



Government of **Western Australia**
Department of **Commerce**
EnergySafety

Gas incident safety report 2015-16

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Preface

This report by EnergySafety summarises information about gas incidents in Western Australia and analyses statistical trends for the years 2006-07 to 2015-16.

EnergySafety has statutory responsibility for the safety regulation of most gas facilities (downstream of transmission pipelines) and activities in Western Australia.

The report provides practical information on how well the State's industry and general community are operating in the supply and use of gas.

EnergySafety uses the information to make assessments on:

- the effectiveness of safety education and regulatory mechanisms (including mandatory technical requirements); and
- changes that should be considered to improve industry and community gas safety outcomes.

These assessments are the subject of continuing policy work by EnergySafety which includes extensive consultation with gas industry stakeholders.

I am confident that the information will interest those involved in the State's gas industry.

Ken Bowron
DIRECTOR OF ENERGY SAFETY

April 2017

Executive summary

This report is an analysis of gas incidents reported to EnergySafety over a ten year period from 1 July 2006 to 30 June 2016.

The distribution of gas across Western Australia is varied in terms of reticulated natural gas (NG), liquefied petroleum gas (LPG) and bottled LPG.

There were 837 gas related incidents reported in the ten years from 2006-07 to 2015-16. Of these, 74% were related to gas utilisation and 26% to gas supply. Overall gas supply incidents recorded by EnergySafety have shown a higher safety outcome in comparison with gas utilisation.

Analyses of workplace and non-workplace incidents indicate that gas supply had more workplace incidents compared to gas utilisation, where a higher number of incidents occurred in a non-workplace setting.

There were five incidents that resulted in a total of seven fatalities over the reporting period.

There were no gas related fatalities recorded in 2015-16.

There were no incidents that resulted in serious injury in 2015-16. The total number of incidents in this category since 2006-07 is 59.

During 2015-16, there were 12 incidents that resulted in minor injury. There were 141 such incidents over the reporting period.

Introduction

The Gas Standards (Gasfitting and Consumer Gas Installations) Regulations 1999 require that an incident involving the sudden discharge of gas or that otherwise relates to gas and causes or is likely to cause injury to a person or damage to property must immediately be reported to the Director of Energy Safety and to the relevant gas supplier where applicable. The Gas Standards (Gas Supply and System Safety) Regulations 2000 specify levels of major discharge of gas in incidents that are required to be reported to the Director of Energy Safety.

All reported incidents are recorded on a database maintained by EnergySafety. The information contained within this report has been compiled from this data. This report provides a comparative analysis of trends in frequency of incidents. EnergySafety is the regulator for downstream gas incidents in Western Australia.

The introduction of mandatory reporting of gas incidents in 1999 resulted in a significant increase in the amount of data recorded, indicating a greater awareness of the reporting requirements. This report focuses on the ten year period from 2006-07 to 2015-16.

Gas related incidents can vary from a gas leak to a fatality. This report analyses incidents resulting in a fatality, serious injury and minor injury and has been categorised into two major sections based on utilisation and supply of gas. This segregation allows for a better understanding of the data in identifying trends.

Abbreviations

FIFR – Fatal Injury Frequency Rate

LPG – Liquid Petroleum Gas

NG – Natural gas

PMP – per million population

WA – Western Australia

Definitions and explanatory notes

Gas: any gas or mixture of gases intended for use as fuel for gas appliances or for use in any chemical process.

Gas related incident: A gas related incident refers to any incident that involves the sudden uncontrolled discharge of gas or that otherwise relates to gas and may or may not cause or be likely to cause injury to a person or damage to property.

FIFR: Fatal injury frequency rate is calculated with the formula: $FIFR = \text{Number of fatal injuries in a period} / \text{number of people at risk to the exposure of gas (population)}$. For comparison of gas safety performance against other jurisdictions, the FIFR is multiplied by a million. To arrive at the FIFR, the demographic population has been utilised as the number of people at risk to the exposure of gas.

Fatality: An incident in which gas was found to be the cause and resulted in accidental death (excludes wilful).

Serious injury: An incident in which gas was found to be the cause and that resulted in such an injury that hospitalisation was required.

Minor injury: An incident in which gas was found to be the cause and resulted in such an injury that may have required medical attention but did not require hospitalisation.

Other Incidents: A gas related incident that has not resulted in injury or fatality.

Hospitalisation: Admission to a hospital.

Serious Accident: An incident which requires admission to a hospital (includes a fatality).

Major discharge: A major discharge is the unplanned and uncontrolled release inside a building of 10 m³ or more of gas or the unplanned and uncontrolled release in the open air of 1,000 m³ or more of gas.

Gas Appliance: An appliance that consumes gas as fuel.

Limitations of this report:

- Fatalities where gas was involved but was not found to be the cause of the incident have been excluded from this report.
- The number of incidents in this report may vary in comparison to other documents previously released by EnergySafety. Although legislation requires prompt notification of incidents, there can be extended delays between when an incident occurs and when notification is received and this can impact on the reported data. This is more evident in cases with low severity. In other instances, some incidents may be found to be non-gas related after investigation and hence are not included in the report.

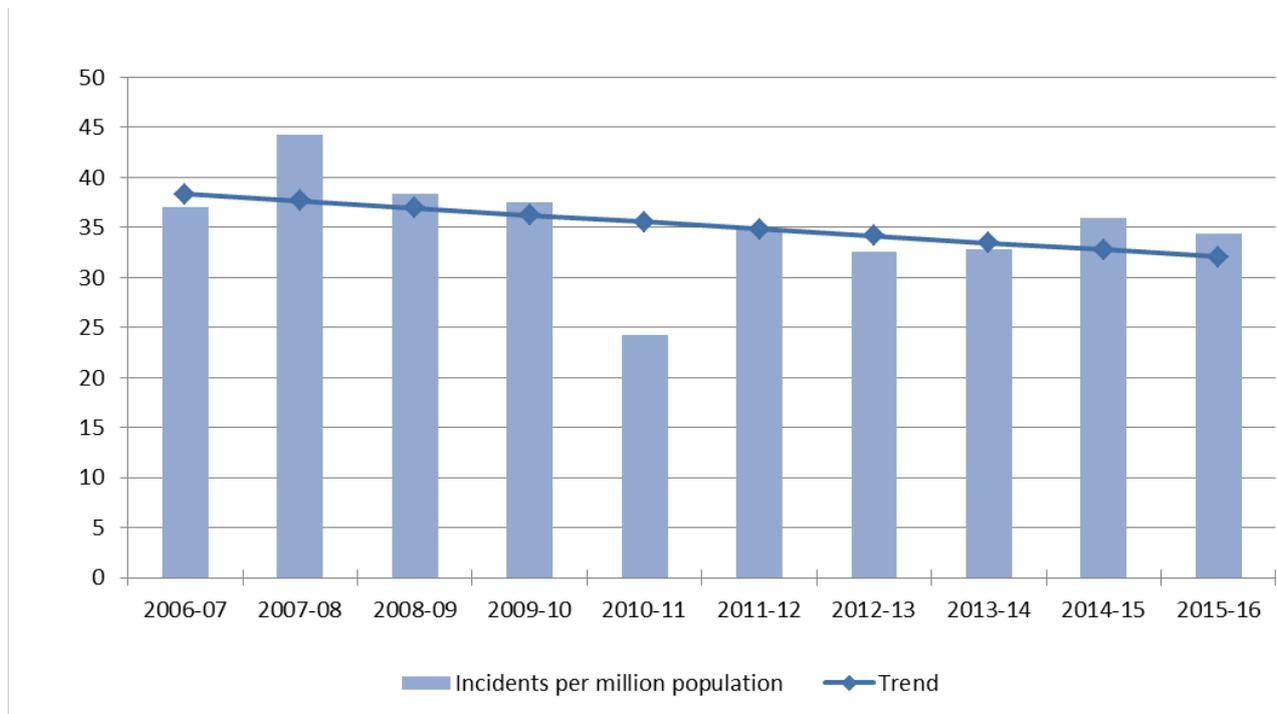
Distribution of gas in WA

Distribution of gas across the state is varied. The Perth Metropolitan Area, Kalgoorlie, Esperance, Bunbury and Geraldton are serviced by reticulated natural gas. Margaret River, Leinster, Albany and Hopetown have reticulated LPG, while bottled LPG is available and utilised throughout WA.

