Electrical and gas accidents

ENERGY SAFETY ANNUAL REPORT

2024

Te Kāwanatanga o Aotearoa
New Zealand Government

WORKSAFE
Mahi Haumaru Aotearoa

Energy Safety

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EXECUTIVE SUMMARY

Overview of 2024

During 2024, 6 notifiable and 31 non-notifiable accidents[1] in New Zealand were reported to WorkSafe's Energy Safety team comprising of:

- 2 electrical notifiable and 18 non-notifiable accident (non-fire) were reported during 2024. Two notifiable accidents resulted in 1 fatality and injury to 1 person
- 3 notifiable and ten non-notifiable LPG accidents were reported. One notifiable accident resulted in no fatality but injuries to one person
- 1 notifiable and 3 non-notifiable natural gas accidents were reported. There was not any casualty by the notifiable accident.

High-risk groups 1993–2024

Since 1993, electrical and gas (natural and LPG) accidents in New Zealand have been analysed according to high-risk groups to provide information about trends, frequency, common causes and severity.

Electrical accidents

The previously known general public accidents (1993–2008), and all public electrical accidents investigated since 2009 by Energy Safety, are aggregated as a single electrical accident category to enable analysis.

Two categories of particular interest are accidents involving young people and electrical safety in domestic residential environments.

Only notifiable shock electrical accidents were recorded in the database until the end of 2007. A new database that has been in use since the beginning of 2008 allows to record non-notifiable electrical accidents.

Young people (17 years old and under)

Since 1993 these young people were involved in 39% (117) of the total notifiable general public accidents (300), involving 19 fatalities and injury to 96 people.

Domestic environment

More than 55% (167 of 300) of the notifiable electrical accidents involving the general public in the last 32-years occurred in a domestic environment, resulting in 33 fatalities (of a total of 53 Fatalities [62%]) and injuries to 136 people, out of a total of 264 injuries [52]%.

Natural gas accidents

More than 56% (214) of the total 379 non-notifiable accidents involving the general public in the last 17-years (2008-2024).

EQUIPMENT

Cookers and ovens

A total of 38 (17%) notifiable natural gas accidents involved cookers or ovens. Twelve of 38 cooker or oven accidents resulted in one fatality and injury to 14 people.

Cookers and ovens accounted for 76 (12%) of reported non-notifiable natural gas accidents.

[1] See Appendix for definitions of 'notifiable' and 'non-notifiable' accidents.

Space heaters

A total of 60 (28%) notifiable natural gas accidents involved space heaters. Of these, 16 notifiable space heaters accidents resulted in three fatalities and injury to 22 people.

Space heaters accounted for 135 (20%) of reported non-notifiable accidents.

Water heaters and boilers

A total of 72 (33%) notifiable natural gas accidents reported, involved water heaters or boilers. Of these, 17 resulting in one fatality and injury to 20 people.

Water heaters and boilers also accounted for 41 (6% of) reported non-notifiable accidents.

Liquefied Petroleum Gas (LPG)

In the last 32-years, a total of 460 notifiable LPG accidents and 634 non-notifiable accidents were reported to Energy Safety.

EQUIPMENT

Cookers and ovens

Of the 460 notifiable LPG accidents reported, 138 (30%) involved cookers or ovens. Out of the 138 notifiable accidents involving cookers or ovens, 102 resulted in 19 fatalities and injury to 130 people.

Cookers and ovens accounted for 107 (17%) of reported non-notifiable LPG accidents.

Cabinet heaters

There were 143 (31%) notifiable LPG accidents reported that involved cabinet heaters. Out of these, 66 accidents resulted in 13 fatalities and injury to 67 people.

Cabinet heaters accounted for 173 (27%) of reported non-notifiable accidents.

Containers (refillable)

There were 26 (6%) notifiable accidents reported that involved LPG refillable containers. This resulted in 17 container accidents that caused four fatalities and injured 20 people.

Refillable containers accounted for 94 (15%) of reported non-notifiable accidents.

ENVIRONMENT

Caravans and campervans

There were 49 (11%) out of the 460 notifiable LPG accidents that occurred in caravans or campervans. Of these, 35 caused 11 fatalities and injured 41 people.

