament. The Minister is required to table the report in both Houses of the NSW Parliament within seven days of receiving it. Following tabling, the report is published on OTSI's website at www.otsi.nsw.gov.au.

BUS FIRES IN NEW SOUTH WALES IN 2016

Introduction

In June 2013, the Office of Transport Safety Investigations (OTSI) released an investigation report into common safety-related issues that had been revealed through its examination of the nature and circumstances of bus and coach fires in the period 2005 to 2012 inclusive (The 2005 - 2012 Report).[1] This was followed by the following annual reports:

- The Bus Fires in NSW in 2013 Report (published in April 2014).
- The Bus Fires in NSW in 2014 Report (published in February 2015).
- The Bus Fires in NSW in 2015 Report (published in February 2016).[2]

Monitoring of the extent, origins and causes of bus fires reported to OTSI continued through 2016 and resulted in the publication of this report in February 2017.

In line with previous years all reported fires were documented and included incidents which did not progress to a fire although involved excessive heat and the generation of smoke. This year, for the first time, the reports were assessed and grouped into two categories: fire incidents and thermal incidents. [3]

In most cases the origin and cause of the incident was readily identifiable and did not require an in-depth investigation. OTSI investigators examined vehicles on 15 occasions following the report of a fire. Four incidents were formally investigated and documented in more comprehensive OTSI bus safety investigation reports.

This report contains a summary of the information gathered in 2016 and provides commentary on comparisons with the information reported in previous years. The report also summarises the progress in implementation of recommendations made in previous reports.

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1 OTSI Bus Safety Investigation Report, *An Investigation into Bus Fires in NSW 2005 - 2012*, available at www.otsi.nsw.gov.au

2 All OTSI investigation reports are available at www.otsi.nsw.gov.au

3 Fire: Visible fire seen by driver, passengers or witnesses. Fire or flames are mentioned in the report. Flaming combustion has occurred (Rapid oxidation of gases and vapours that generate detectable heat and light.) The level of damage was such that it was likely that an actual fire occurred. Thermal incident: No mention of fire or flames seen by driver, passengers or witnesses. Heat only. No fire damage.

Data for this report came primarily from information provided by operators using the same methodology as used for recording occurrences in the previous years.

Data Analysis

In 2016 there were a total of 77 reported incidents: 37 fire incidents and 40 thermal incidents. This was an increase of 92% from 2015. The total represents a significant increase over the number of incidents recorded for prior years: 28 in 2013, 29 in 2014, 40 in 2015 and 77 in 2016 (see *Figure 1)*.

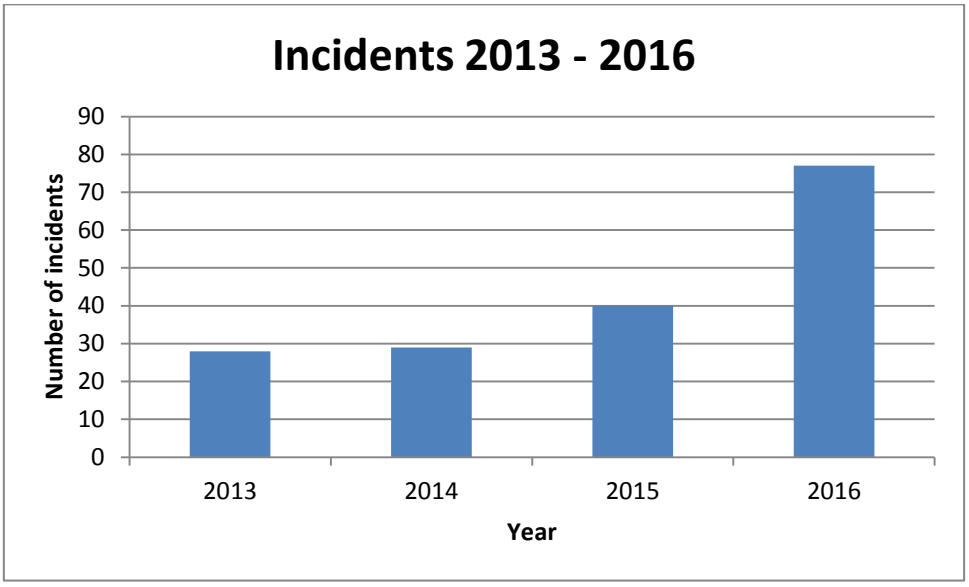

Figure 1: Overall number of incidents 2013-2016

The 77 incidents reported in 2016 were distributed through the year as shown in *Figure 2*. Brief details of each incident are recorded at *Appendix A*.

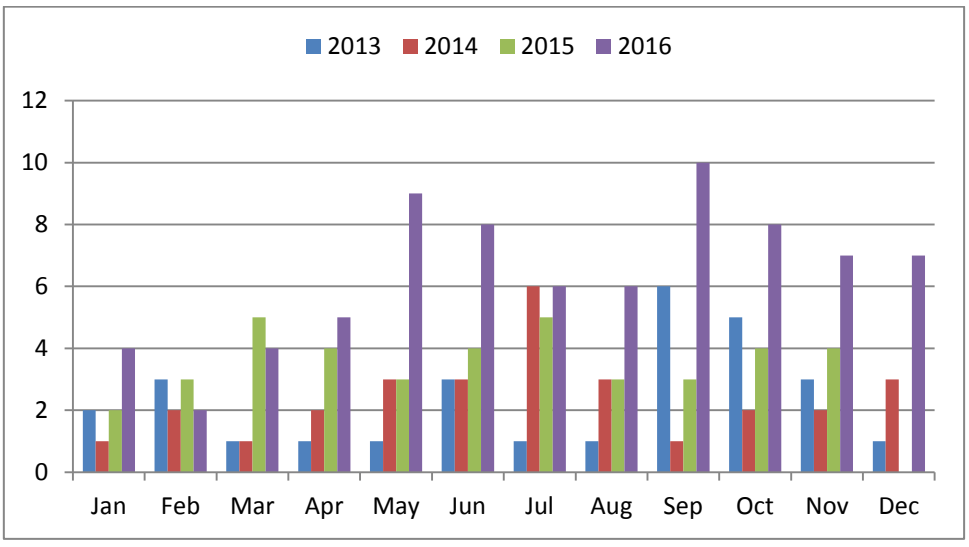

Figure 2: Incident spread 2013-2016

The growth appears to be a result of a combination of increased reporting by operators and a rise in actual incidents. There was an increase across all categories of incidents including destroyed and major damage levels. There also appears to be an increased awareness among bus operators of the importance of reporting incidents.

Damage levels of incidents. In previous years incidents were classified into various severity levels. This year incidents were classified into the following levels (see Appendix B for a more detailed description):

- Destroyed.
- Major.
- Minor.
- Smoke damage.
- Nil damage.

Based on OTSI assessment and operator reports seven vehicles were destroyed, seven vehicles were assessed as having suffered major damage, 39 were assessed as having suffered minor damage, with 23 assessed as having sustained smoke damage, one vehicle with nil damage (see *Figure 2*).