Gas incidents recorded in WA

There were 837 gas related incidents reported from 2006-07 to 2015-16. The number of reported incidents per million population has been represented in Figure 2 below. During the ten year reporting period, the most number of incidents were reported in 2007-08 with the trend showing a steady decline in the number of incidents.

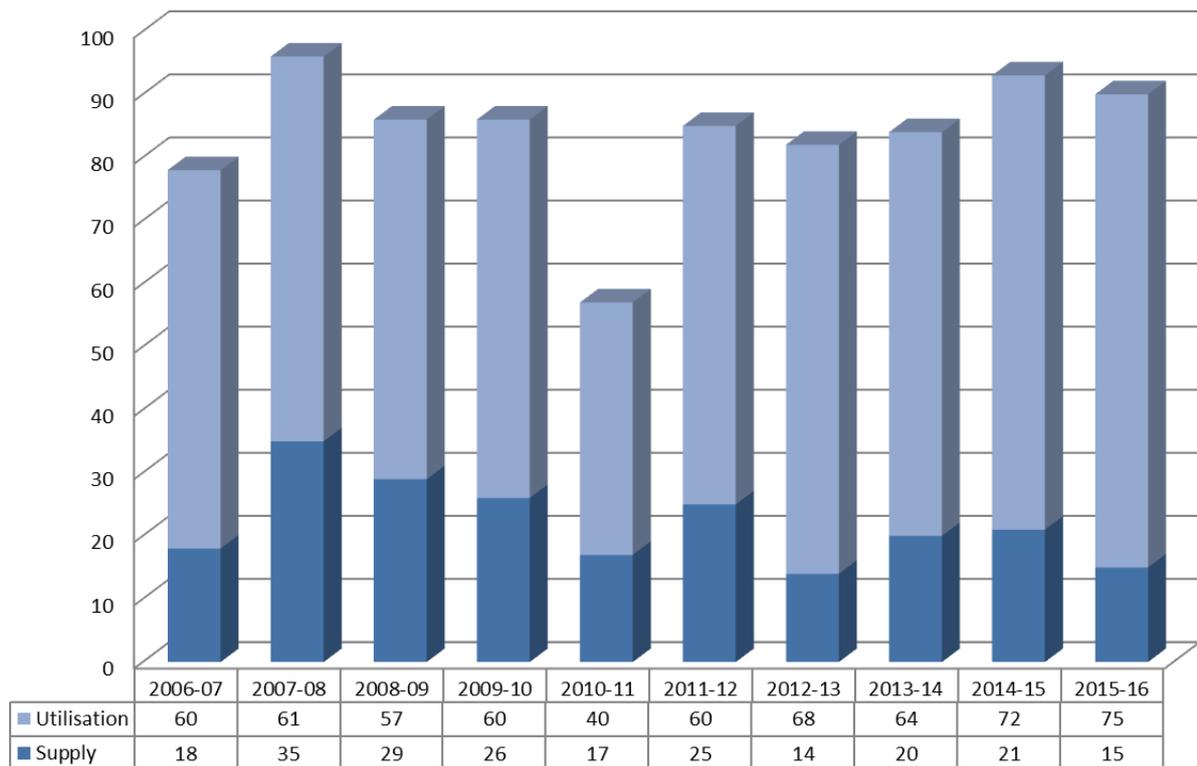
Figure 2: Number of WA gas related incidents per million population



All the incidents recorded can be broadly classified into either gas utilisation or gas supply incidents. 74% of all incidents in the reported period were related to gas utilisation. The high number of reported gas utilisation incidents may be due to the legislative requirement to report gas incidents.

For supply incidents, there is a requirement to report only those incidents which have a major discharge of gas. Figure 3 below provides information on the number of incidents reported to EnergySafety each year.

Figure 3: Number of incidents by gas utilisation and supply



Fatalities

There were no gas related fatalities reported in 2015-16. Over the reporting period, there have been five incidents that resulted in a total of seven fatalities.

A fatal incident in 2006-07 caused the death of a mother and her two children. It resulted from the escape of LPG from a two-burner camping gas stove, believed to have been left unattended for a brief time. Nearby combustibles caught fire which ultimately consumed the front portion of the house in Karrinyup. The three deceased were found in a bedroom unable to escape the fire.

A fatality in 2009-10 related to an explosion involving a gas cylinder where cylinder abuse was identified as the cause. Medical complications relating to burns received from the explosion resulted in the fatality.

There was a fatality in 2012-13 due to LPG leaking from a mechanical bolted sleeved coupling on a gas main in the verge, near the residence at 282 Middleton Road, Centennial Park, Albany which permeated into the lower ground floor bedroom of the residence. The presence of LPG as a vapour cloud in the bedroom was ignited by an electrical source. The explosion and fire that followed proved fatal to a resident.

The fatality reported in 2013-14 involved a victim that was alleged to have been using LPG during the manufacture of an illegal substance. There was a fire and explosion in which the victim sustained burns and later succumbed to his injuries.

During 2014-15, a fatality occurred in a caravan fire where the person was trapped inside. The police found a gas cylinder inside the caravan that had a loose connection and was partially on. The cause of this fatal incident is still undetermined.

Figure 4: Fatalities and fatal incidents

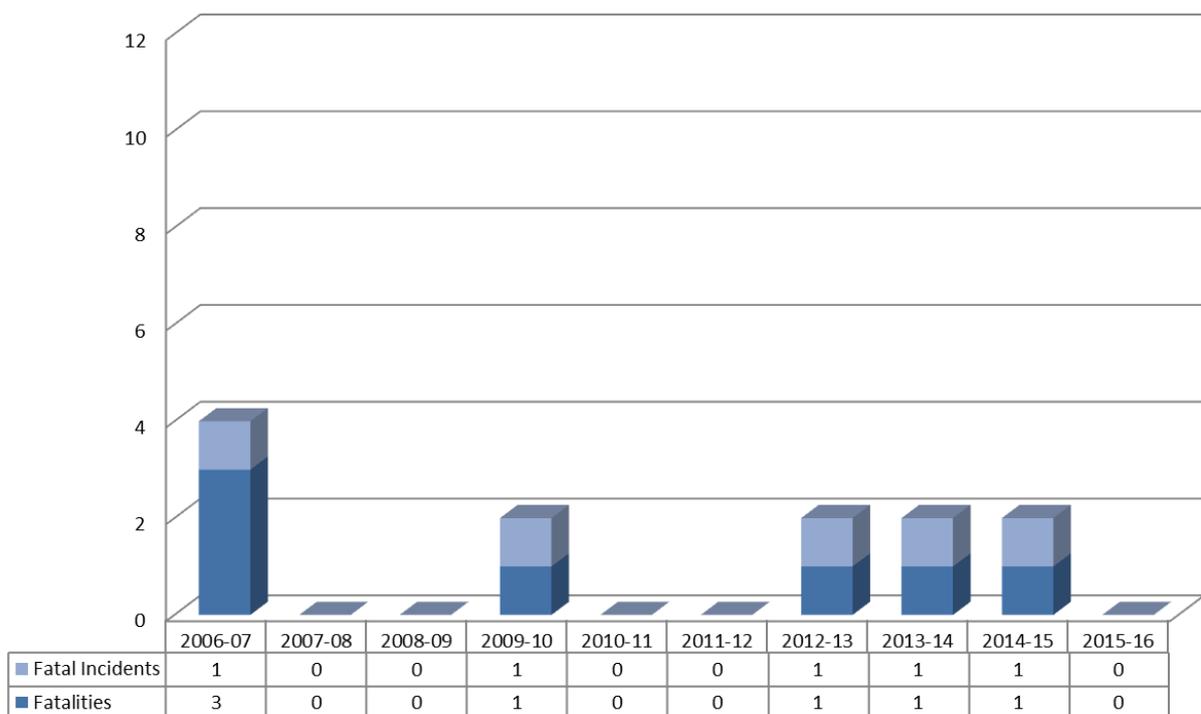


Figure 4 shows that fatalities arising from gas incidents may impact more than one person in a single incident, as is evident from the incident which occurred in 2006-07 involving a camping stove causing three fatalities.