1.0
Background

Energy Safety is part of WorkSafe New Zealand – we are responsible for the administration of electricity and gas safety and related matters under the Electricity Act 1992 and the Gas Act 1992.

We aim to bring a clear focus on safety, supply quality and measurement across the electricity and gas sectors.

In January 2009, the responsibility for investigating and reporting on all worker and workplace related gas and electrical accidents was transferred from Energy Safety to the Labour Group (formerly the Department of Labour). This reporting and responsibility change may have impacted reporting volumes and therefore will be reflected in the reporting and analysis.

In 2013, Energy Safety became part of WorkSafe and maintains its responsibility of conducting a range of functions under energy-related legislation. These include monitoring and enforcement, investigation of accidents related to gas and electricity, and the development and the promulgation of safety standards and information.

This publication provides an analysis that highlights trends and risks. While the focus of the annual analyses has been on notifiable accidents, trends in non-notifiable accidents have also been examined. In 2009 we replaced the printed annual analyses with an online version.

2.0
Accident data collection and recording

IN THIS SECTION:

2.1 Accident analysis

Energy Safety must be notified of certain accidents.[2]

These are generally high consequence accidents. This obligation falls on participants in the energy industry in the first instance. Notifications of gas and electricity related accidents also come from consumers and other agencies, such as the Fire and Emergency New Zealand (FENZ) for example.

We investigate accidents and record at least a basic set of data on all reported accidents, regardless of the scale of the investigation. In general, more comprehensive information is recorded for the more intensive investigations that follow significant accidents.

As there is no obligation, and no rationale that is consistently applied for industry or industry sectors to report non-notifiable accidents to us, a low proportion of these accidents are reported.

We do not in general, conduct in-depth investigations of electrically caused fires unless there is evidence of equipment failure. This is because a significant number of fires that are related to the supply or use of electricity are either not reported or are not reported in a timely manner. Consequently, this does not allow for a meaningful investigation to be completed. In any case, many electrical fires, although covered by the Electricity Act 1992, occur from incorrect operation or misuse of electrical equipment.

The definitions of 'accident' are similar in the Electricity Act 1992 and the Gas Act 1992. However, there are significant differences in the collection and recording of electrical and gas accident data that affect the analysis of accidents and trends:

1. Electrically related fires are excluded from our analysis. As outlined above, there is evidence that there has historically been under-reporting to Energy Safety of less significant electrically related fires. In addition, our focus has been on electrical accidents[3] other than fire.
2. Energy Safety investigates and records gas-related accidents that involve fire, explosion, or gas 'poisoning'.[4] Only those accidents that involve deliberate inhalation of LPG are excluded from our analysis.
3. The electrical accident database in use up until 2008 allowed investigators to record only one likely major cause for an electrical accident. The database used for gas investigations allowed investigators to record up to four likely causes or factors for a gas-related accident. The accident investigation database that has been in use since the beginning of 2008 allows a range of factors to be considered, identified and recorded.

[2] See section 17 of the Gas Act 1992 and section 16 of the Electricity Act 1992.

[3] These electrical accidents relate to direct contact with electricity (that is, 'shock').

[4] Because modern reticulated gases do not contain carbon monoxide, this typically involves exposure to harmful products of combustion.

4. Only notifiable shock electrical accidents were recorded in the database until the end of 2007. A new database that has been in use since the beginning of 2008 allows to record non-notifiable electrical accidents.
5. Natural gas and liquefied petroleum gas (LPG) have different characteristics as fuels and differing distribution and utilisation patterns, so they are recorded and analysed separately.
6. The gas accident database contains information about fatalities, injuries, fires, explosions and minor accidents for natural gas and LPG. These accidents have been analysed for severity[5] and frequency of similar types of accidents.

2.1 Accident analysis

To identify trends and risk areas, this report examines data collected since 1993 on notifiable electrical accidents (other than fires) and both notifiable and non-notifiable gas accidents, and since 2008 on non-notifiable electrical accidents.

Since the implementation of the Electricity Act 1992 and the Gas Act 1992 came into force, comparisons have been made between five-year periods.