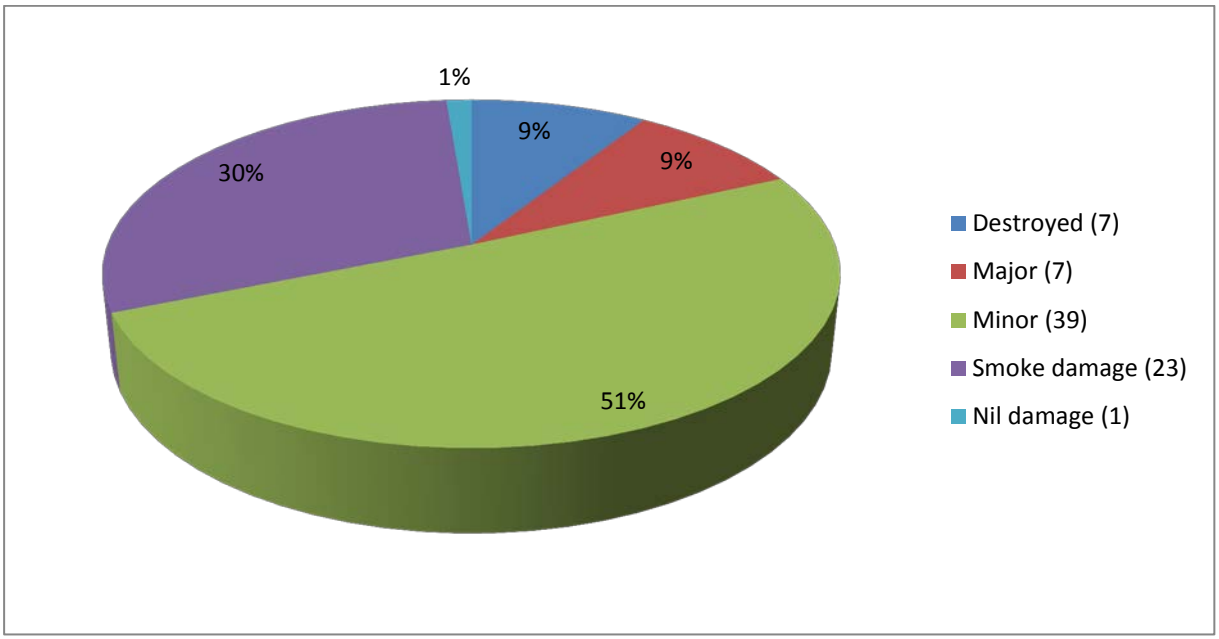

Figure 2: Severity level of incidents NSW 2016

One important area is the category of highest severity; where a bus or coach is destroyed by fire. It would be expected that this is an area where the number of reports is likely to be accurate. This is an event that is difficult to conceal and highly likely to be reported. The numbers of destroyed vehicles show a rising trend, see *Figure 3*. In 2016, seven vehicles were destroyed. In one incident at Sydney Airport two buses were destroyed as they were parked side-by-side.

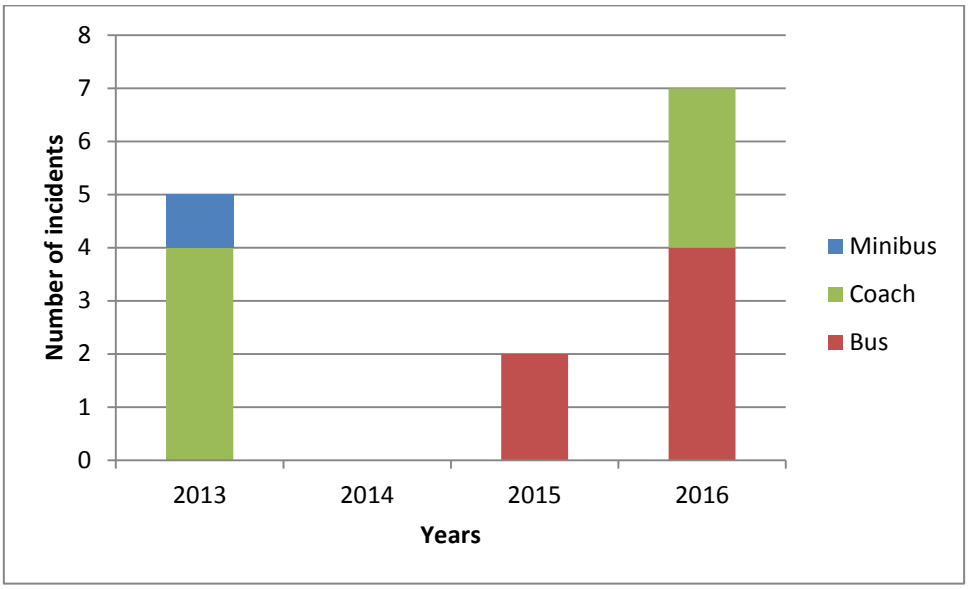

Figure 3: Destroyed buses/coaches 2013-2016

There was also an increase in the next severity level of major damage. In 2016, seven vehicles were classified as having sustained major damage as a result of a fire. The number of incidents resulting in major damage in previous years was: 2013 (2), 2014 (2) and 2015 (2).

Injuries. Despite an increase in incidents, only three injuries were reported in 2016. Two persons, the driver and a passenger, involved in the Sydney Harbour Bridge bus fire incident in September were taken to hospital for treatment. The other was a coach incident in August at Somersby where the driver also suffered smoke inhalation and was taken to hospital for treatment.

Approximately 668[4] passengers had their travel affected by the incidents. The largest number involved in a single incident was approximately 90 passengers. There was a significant disruption to the transport network as a result of some of these incidents.

On 44% of occasions the vehicle involved in the incident was empty of passengers. On one occasion a bus was destroyed with no driver or passengers on board.

Age of vehicles. The ages of the vehicles involved ranged between 2 and 31 years. The majority of incidents involved buses between 5 and 10 years old, this correlated approximately to the number of buses manufactured in each year operating in NSW (see *Figure 4*). Seven different makes of vehicle were involved. No make or model trends were identified.