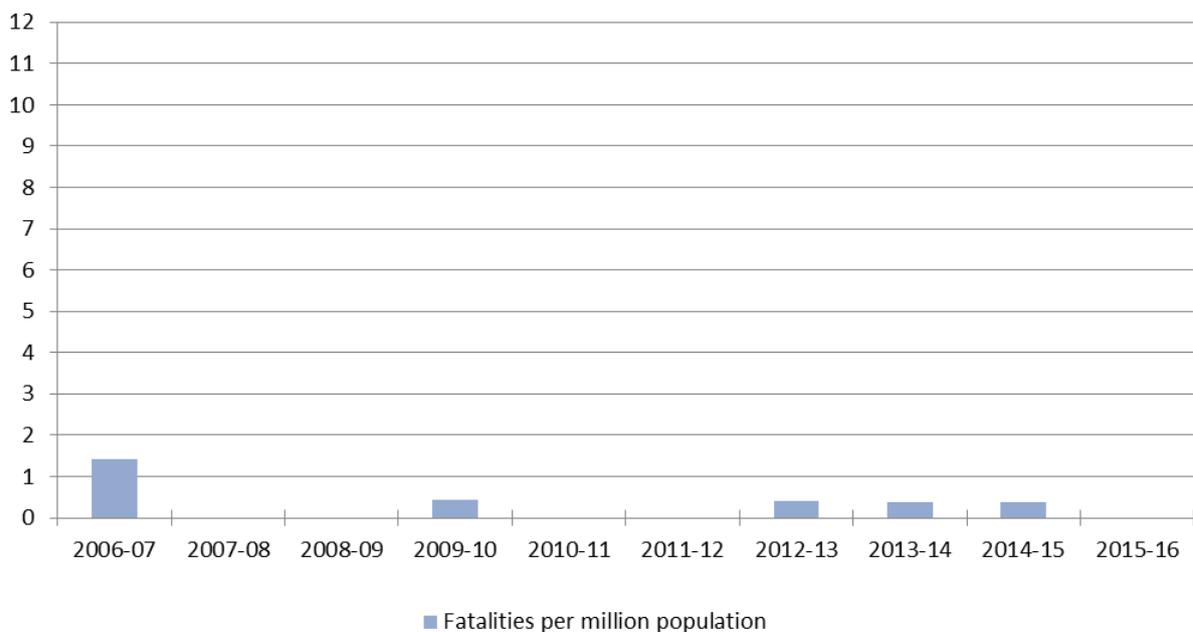
For ease of comparison, the Fatal Injury Frequency Rate (FIFR) is used as a means to compare gas safety performance in a changing demographic population. This is also referred to as fatalities per million population.

Table 5 below lists the FIFR over the reporting period and Figure 5 provides a graphical view of the number of fatalities per million population.

Table 5: Fatal Injury Frequency Rate

Year	FIFR x 10 ⁶
2006-07	1.42
2007-08	0.00
2008-09	0.00
2009-10	0.44
2010-11	0.00
2011-12	0.00
2012-13	0.40
2013-14	0.39
2014-15	0.39
2015-16	0.00

Figure 5: Fatalities per million population

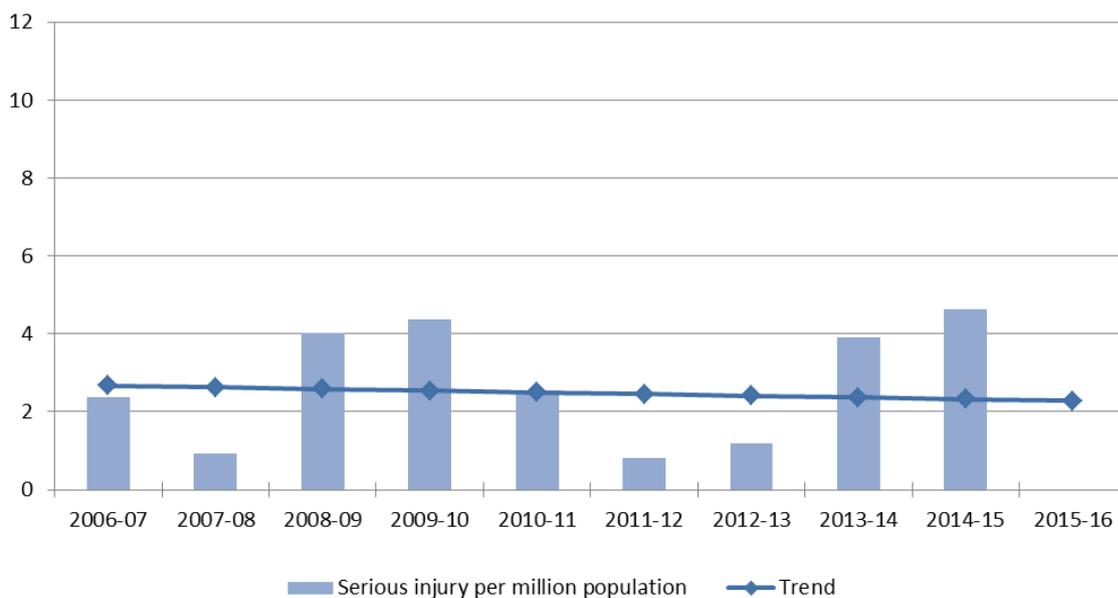


Since the establishment of EnergySafety in 1995 there have been no gas related fatalities involving a gas worker, which suggests that the safety of gas workers is generally maintained at a high level.

Serious injury

Non-fatal gas incidents have been classified into two groups, those causing serious injury requiring hospitalisation and those causing minor injury. Figure 6 below shows the number of incidents resulting in serious injury per million population. There were no gas incidents resulting in serious injury reported in 2015-16. Trends indicate a decrease in incidents reported in this area.

Figure 6: Serious injury per million population



The majority of incidents resulting in serious injury involved cookers, recreational equipment (predominately barbeques) or water heaters.