This report includes the latest information available at the time of preparation. In some cases, the investigations are complex and may not have been completed at the time of publication. This means that each annual analysis has to review previous years' cases when further information has been obtained.

This report does not set out to explain the reasons behind the trends and variations found. These trends may be influenced by any number of factors, including changes in the way accidents are reported, reporting level, or some improvements in safety or safety practices. Establishing the reason behind these trends would require a more detailed analysis of comprehensive data that is not always available and some of which may or may not exist.

We use a system called Energy Safety Intelligence (ESI), which was introduced at the beginning of 2008. This system integrates case management of electricity and gas operational activities, and stores electricity and gas accident information in a single database. This system has more data fields and a more consistent classification facility than was previously used.

[5] For the purpose of analysis, severity is categorised broadly as 'fatal', 'notifiable – injury', 'notifiable – other' or 'non-notifiable'.

3.0
Electrical accidents

IN THIS SECTION:

3.1 Current trends

3.2 Longer term trends

3.3 Age group

3.4 Voltage

3.5 Causal factors

3.6 Equipment

3.7 Environment

Notifiable electrical accidents (non-fire) reported to us.

In a typical non-fire electrical accident, the victim receives an electric shock which may requires medical treatment. In general, these accidents are due to coming into proximity or contact with live electric lines, equipment, or components. **Note**: Fire-related electrical accidents and accidents that involve workers are not included in this analysis.

Electrical accidents prior to 1 January 2009 were categorised under three main occupational headings: **electrical workers**, **workers in other (non-electrical) occupations**, and **the general public**. Generally, about 50% of accidents involved electrical workers, 30% involved workers in other occupations, and 20% involved members of the public.

A notifiable electrical accident, as defined by the Electricity Act 1992, was modified by the Health and Safety at Work Act in 2015.[6] The threshold for the electrical notifiable accident was raised, so now a fewer number of electrical accidents is qualified as notifiable accidents.

This report examines accidents involving members of the public for 2024 and also gives an overview of the last 32-years (period 1993 to 2024) notifiable accidents and overview of last 17-years (period 2008 to 2024) non-notifiable accidents.

It also compares rolling averages for the five-year base period (1993–1997) and the current five-year period (2019–2024).

One area of interest for electrical safety is protection of young people and the elderly. This section examines the number of accidents involving young people up to 17-years old and elderly people over 65-years.

A limited analysis of the non-notifiable accidents was carried out due to a limited available information, especially the information related to victims.

3.1 Current trends

During 2024:

- Two electrical notifiable and 18 non-notifiable (non-fire) accidents were reported during 2024. There was a single fatal accident during last year (2024). Over the past 32-years there has been an average of 1.7 fatalities per year.
- One accident resulting in an injury affected one person. Over the past 32-years the average was 7.9 notifiable injury accidents and injuring average 8.3 people per year.
- These two notifiable accidents involved the standard low voltage system of 230 Volt (V). The average number of notifiable accidents involving 230V systems over the past 32-years is 6.3 per year.
- Thirteen of 18 non-notifiable involved 230V system and average 22.3 accidents per year involving 230V over the last 17-years. These two notifiable accidents involved the standard low voltage system of 230 Volt (V). The average number of notifiable accidents involving 230V systems over the past 32-years is 6.3 per year.

[6] The definition changed from ‘receiving medical treatment from a registered health practitioner’ to ‘admitted to hospital for immediate treatment’.

3.2 Longer term trends

Observations based on 32-years (period 1993 -2024) of notifiable accidents and 17-years (period 2008–2024) of non-notifiable accident analysis for trends, consequence, and frequency:

- There were 300 notifiable accidents involving members of the public which resulted in fatalities or injuries to 317 people (see Figure 1A and Table 1: Notifiable electrical accidents and casualties).
- Fifty-three of these were fatal accidents, each of which involved a single fatality. In seven of the fatal accidents there was at least one other person injured.
- There were 254 injury accidents causing injury to a total of 264 people.
- Figure 1a shows considerable year-on-year variation in the number of fatal and injury accidents and there is no obvious significant trend in the annual number of fatal and injury accidents in this period. A five-year rolling average accident number shows some reduction over the last 32-years.
- One hundred and eighteen (37%) of the total 317 victims are young people (under 17), see Figure 1B.
- There were 379 non-notifiable accidents involving members of the public which reported over last 17-years, average of 22.3 accidents per year (see Figure 1C).