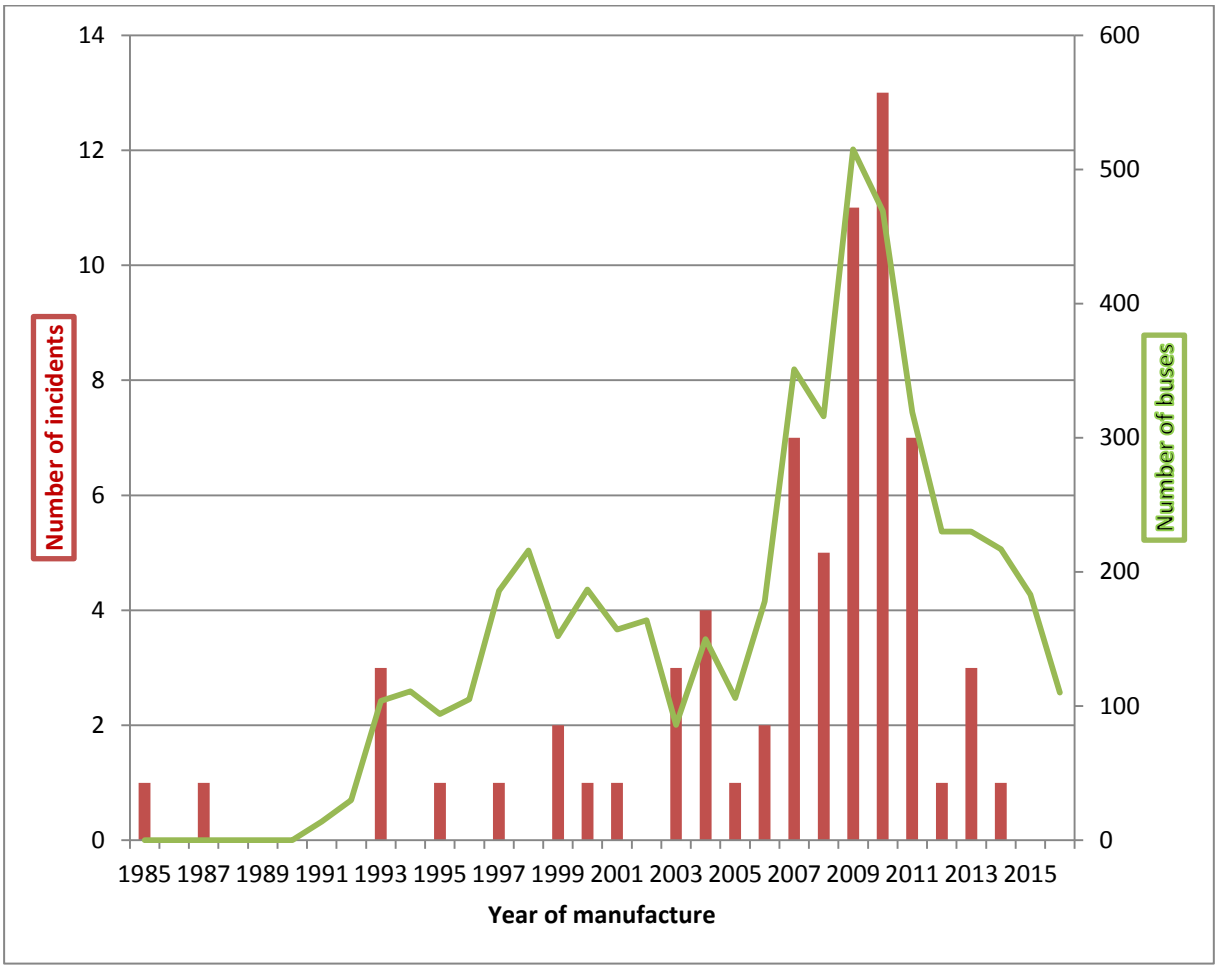

Figure 4: Year of manufacture and incidents NSW 2016

[4] The number is approximate as some of the operators were only able to provide estimates of passenger numbers.

The seven destroyed vehicles ranged in year of manufacture from 1995 to 2004. The seven vehicles that sustained major damage ranged in year of manufacture from 1993 to 2011. The average age for buses in the destroyed and major damage category was 16.4 years. The average age for buses in the all categories in 2016 was 9.7 years. This shows that older buses sustained a great level of damage than newer buses in 2016.

The severity level and the average age of buses involved in incidents in 2016 is shown in *Figure 5*.

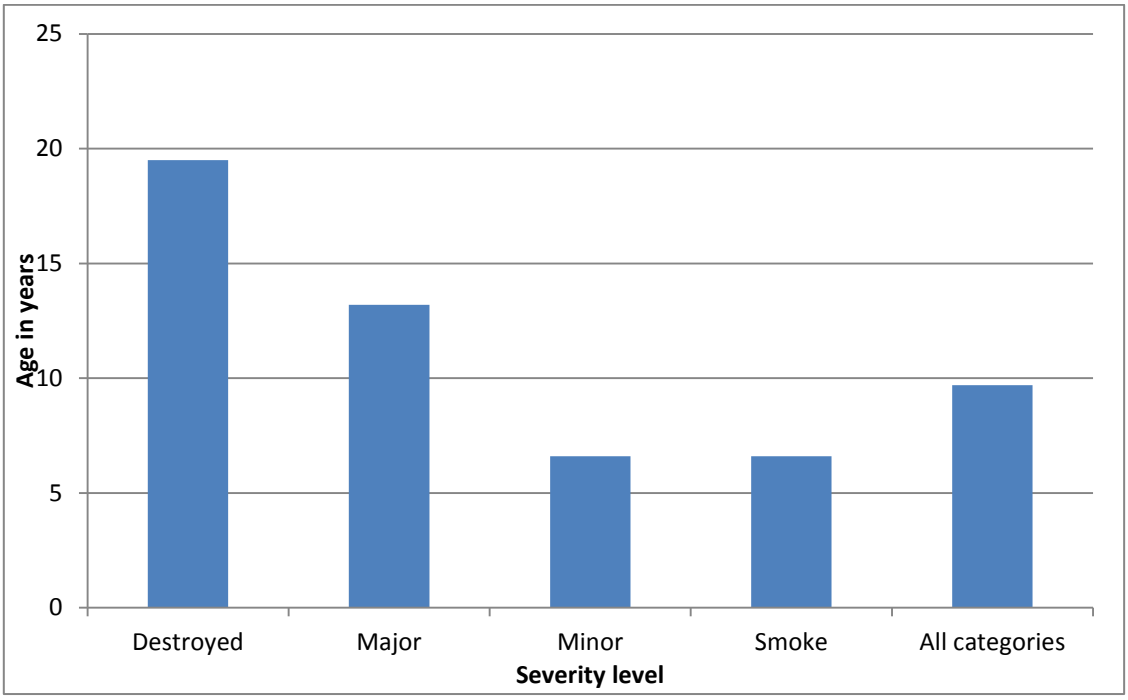

Figure 5: Severity level and average age of vehicles

Origins and Causes

Overall origin. In 2016, the majority of incidents originated in the engine bay (45%), the wheel well had 43% and the body 10%. One fire originated outside the bus, caused by radiant heat from another burning bus. The following figure shows the originating area of the 77 incidents in 2016 (see *Figure 6*).

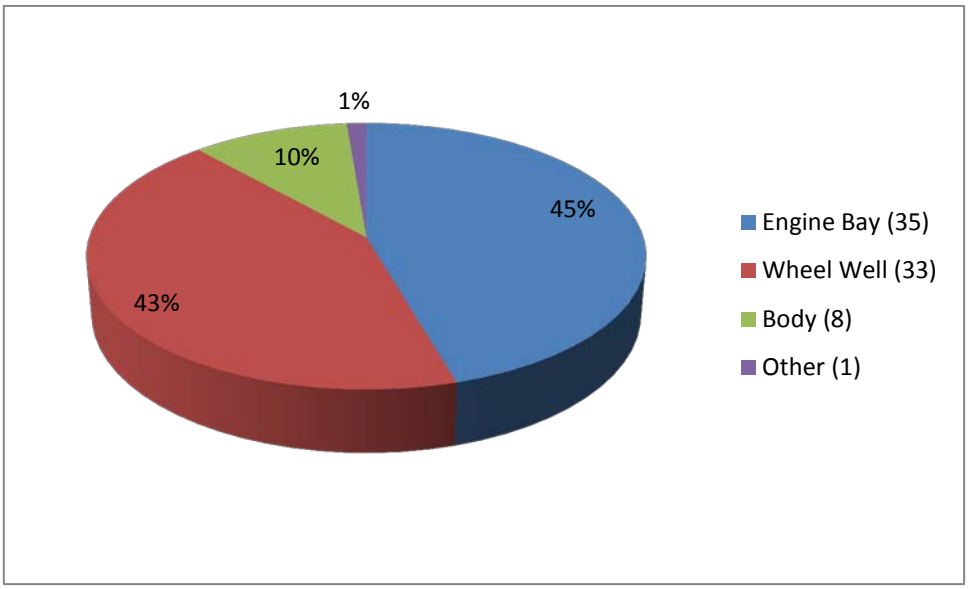

Figure 6: Location by origin NSW 2016

Overall causation. The data for the causes of incidents in 2016 are shown in *Figure 7.*