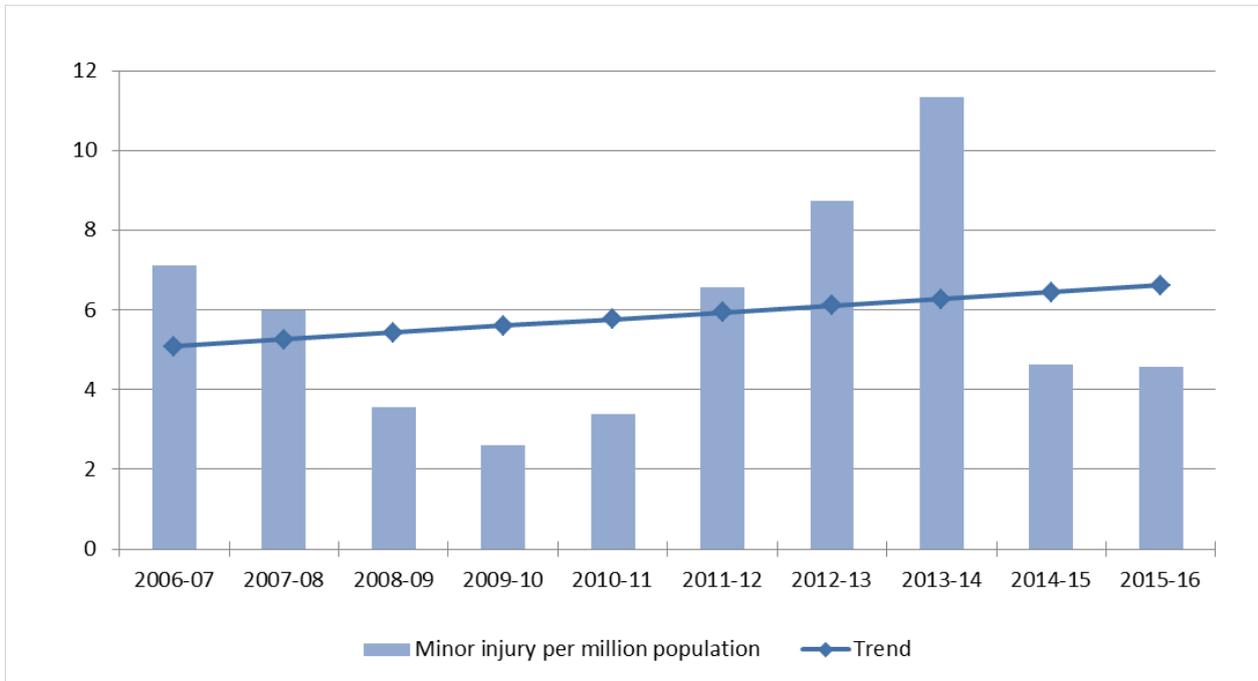
Unsafe installation was identified as a major cause of incidents involving cookers and component failure/design fault in recreational equipment. Incidents involving water heaters resulted mainly from improper use of the unit or when trying to ignite the pilot light.

One incident in 2014-15 caused serious injury to four people. The incident involved a lunchbox gas cooker with a butane canister which exploded during use. A safety issue with such cookers has been highlighted by Energy Safety. More information is available on the Division's website discouraging the use of cookers which have been prohibited from sale and use.

Minor injury

Minor injuries resulting from gas incidents show an increasing trend over the reporting period. There were a comparatively higher number of reported incidents in 2011-12, 2012-13 and 2013-14 which has influenced the overall trend as indicated in Figure 7.

Figure 7: Minor injury per million population



A significant number of incidents resulting in minor injury were caused by operational defects related to component failure and improper use or unskilled interference with gas equipment.

Gas utilisation

Gas utilisation incidents

There were 617 gas utilisation incidents reported during the period 2006-07 to 2015-16. 28% of these occurred within a workplace setting and the remainder within the larger community. Figure 8 below shows the distribution between workplace and non-workplace incidents over the past ten years.

Figure 8: Gas utilisation incidents – Workplace and non-workplace

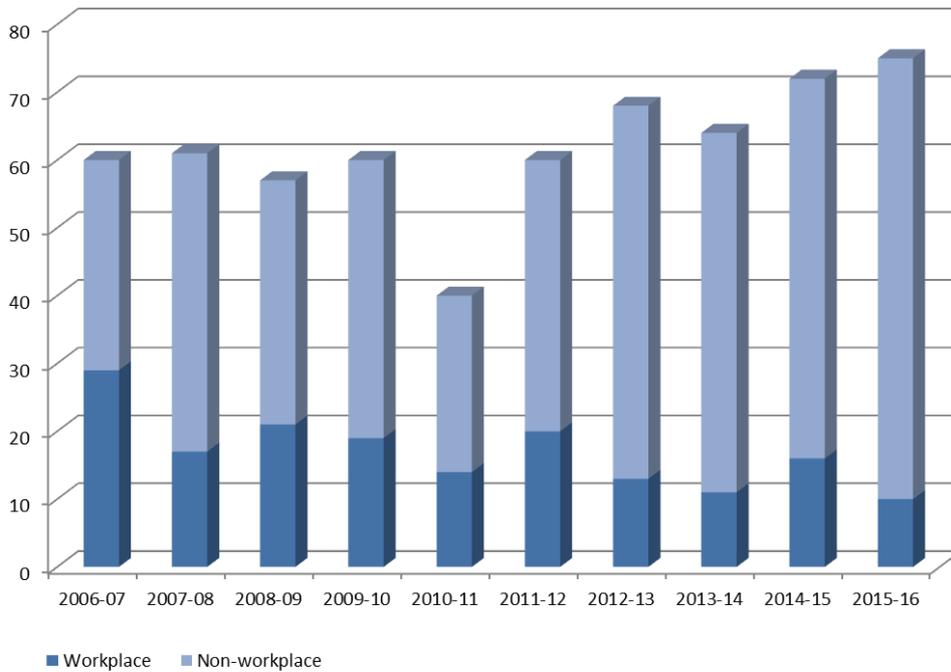


Figure 8A shows the percentage distribution of workplace and non-workplace incidents.

Figure 8A: Gas utilisation incidents – Workplace and non-workplace

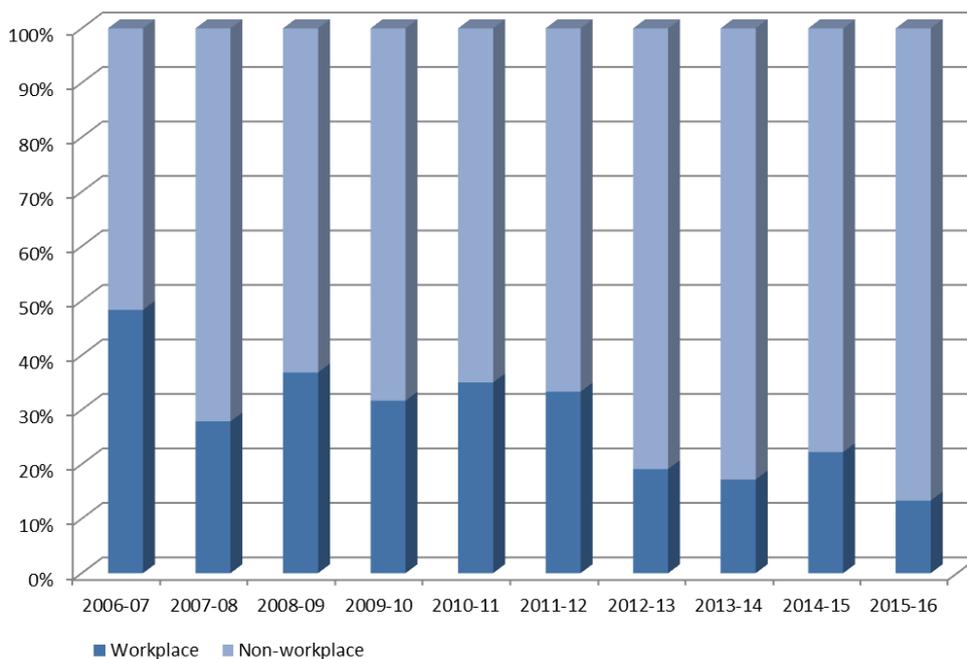
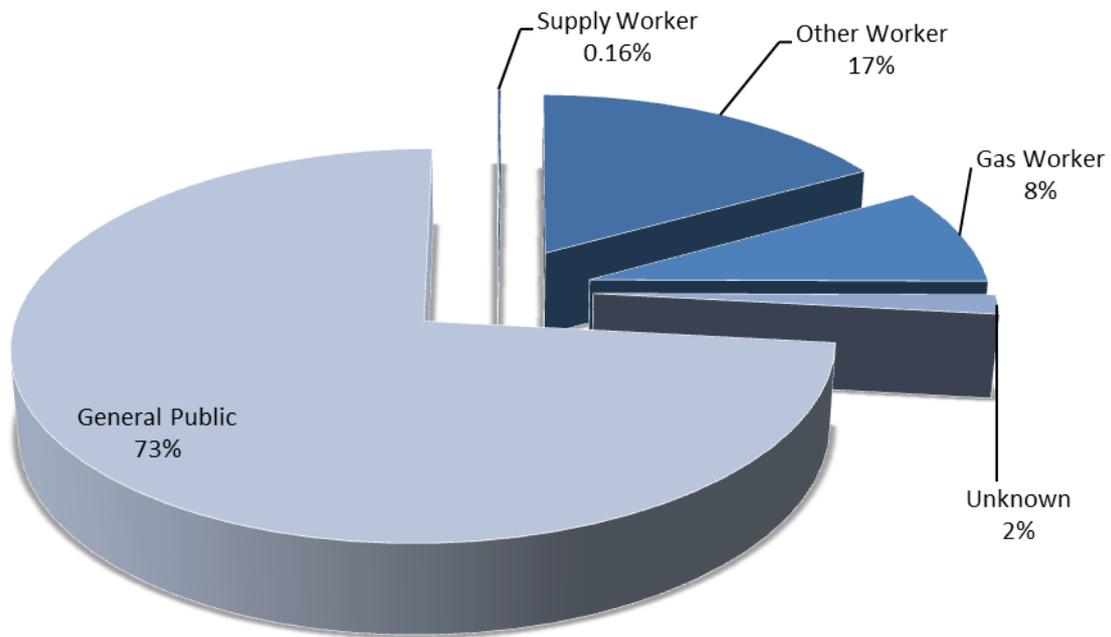