	NUMBER OF ACCIDENTS	NUMBER OF CASUALTIES
Fatality	46	46
Fatality and injury	7	15
Injury	247	256
Total	300	317

TABLE 1: Notifiable electrical accidents and casualties

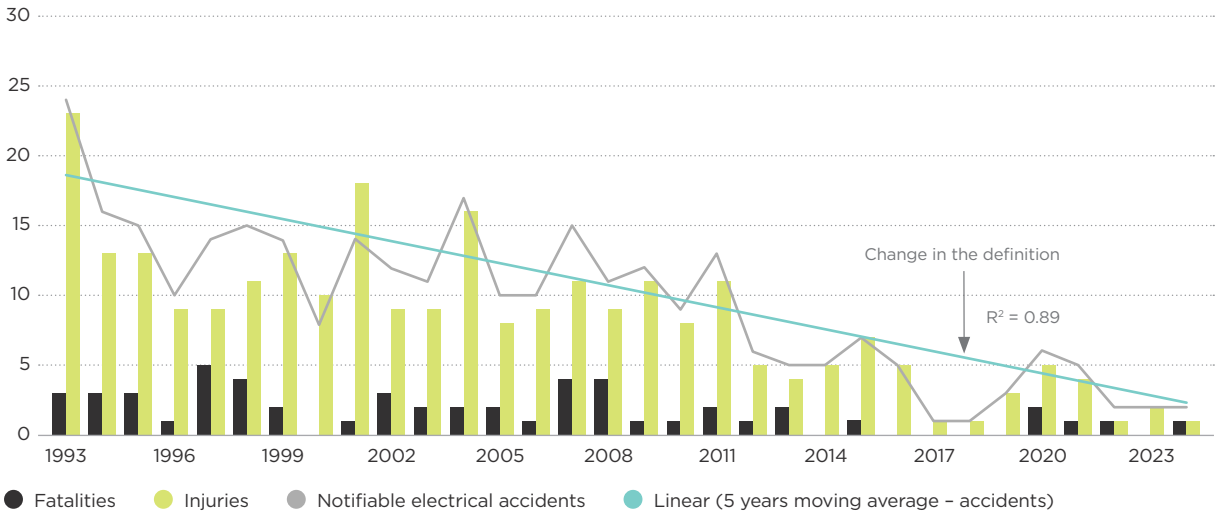

FIGURE 1A: Notifiable electrical accidents involving the general public

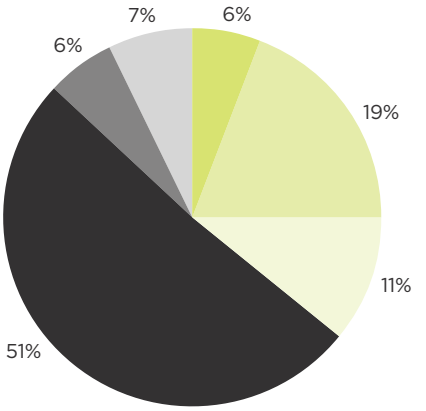

FIGURE 1B: Notifiable electrical accidents by victim age

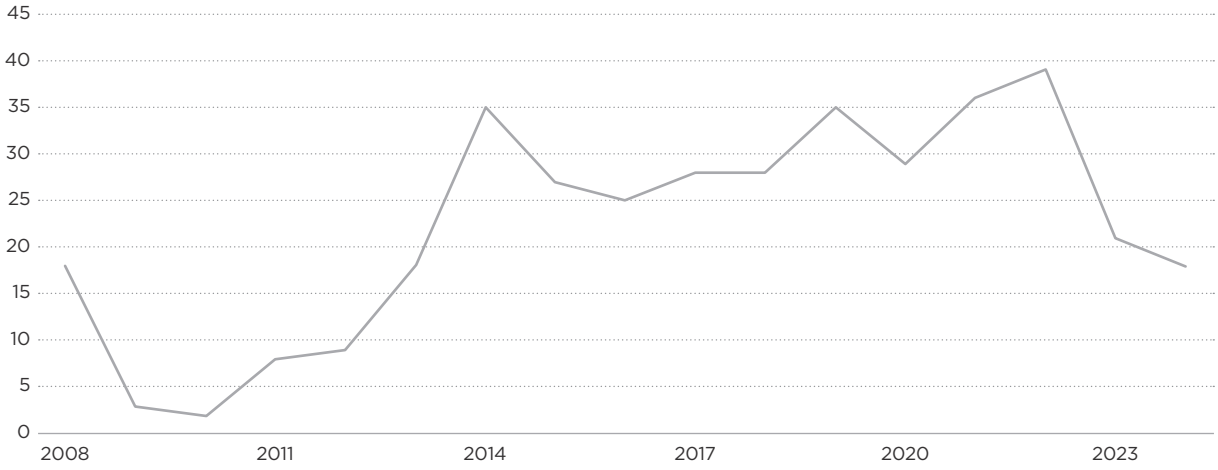

FIGURE 1C: Non-notifiable electrical accidents involving the general public

3.3 Age group

Notifiable accident data includes the general age group of involved parties (see Table 2) where it is known, or a reasonable estimate can be made.

	FATAL		INJURY	
AGE GROUPS	**CONSEQUENCE[7] (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**	**CONSEQUENCE (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**
Young people (0–17)	19 (19)	2 (2)	96 (89)	1 (1)
Child (0–4)	6 (6)	2 (2)	15 (13)	0 (0)
School age (5–12)	5 (5)	0 (0)	55 (54)	1 (1)
Adolescent (13–17)	8 (8)	0 (0)	26 (22)	0 (0)
Adult	31 (31)	1 (1)	130 (129)	7 (7)
Elderly (65+)	3 (3)	1 (1)	15 (15)	2 (2)
Total	53 (53)	5 (5)	264 (254)	13 (13)

TABLE 2: Age breakdown for notifiable electric shock accidents involving members of the public

[7] The first number represents casualties and, the bracketed number represents accidents.

Our analysis shows:

- Thirty-six percent of fatal accidents (19 fatalities) involved young people. There are two fatal accidents over the last eleven-years for this age group.
- Eighty-nine injury accidents involved 96 young people and two of these accidents, injuring two, occurred in the last five-years.