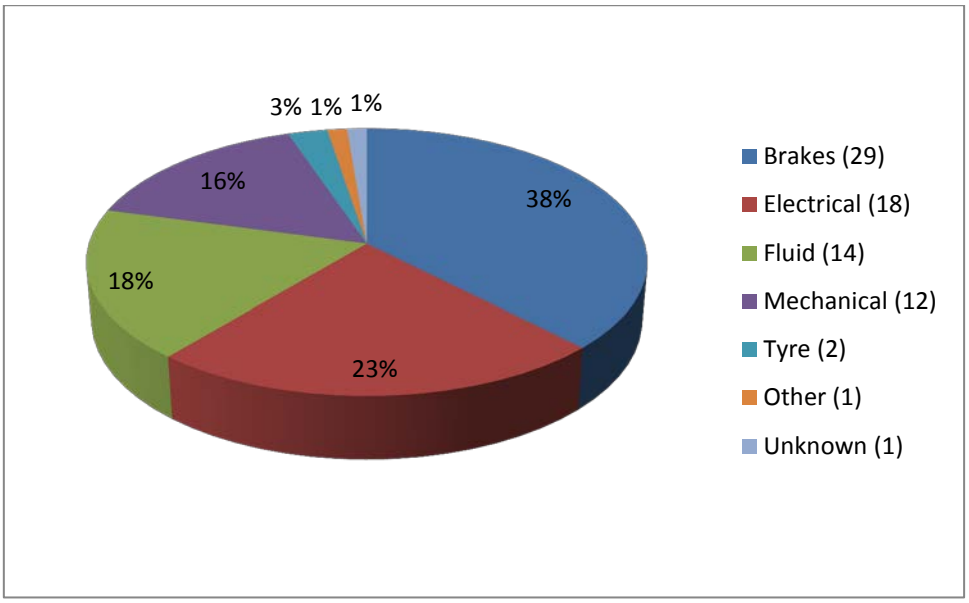

Figure 7: Causes of incidents NSW 2016

Brake-related incidents have increased markedly over the four years from 6 (23%) in 2013, 10 (34%) in 2014, 17 (42%) in 2015 and 29 (38%) in 2016. In part the increase may be attributable to increased reporting of brake-related thermal incidents which were often not reported in the past as they did not involve an actual fire. More bus operators are now reporting these incidents. The maintenance and adjustment of brakes are a continuing concern.

Though the number of electrical incidents has varied over time, the percentage has not varied significantly. The results were 4 (27%) in 2013, 6 (21%) in 2014, 11 (28%) in 2015, and 18 (23%) in 2016. The majority of the incidents were caused by short circuits, which highlights the need for extra vigilance in checking the condition and securing of electrical wiring.

There was a large increase in the number of incidents attributed to fluid leaks from the previous year. The results were 11 (39%) in 2013, 10 (34%) in 2014, 3 (7%) in 2015, and 14 (18%) in 2016.

The reasons for the fluid leaks were diverse, a sample are listed below:

- A small crack developed in the power steering hydraulic hose.
- An electrical loom rubbed through a fuel line.
- An oil leak developed in the air conditioning pump.
- A faulty seal allowed brake fluid to leak onto the wheel.

The number of incidents attributable to mechanical failures was a similar percentage to the previous year. The results were 1 (4%) in 2013, 2 (7%) in 2014, 7 (18%) in 2015, and 12 (16%) in 2016.

The reasons were diverse:

- An alternator bearing collapsed (two occasions).
- An engine injector failed.
- A fan belt failed, and the old engine belt was left in the engine.
- An exhaust pipe leaked.
- An air conditioning compressor seized.

Number of Engine Bay incidents. 35 incidents (45%) originated in the engine bay. This is a large increase from previous years. In 2013, the 16 engine bay incidents represented 59% of the total number of incidents. In 2014, the 14 engine bay incidents represented 48% of the total. In 2015, the 16 engine bay incidents represented 40% of the total (see *Figure 8*).

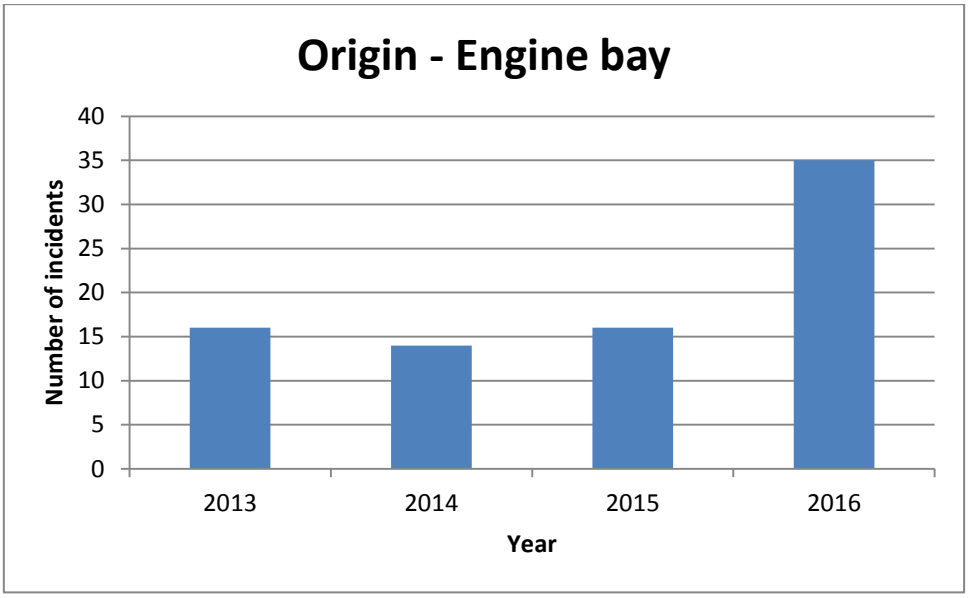

Figure 8: Number of engine bay incidents 2013-16

The cause of the engine bay incidents in 2016 was fairly evenly split between fluid (37%), mechanical (34%) and electrical causes (26%) (see *Figure 9)*. An example of fluid causation was the November M2 Motorway bus fire at Cheltenham. In this fire it was found that a hydraulic power steering pipe had a fatigue crack which caused hydraulic fluid to be sprayed over the engine which then ignited. An example of mechanical causation was in December at Manly where an air conditioning compressor failed.

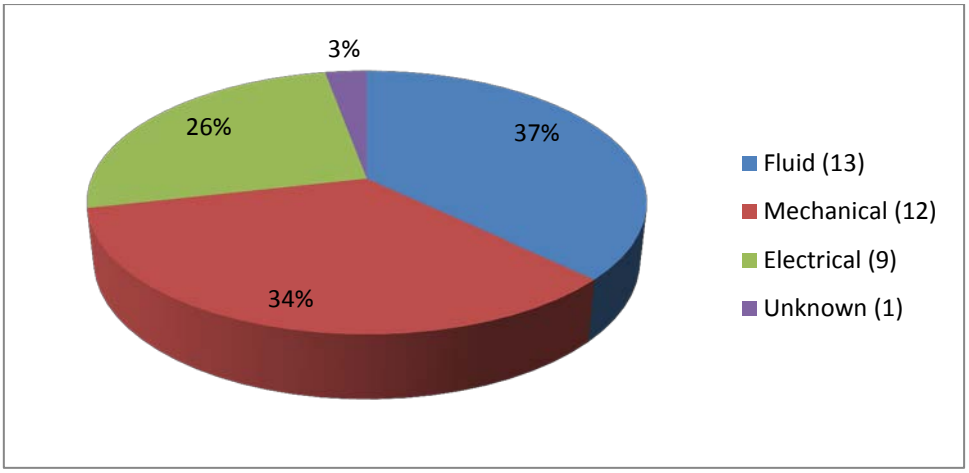

Figure 9: Cause of engine bay incidents 2016

Number of wheel well incidents. In 2016, 33 (43%) incidents were located around the wheel well; most of these incidents were a result of poorly adjusted or faulty brakes. It should be noted that the majority of these incidents (62%) resulted in smoke damage only. OTSI believes that it is likely the increasing trend of wheel well thermal incidents is due mainly to an increase in reporting. However, these precursor incidents should not be ignored as one wheel well fire destroyed a coach at Appin in June 2016.