Figure 9 below shows the classification of incidents according to broad categories of workers and the general public. Gas workers were involved in 8% of the incidents.

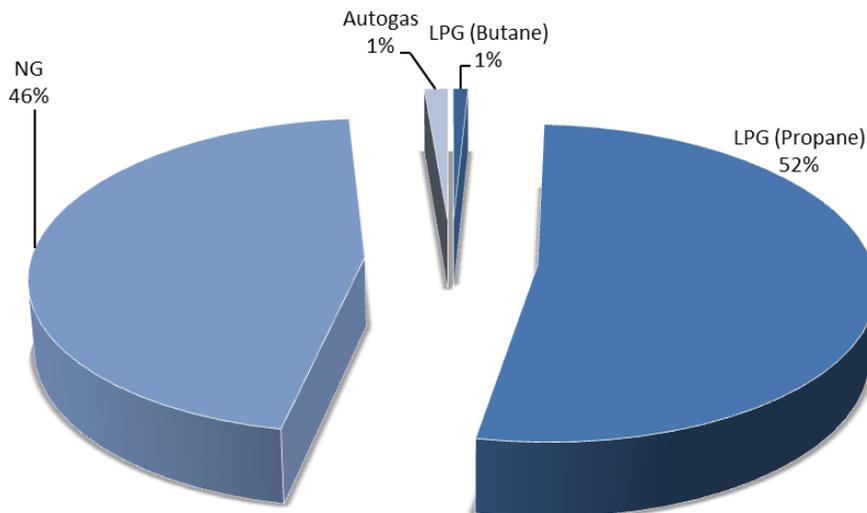
Figure 9: Gas utilisation incidents – Workers versus general public



Gas utilisation incidents – by type of gas

Natural gas, LPG (Propane), LPG (Butane) and auto gas are the main types of gas utilised in Western Australia. Figure 10 below provides a graphical view of incidents in relation to the type of gas. 52% of incidents involved LPG (Propane), followed by NG at 46%.

Figure 10: Gas utilisation incidents – Type of gas



The percentage of incidents involving butane and auto gas is low compared to NG and LPG (propane). There have been five incidents involving butane and eight incidents related to auto gas over the ten year period.

Figures 11 and 12 show classification of the types of incidents reported to EnergySafety, segregated by the type of gas. This breakdown of incident types has not altered significantly over the ten year reporting period. Incidents for butane and auto gas have not been presented graphically as there were a low number of reported incidents in these categories.

Figure 11: Gas utilisation incidents – Type of incidents resulting from NG

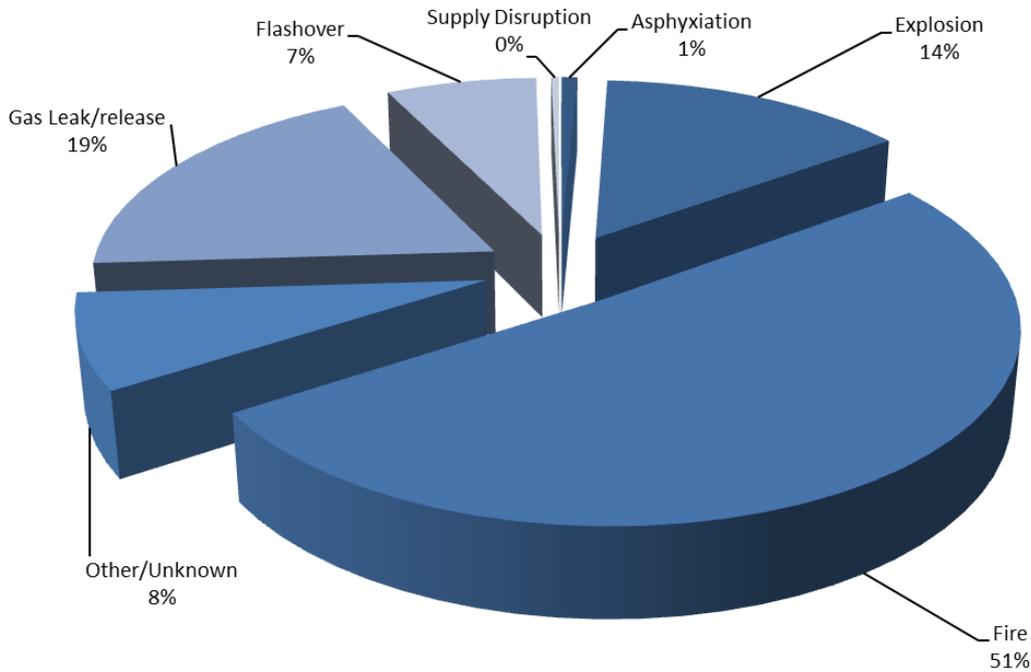
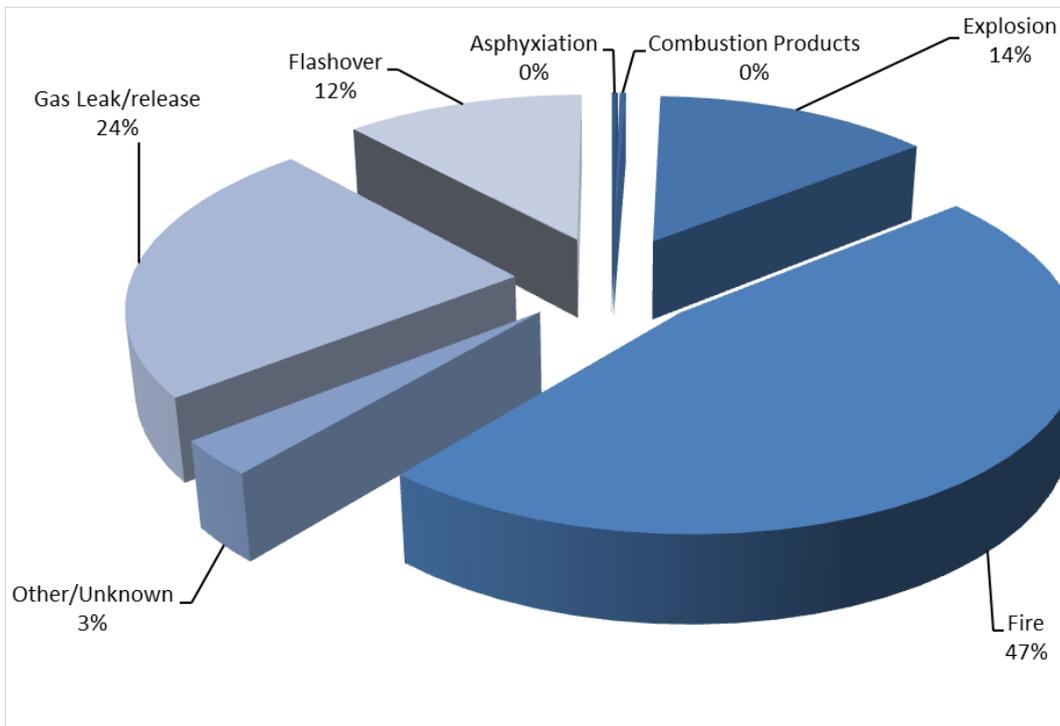
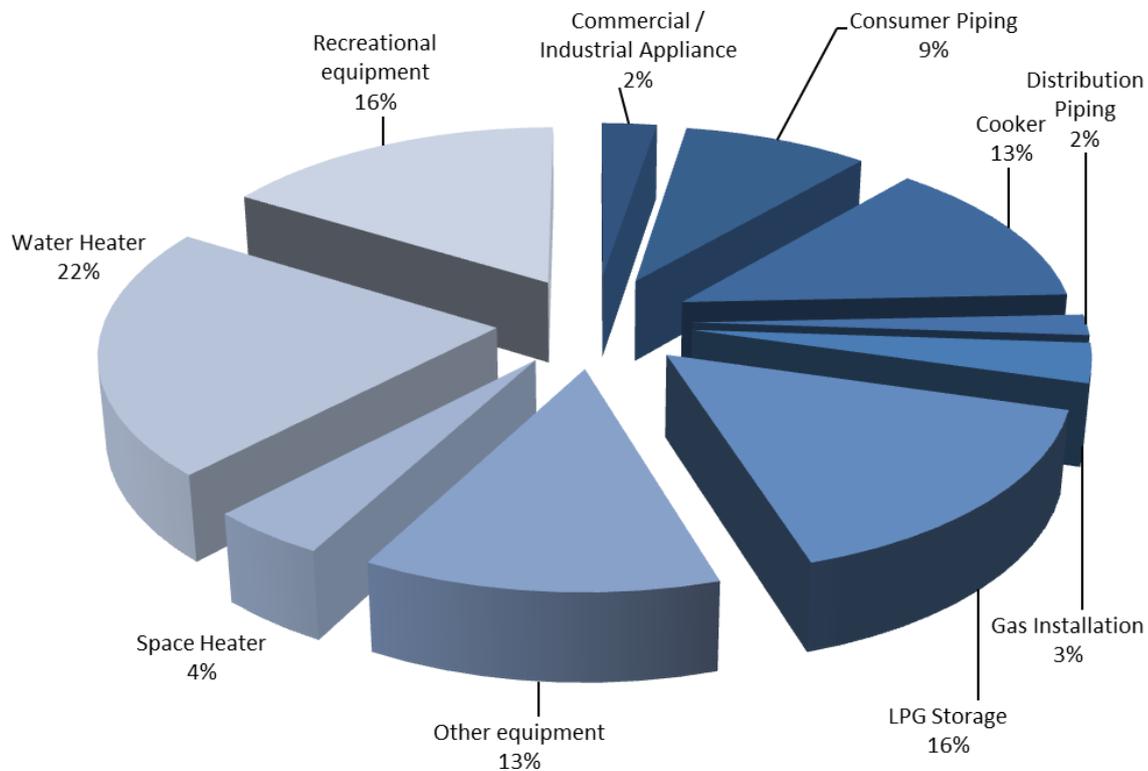