- There has been a significant reduction in the number of young people who were injured in electrical accidents during the current period compared with the base period. In the current period (2020-2024), one (8%) out of 13 injuries involved young people compared with 30 (45%) out of 67 injuries in the base period (1993-97).
- Only 6% (18) of the total 300 accidents involved people aged 65-years or over. This is a relatively small number compared with the age profile of the population as a whole. As numbers are small no further analysis has been carried out.

3.4 Voltage

Our analysis shows:

- The standard voltage in New Zealand domestic installations is 230V. This is the voltage that people normally interact with in their homes. About two-thirds of fatal accidents and similar number of total notifiable accidents involving members of the public involve 230V (see Figure 1D). However, three-quarter of non-notifiable accidents involved 230V (see Figure 1E).
- Thirty-five (66%) of the 53 fatal accidents and 168 (66%) of the 254 injury accidents involved 230V systems; two (4%) fatal accidents and 17 (7%) of injury accidents involved 400V systems; and eight (15%) of fatal accidents and 36 (14%) of injury accidents involved 11,000V systems (see Table 3).
- Of the 53 fatal accidents, 19 of the victims were young people. 13 of these cases involved 230V systems.
- Sixty-nine (35%) of the 200 fatal and injury accidents associated with 230V systems involved young people.
- Over three-quarter of the 296 non-notifiable accidents involved 230V systems and 9% of non-notifiable accidents involved 400V systems (see Table 4).