In 2013, there were 6 wheel well incidents (22% of the total number of incidents in 2013), in 2014 there were 11 (38%) and, in 2015, there were 17 (43%) (see *Figure 10)*.

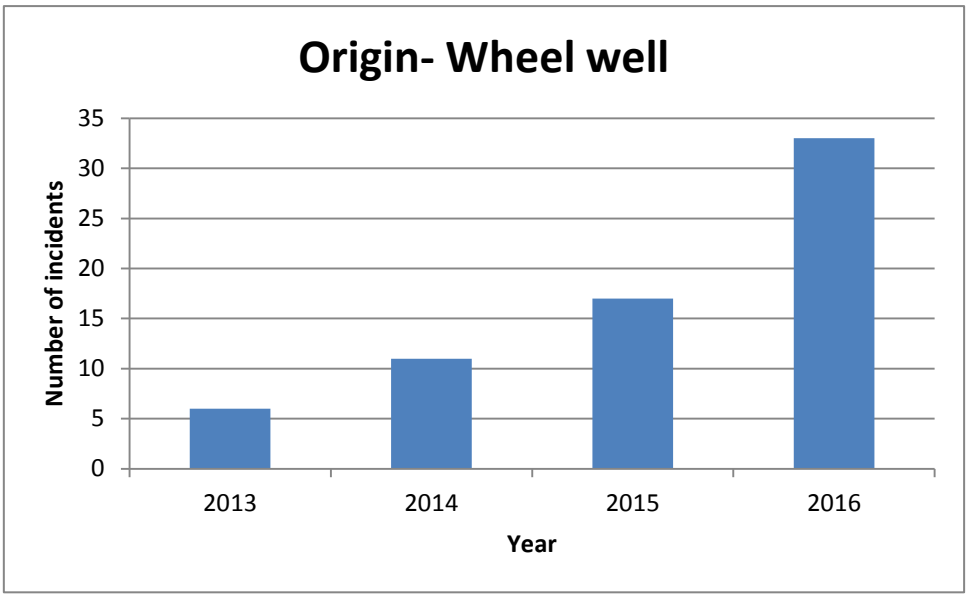

Figure 10: Number of wheel well incidents 2013-16

Cause of wheel well incidents. The cause of the wheel well incidents was mainly due to poorly adjusted or faulty brakes (88%), tyre (6%), mechanical (3%) and fluid causes (3%) (see *Figure 11)*. An example of brake causation was the Woy Woy fire in July. In this fire, the driver noticed smoke and flames coming from the wheel well. The driver successfully used the on board extinguisher to put out the fire.

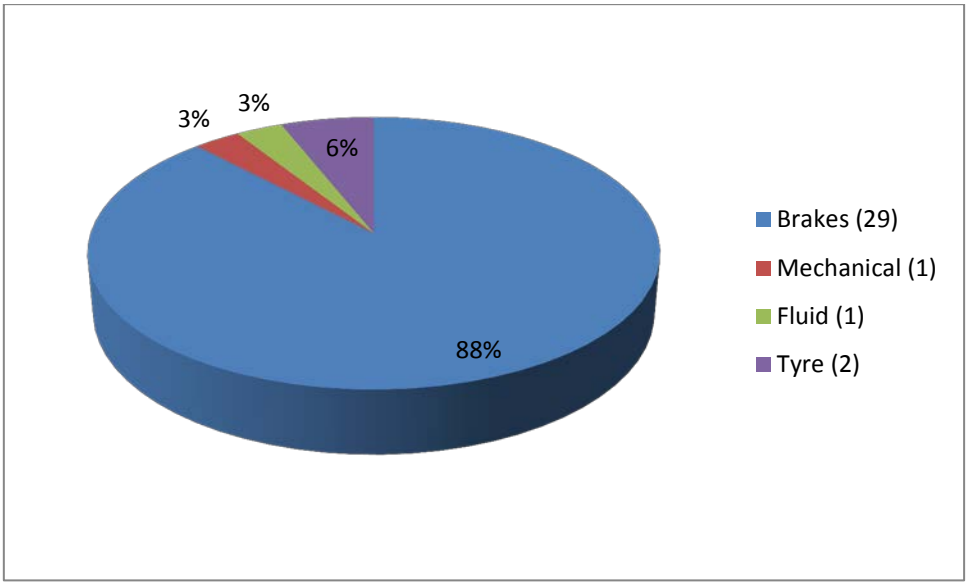

Figure 11: Causes of wheel well incidents 2016

Number of incidents originating in the body. A smaller number of incidents originated both inside and outside the body of the bus or coach. The number of body incidents has shown a large increase in 2016 (see *Figure 12)*.

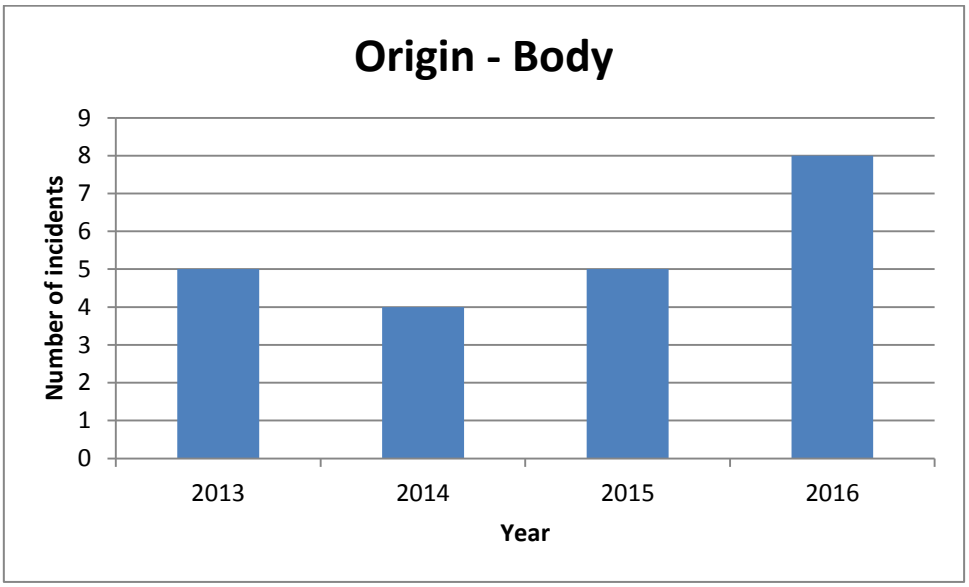

Figure 12: Number of body incidents 2013-16

Cause of body incidents. The cause of body incidents was mainly due to electrical malfunction or failure (87%) (see *Figure 13)*.