Figure 12: Gas utilisation incidents – Type of incidents resulting from LPG



There is a wide range of equipment/appliances involved in gas utilisation incidents as shown in Figure 13 below.

Figure 13: Gas utilisation incidents – Equipment type



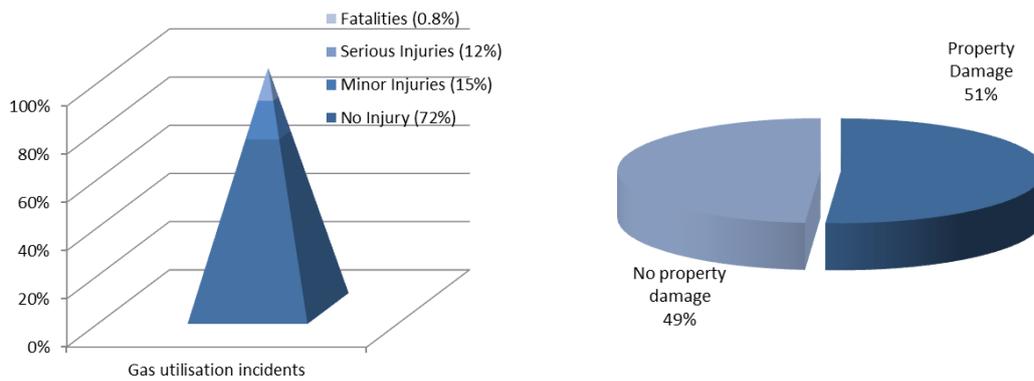
The most common types of equipment found in utilisation incidents are water heaters (hot water systems), which accounts for 22% of all incidents. This was followed by LPG (storage) cylinders and recreational equipment (which includes gas barbeques), both at 16%.

Most incidents involving water heaters occurred while igniting the pilot light.

Component failure was also found to be the cause in the majority of LPG storage incidents and in incidents involving recreational equipment such as barbeques.

From 2006-07 to 2015-16, in the area of gas utilisation, 0.8% of incidents have resulted in fatalities, 12% in serious injury requiring hospitalisation, 15% resulting in minor injuries and 72% did not result in any injury.

Figure 14: Gas utilisation incidents – Incidents resulting in fatality, injury, hospitalisation or property damage



The same data set has been analysed in terms of damage to property, with an almost even split between incidents resulting in some kind of property damage and those with no impact to property.

Gas supply

Gas supply incidents

There were 220 gas supply incidents recorded during the reporting period from 2006-07 to 2015-16. In contrast to gas utilisation incidents, the majority of gas supply incidents occurred within the workplace. Figure 15 shows the number of workplace and non-workplace incidents, with workplace incidents amounting to 83% of all recorded supply incidents.