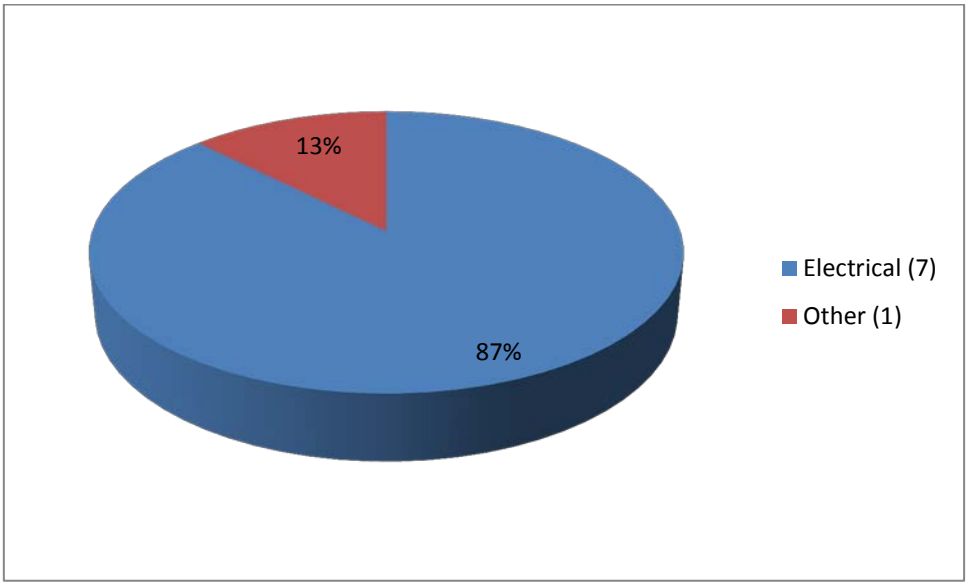

Figure 13: Causes of body incidents 2016

The seven electrical incidents had a wide variety of origins: battery compartment, battery isolator switch, heater, CD player and headlight relay. Another incident involved a fault in the exhaust stack which led to a fire in the rear roof area which eventually destroyed the coach.

Compressed Natural Gas (CNG) incidents. The number of CNG fuelled buses that reported incidents was up from 2015, but did not exceed the 2013 or 2014 numbers.

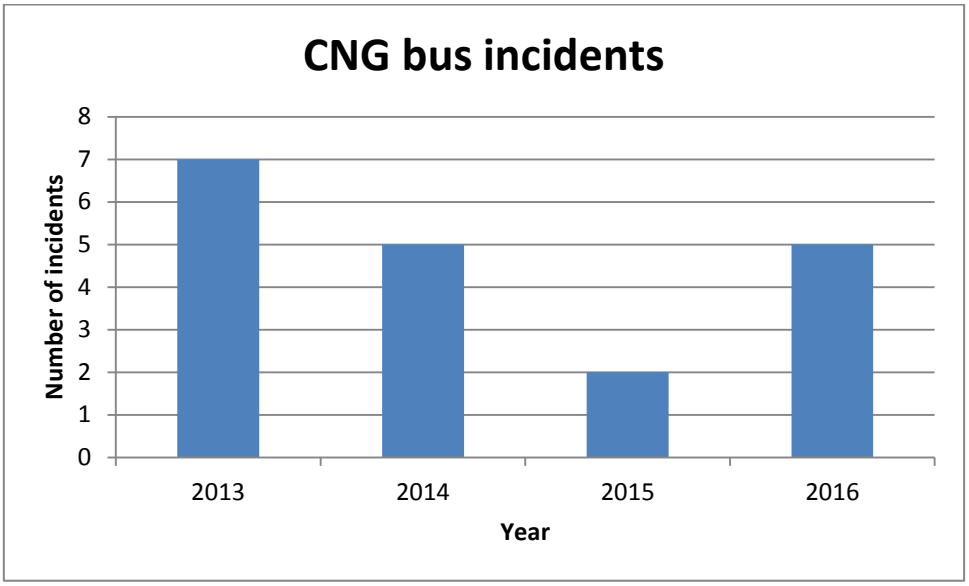

Figure 15: Number of CNG bus incidents 2013-16

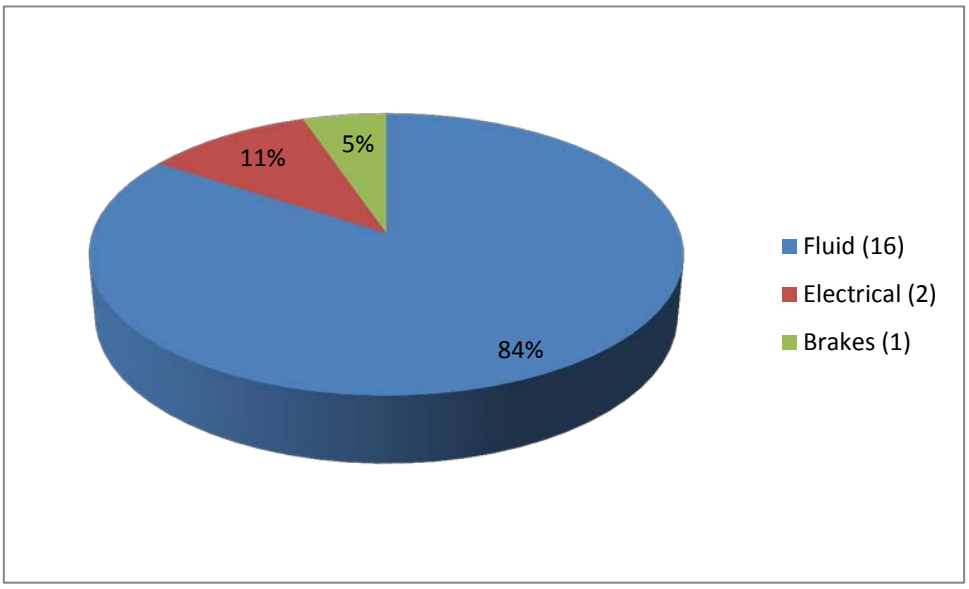

Figure 16: Causes of CNG bus incidents 2013-16

In 2016, five of the incidents were CNG fuelled buses, four sustained minor damage and one major damage. One was electrical in nature and the other four were associated with leaking liquids in the engine bay (see *Figure 17*).

Description of CNG bus incidents	Damage level[5]
'Oil leaking from tappet cover.'	Minor
'Heat damage to small wiring harness.'	Minor
'Oil leak from air compressor feed line onto manifold.'	Minor
'Oil leak from air compressor onto upper engine surface and then onto manifold.'	Minor
'Coolant leak caused overheating and oil filter to ignite, significant damage to engine with the rear window bursting causing internal damage.'	Major

Figure 17: Description of CNG bus incidents NSW 2016

Detection of Fire

The data for the detection of incidents in 2016 are shown (see *Figure 18).*

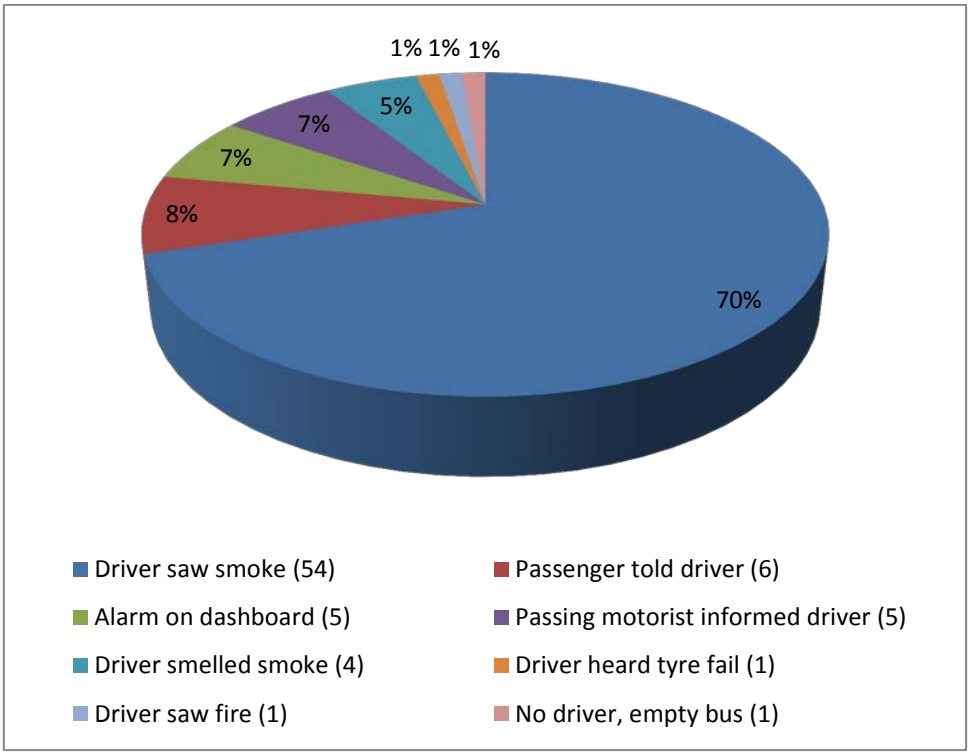

Figure 18: Detection of incidents 2016

In 2016 bus drivers were the first to either see or smell smoke or see flames on 77% of occasions. This was an increase from 2015 where the driver detected the incident

[5] For description of damage level classifications see Appendix B.

on 58% of occasions. On one occasion the driver heard the sound of the tyre rupturing which alerted him to a problem.

Only on five occasions was the driver alerted by a dashboard alarm. During the Sydney Harbour Bridge bus fire in September the dash alarm activated only after the driver had stopped the bus and was evacuating the passengers.

Passengers were the first to detect smoke on six occasions while external parties raised the alarm on the remaining five occasions.

Fire Fighting

Portable fire extinguishers were used on 31 (40%) occasions. The use of portable extinguishers was successful on 23 of those occasions, a success rate of 74%. This highlights the importance of the role of fire extinguishers in limiting damage.

An extinguisher was unsuccessful in defeating the fire on six occasions. On the wheel well fire at Appin in June, where the coach was destroyed, the driver stated that the fire extinguisher was used but was extremely ineffective. In August at Somersby, two fire extinguishers were used in an attempt to extinguish the fire, four times the fire seemed to be extinguished; the fire kept igniting and eventually destroyed the bus.

In one case at Haymarket, the driver discharged the fire extinguisher prematurely with the hose still attached to the clip in the holder. The driver was attempting to fight an engine bay fire which eventually caused major damage to the bus.

On five of occasions the smoke or flames ceased when the vehicle was stopped and the ignition or battery power was switched off. There were two confirmed occasions where the battery power was not switched off and it is likely the fire continued due to the power not being isolated. One of these buses was completely destroyed while the other sustained major damage.

In 2016, NSW Fire and Rescue was called upon to attend on 27 (35%) occasions. This is an increase from 2015 where they attended on 11 (28%) occasions. Given that there were occasions where the battery power was not isolated there may be some value in increasing awareness of first responders of the stored energy in those battery systems.

Non-reporting of fire incidents

It is a legislative requirement that: 'An operator of a bus service who becomes aware that a bus being used to provide the service has been involved in an accident or incident must notify the Chief Investigator of the accident or incident … if the accident or incident involves a mechanical or electrical fire or an explosion on the bus.'[6]

It was found that on seven occasions OTSI were not notified of a fire incident. The incidents were instead reported in the online Roads and Maritime Services (RMS) bus incident management database. It is important that the legislative requirement is met by all operators in order to gather a complete record of incidents for analysis.

Progress on Implementing Recommendations

Based on advice from Transport for NSW (TfNSW), the RMS and the State Transit Authority (STA), the status of actions in response to the key recommendations contained in the 2005 - 2012 Report is as set out below.

The installation of engine bay bus fire suppression systems was commenced by STA in 2009 where all new bus supply contracts from 2009 required the bus to be delivered with a fire suppression system installed. In 2013 STA retrofitted their Mercedes Benz 0500 CNG bus fleet with fire suppression systems and in 2015 commenced their fire suppression retrofit programme of the rest of their fleet, this project was completed in December 2016. There were 21 different STA bus models which required modification to the specified suppression system design. STA used in-house expertise to ensure each suppression system was tailored to the different engine bay configuration. All STA buses are now fitted with engine bay fire suppression systems.

Previously, the Minister for Transport and Infrastructure announced that all private operator buses covered under the TfNSW metropolitan and outer metropolitan private bus operators' contract will also be retro-fitted with engine bay bus fire suppression systems.[7] This project is expected to be completed by September 2017. All future buses supplied under the Bus Procurement Panel will be delivered with engine bay bus fire suppression systems.

6 NSW Passenger Transport Regulation 2007 clause 88.

7 A Constance (Minister for Transport and Infrastructure), *Safety Boost for Bus Customers*, media release, Sydney, 6 August 2015.

The installation project is applying international standards for designing, testing and installation of automatic fire suppression systems to ensure consistency of the solution.[8]

No bus with an engine bay fire suppression system fitted was destroyed in 2016 in NSW. OTSI will monitor the effectiveness of the engine bay bus fire suppression systems in the future.

RMS communicates key information to operators in various ways such as by distributing OTSI bus safety investigation reports and issuing information alerts. Recently RMS issued the following alerts:

- A bus driver's pocket guide for managing critical incidents (RMS 16.627)
- A bus operator's procedure in the event of a serious incident or accident (RMS 16.628).

Previously RMS has issued a checklist for fires on buses containing information and advice.

Conclusions

There was a 92% increase in the number of fire and thermal incidents reported to OTSI in 2016.

There was a corresponding increase in severity of damage to vehicles, with seven vehicles destroyed in 2016 compared to two in 2015.

Despite the large increase in incidents there were only three injuries reported. These individuals were treated for smoke inhalation at hospital.

The majority of incidents originated in the engine bay (45%). There are a wide range of ignition sources of bus incidents. The three main initiators were fluid leaks, mechanical malfunction and electrical malfunction.

There is a continuing increase in the number of brake related thermal incidents. It is likely a result of increased reporting; however, these incidents should not be ignored as 20% of these wheel well incidents led to actual fires.

[8] The P-Mark certification process developed and controlled by the RISE Research Institutes of Sweden (formerly SP Technical Research Institute of Sweden), consisting of a series of tests (SP Method 4912) to rate suppression performance and limitations of fire suppression systems installed in engine compartments of buses and coaches.

All STA buses are now fitted with engine bay fire suppression systems. Progress is also being made to retrofit engine bay fire suppression systems to private buses operating under the Sydney Metropolitan and Outer Metropolitan contracts. Also, new buses purchased under these contracts will be delivered with fire suppression systems.