Figure 15: Gas supply incidents – Workplace and non-workplace

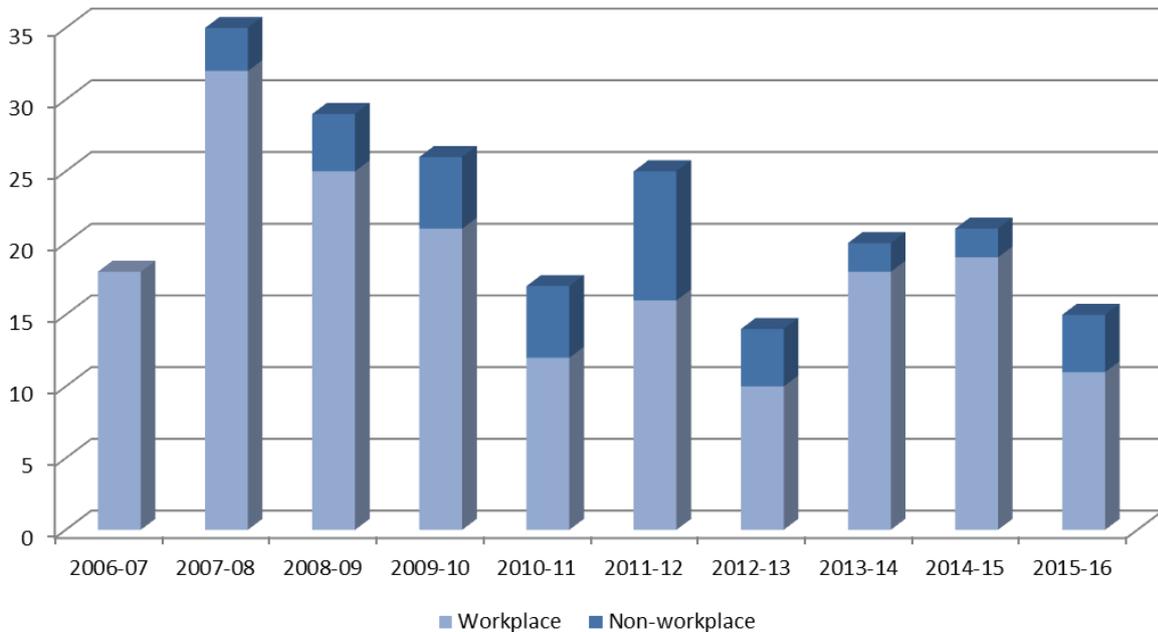
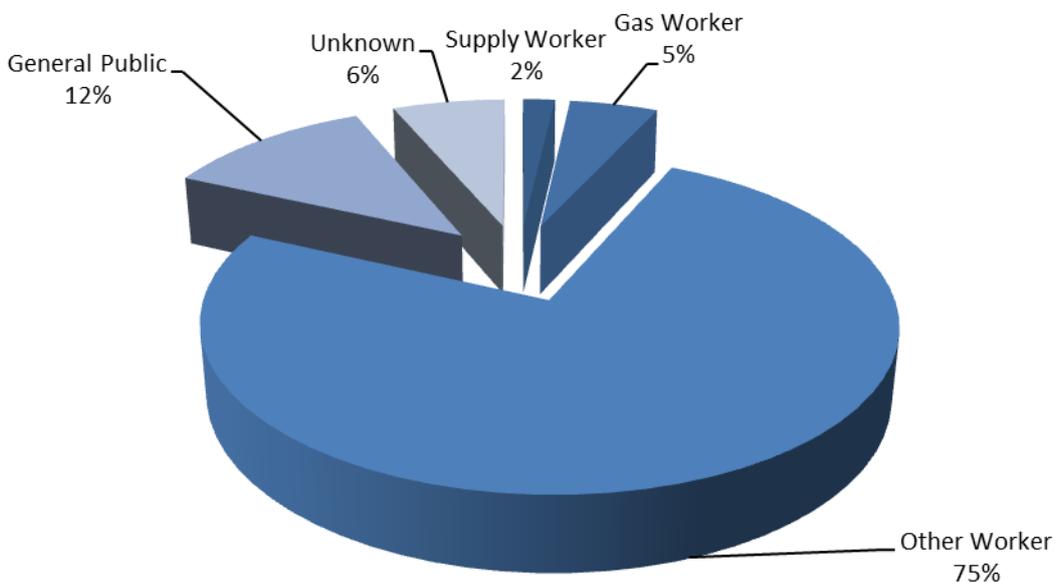


Figure 16 illustrates that supply workers were involved in just 2% of the incidents and gas workers in 5%. Workers from other occupations were found to be involved in 75% of incidents and approximately 12% involved the wider general public.

Figure 16: Gas supply incidents – Workers and general public



Gas supply incidents – by type of gas

Analysis of the type of gas found in recorded supply incidents reveals 93% of incidents involved NG. In comparison, incidents involving LPG accounted for 7%. This is shown in Figure 17 below. Figure 17A shows the approximate percentage of consumers for NG and LPG.

Figure 17: Gas supply incidents – Type of gas

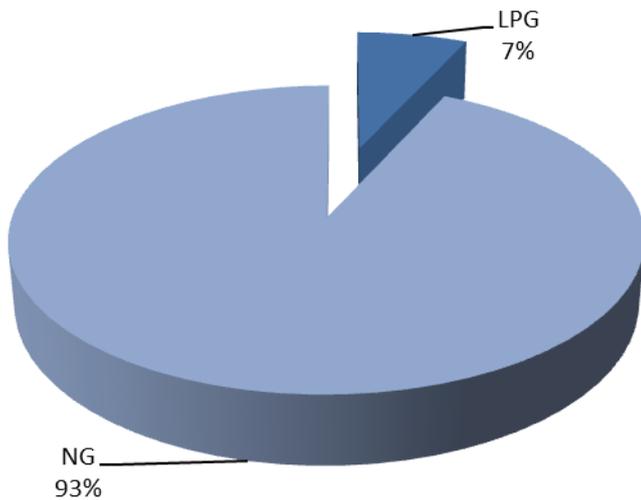


Figure 17A: Gas supply incidents – Percentage of consumers by type of gas

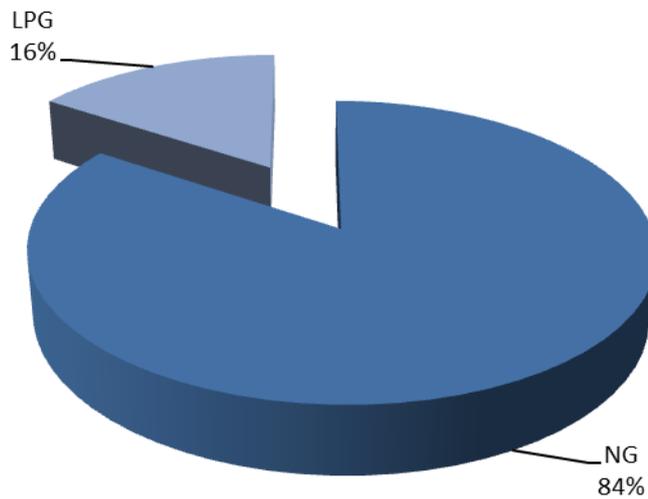


Figure 18 below indicates that 82% of incidents resulted from a gas leak or release and 13% resulted in a fire.

Figure 18: Gas supply incidents – Type of incidents resulting from NG

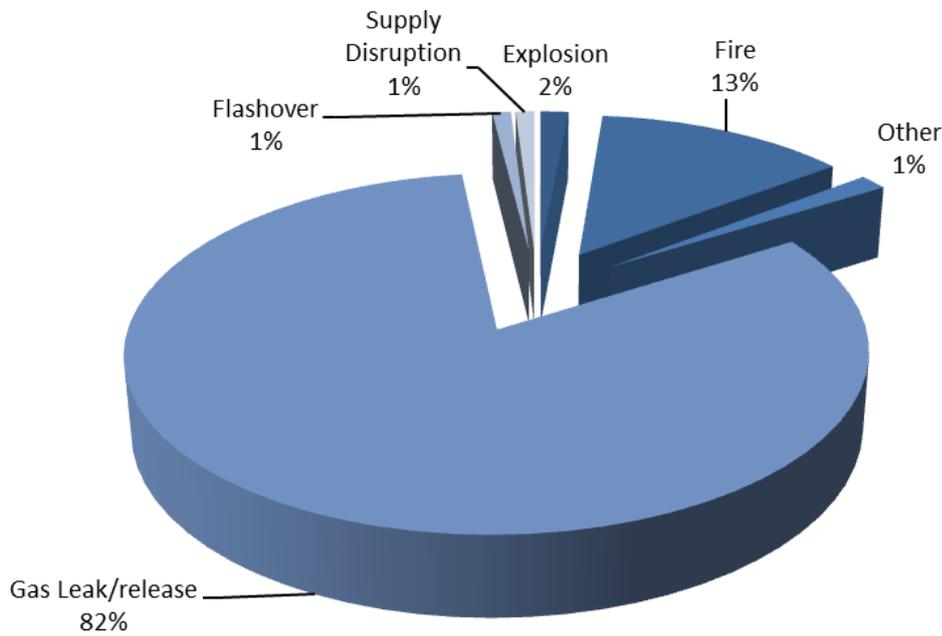


Figure 19 below provides an overview of the types of incidents resulting from LPG but they are minimal in number when compared to natural gas. There were no LPG supply incidents reported in 2015-16.