No bus with an engine bay fire suppression system fitted was destroyed in 2016 in NSW.

Appendix A

BUS INCIDENTS RECORDED IN 2016

MONTH	VEHICLE TYPE	YEAR	LIKELY FIRE SOURCE	SEVERITY	ONBOARD FIRE EQUIPMENT USED
Jan	Bus	2009	Broken hydraulic hose	Minor	Yes*
Jan	Bus	2009	Broken hydraulic hose	Minor	Yes
Jan	Bus	2004	Electrical short - overheating of air brake condenser valve	Minor	Yes*
Jan	Coach	1987	Engine fire unknown	Destroyed	Yes
Jan	Bus	2008	Oil leaking from tappet cover	Minor	Yes
Feb	Bus	2013	Alternator bearing collapsed	Minor	Yes
Feb	Bus	2015	Failure of the starter motor caused a plastic cover on the solenoid to ignite	Minor	Yes
Mar	Bus	2004	Loom rubbed through fuel line	Minor	Yes*
Mar	Bus	2006	Engine bay mechanical issue	Minor	Yes*
Mar	Bus	2003	Alternator mechanical failure propagating into electrical fire	Major	Yes*
Mar	Bus	2011	Oil leak from air conditioning pumped onto the engine	Major	No*
Apl	Bus	2011	Smoke at back of bus	Smoke damage	No
Apl	Bus	2010	Oil leak	Smoke damage	No*
Apl	Bus	2015	Brake issue	Smoke damage	No
Apl	Bus	2010	Rail pressure fault, causing injector to fail	Minor	No
Apl	Bus	2003	Short circuit to alternator progressed to fire	Major	No*
May	Bus	2011	Brakes over adjusted	Smoke damage	No
May	Bus	2004	Front air conditioning unit electrical board failure	Major	No*
May	Bus	1993	Starter motor terminal melted from mounting block	Minor	Yes*
May	Bus	2010	Heat damage to small wiring harness	Minor	No
May	Bus	2009	Electrical short in battery compartment	Minor	Yes
May	Bus	2010	Leak found on brake service module	Smoke damage	No
May	Bus	2007	Old fan belt left on hot exhaust manifold	Minor	Yes
May	Bus	2007	Brakes binding	Minor	Yes
May	Bus	1996	Brake adjustment	Smoke damage	No

Jun	Coach	1998	Tyre failure led to wheel well fire	Destroyed	Yes*
Jun	Bus	2009	Brake issue	Minor	Yes
Jun	Bus	2010	Brake issue	Smoke damage	No
Jun	Bus	2007	Brake issue	Smoke damage	No
Jun	Bus	2007	Brake issue	Smoke damage	No
Jun	Bus	1997	Cracked fuel line sprayed fuel onto hot turbocharger	Minor	Unknown
Jun	Bus	2013	Brake issue	Smoke damage	No
Jun	Bus	2008	Battery terminal short	Smoke damage	No
Jul	Bus	2010	An oil leak caused fire under bus	Smoke damage	No
Jul	Bus	2008	Flames from RNS wheel - brake issue	Smoke damage	No
Jul	Bus	2014	Leaking hub seal	Smoke damage	No
Jul	Bus	2008	Brake issue	Minor	Yes
Jul	Bus	2009	Brakes overheated due to air leak from brake booster	Minor	Yes
Jul	Bus	2011	Brake issue	Minor	Yes
Jul	Bus	2013	Short circuit in CD drive	Minor	No*
Aug	Bus	2010	Air con compressor failed	minor	Yes*
Aug	Bus	1998	Short circuit in engine bay	Major	Yes*
Aug	Bus	2012	Brake calliper over adjusting	Minor	Yes
Aug	Bus	2010	Coolant leak	Minor	No
Aug	Bus	2006	Brake issue	Smoke damage	No
Aug	Coach	1985	Exhaust stack caught fire	Destroyed	Yes*
Sep	Bus	2009	Air conditioning condenser fan failed	Minor	No
Sep	Bus	2011	Brake issue	Smoke damage	No
Sep	Bus	2009	Brake issue	Smoke damage	No
Sep	Bus	2009	Brake issue	Minor	No*
Sep	Bus	1996	Short circuit in engine bay	Destroyed	No*
Sep	Bus	2010	Brake issue	Minor	No
Sep	Coach	1999	Cooling system fault	Nil	No
Sep	Bus	2010	Brake issue	Smoke damage	No
Sep	Bus	2011	Rear brakes bind due to pressure limiting value leak	Smoke damage	No
Sep	Bus	2008	Air conditioning compressor seized	Minor	Yes

Oct	Bus	2015	Brake issue	Minor	Yes
Oct	Bus	2009	Brake issue	Minor	Yes
Oct	Bus	1995	Electrical short in heater on dashboard	Minor	No
Oct	Bus	2011	Brake pad issue	Smoke damage	No
Oct	Bus	2009	Oil leak from air compressor feed line onto manifold	Minor	Yes*
Oct	Bus	2009	Brake issue	Smoke damage	No
Oct	Bus	2009	Brake issue	Smoke damage	No
Oct	Bus	2003	Gearbox electrical fault	Minor	Yes
Nov	Bus	2001	Cracked pipe	Destroyed	Yes*
Nov	Bus	2000	Leak from power steering return line onto exhaust	Minor	yes
Nov	Bus	1993	Exhaust pipe leak due to cracked pipe	Minor	Yes*
Nov	Bus	2010	Oil leak from air compressor onto upper engine surface and then onto manifold	Minor	Yes
Nov	Bus	1999	Electrical short in headlight relay on dashboard	Minor	No
Nov	Bus	2007	Front tyre caught fire	Minor	no
Nov	Bus	2010	Brake issue	Minor	No
Dec	Bus	2010	Brake overheat	Smoke damage	No
Dec	Bus	2004	Arcing on the battery isolator switch	Destroyed	No*
Dec	Bus	2004	Bus parked next to bus that caught fire	Destroyed	No*
Dec	Bus	2007	Leaking seal onto wheel	Minor	No
Dec	Bus	1993	Electrical problem engine bay	Major	Yes*
Dec	Bus	2005	Air conditioner compressor seized	Minor	No*
Dec	Bus	2007	Coolant leak caused overheating and oil filter to ignite	Major	Yes*

***** Denotes attendance by NSW Fire and Rescue.

Appendix B

Severity level descriptions

Destroyed
Due to damage sustained in the fire the bus cannot be repaired. Significant destruction to one or more sections. Examples of this category are:

- The bus is completely burnt out.
- The engine bay and the rear passenger area of the bus are completely burnt out.

Major
Damage to one large section of the bus or multiple parts where the bus can be repaired with that panel or part replaced. Examples of this category are:

- The engine bay sustains a fire, but the fire is contained to that area and the rest of the bus is undamaged.

Minor
One part of the bus is damaged but that part can be repaired or replaced. Examples of this category are:

- An oil leak from a cracked pipe onto a hot engine part creating a small fire.
- Brake callipers sticking generating intense heat and need replacing.
- An electrical fuse generates heat to that local area.

Smoke damage
No physical damage to any part except smoke stains/residue. No parts need replacing. Examples of this category are:

- Brake callipers sticking generating intense heat and do not need replacing.

Nil damage
No physical damage to any part. No smoke staining. No parts need replacing. Examples of this category are:

- Tyre lockup and smoke generated.
- Water leak generating steam.