Figure 19: Gas supply incidents – Type of incidents resulting from LPG

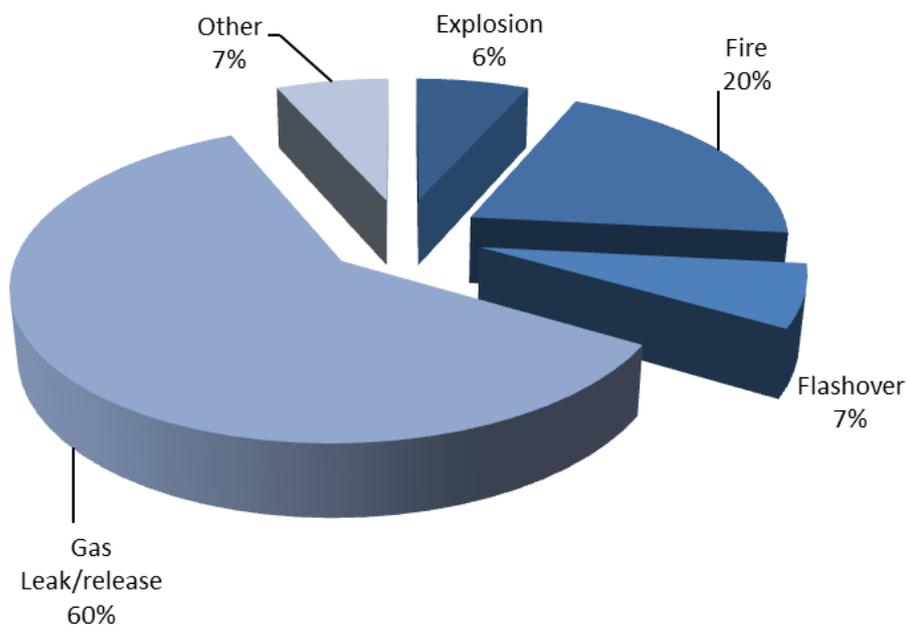


Figure 20 below is an analysis of the type of equipment found in gas supply incidents. It was found that gas piping (consumer and distribution piping) was a factor in 88% of incidents. These incidents largely related to accidental damage of gas piping while performing excavation works.

Figure 20: Gas supply incidents – Equipment type

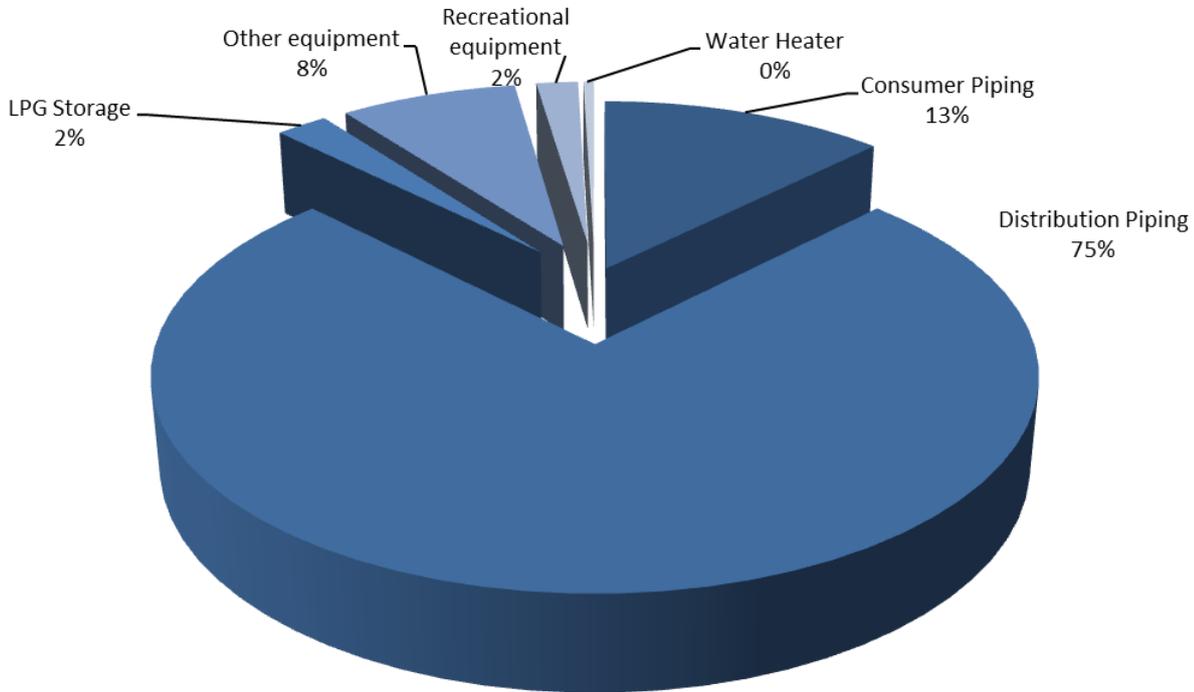
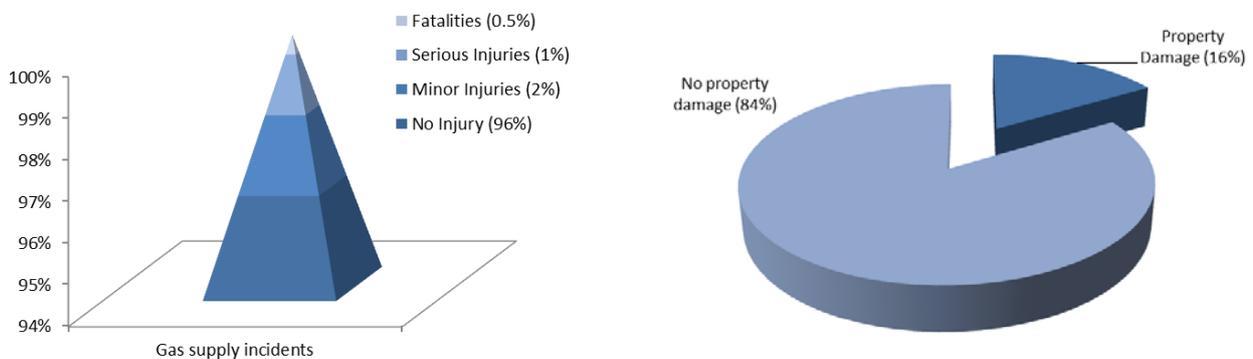


Figure 21 below is an indication of the injury types sustained in supply incidents. There were no fatalities recorded in gas supply incidents until 2012-13 when there was one fatality.

Of all gas supply incidents, 0.5% resulted in a fatality, 1% resulted in serious injury requiring hospitalisation and 2% resulted in minor injuries. The large majority (96% of incidents) resulted in no injury. Analysing the same data in terms of damage to property indicates that 84% of incidents resulted in no damage to property.

Figure 21: Gas supply incidents – Incidents resulting in fatality, injury, hospitalisation or property damage



Conclusion

With the exception of incidents resulting in minor injury, the trends for gas related serious injury and fatalities are decreasing. Cookers, recreational equipment and hot water systems were found to be most commonly involved in incidents resulting in serious injury.

Analysis of gas utilisation incidents shows that the majority of incidents occurred in a non-workplace environment, with LPG being the primary gas source. Increased education on using LPG safely particularly with recreational equipment and LPG storage could help to improve safety outcomes.

Over the reporting period incidents related to auto gas or butane were minimal in comparison to NG or LPG. However, lunch box cookers with butane canisters pose a safety risk. This was evident where an incident resulted in four people being seriously injured.

Gas supply incidents show the inverse of gas utilisation incidents with the majority occurring in a workplace environment. Workers from occupations unrelated to gas or gas supply were involved in a significant majority of incidents. These incidents were the result of third party strikes or damage to the network. Most gas supply incidents resulted from damaged piping due to excavations or digging and inadvertently hitting a gas pipe. Overall, supply incidents have a higher safety outcome when compared with utilisation. Safety information and education on digging and excavation may help to improve outcomes in this area.