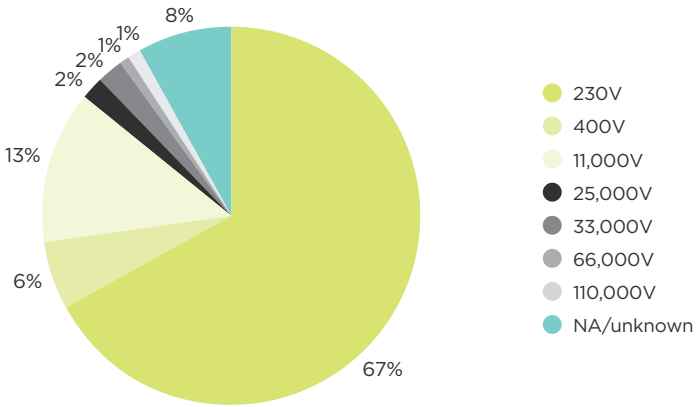

FIGURE 1D: Notifiable electrical accidents by voltages

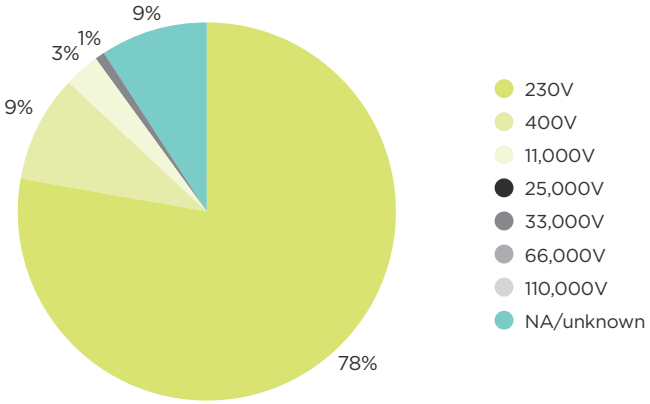

FIGURE 1E:
Non-notifiable electrical accidents by voltages

	FATAL		INJURY	
VOLTAGE GROUPS	**CONSEQUENCE[8] (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**	**CONSEQUENCE (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**
230	35 (35)	4 (4)	170 (168)	11 (11)
400	2 (2)	0 (0)	17 (17)	2 (2)
11,000	8 (8)	0 (0)	38 (36)	0 (0)
25,000	2 (2)	0 (0)	3 (3)	0 (0)
33,000	2 (2)	0 (0)	7 (7)	0 (0)
66,000	1 (1)	0 (0)	1 (1)	0 (0)
110,000	0 (0)	0 (0)	6 (2)	0 (0)
Total	53 (53)	5 (5)	264 (254)	13 (13)

TABLE 3: Voltage breakdown for notifiable electric shock casualty involving members of the public

	FATAL		INJURY	
VOLTAGE GROUPS	**CONSEQUENCE[9] (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**	**CONSEQUENCE (frequency) 2008–2024**	**CONSEQUENCE (frequency) 2020–2024**
230	200 (6.3)	13 (2.6)	296 (17.4)	106 (21.2)
400	19 (0.6)	2 (0.4)	34 (2.0)	14 (2.8)
11,000	41 (1.3)	0 (0)	12 (0.7)	2 (0.4)
25,000	5 (0.2)	0 (0)	0 (0)	0 (0)
33,000	8 (0.3)	0 (0)	2 (0.1)	1 (0.2)
66,000	2 (0.1)	0 (0)	1 (0.1)	1 (0.2)
110,000	2 (0.1)	0 (0)	1 (0.1)	1 (0.2)
Total	300 (9.4)	17 (3.4)	279 (22.3)	143 (28.6)

TABLE 4: Voltage breakdown for electric shock accidents involving members of the public

[8] The first number represents casualties and the bracketed number represents accidents.

[9] The first number represents accidents and the bracketed number represents accidents per year.

3.5 Causal factors

Our investigations seek to identify a causal factor(s). The causal factors of non-notifiable accidents are not analysed due to the lack of consistent information. The causal factors of notifiable accidents fall into one or more broad categories as indicated in Figure 1F. Because there can be a combination of one or more causal factors for an accident, percentages do not add up to 100%.

Our analysis shows:

- in notifiable accident involving members of the public, the most common causes of electrical accidents were lack of maintenance in 68 cases (23%), and misuse actions in 46 cases (15%) (see Figure 1F)
- in 11 (21%) fatal electrical accidents, misuse of equipment was identified as the cause
- Table 5 gives the most common causes of notifiable electrical accidents over the past 32 years, and over the past 5 years.

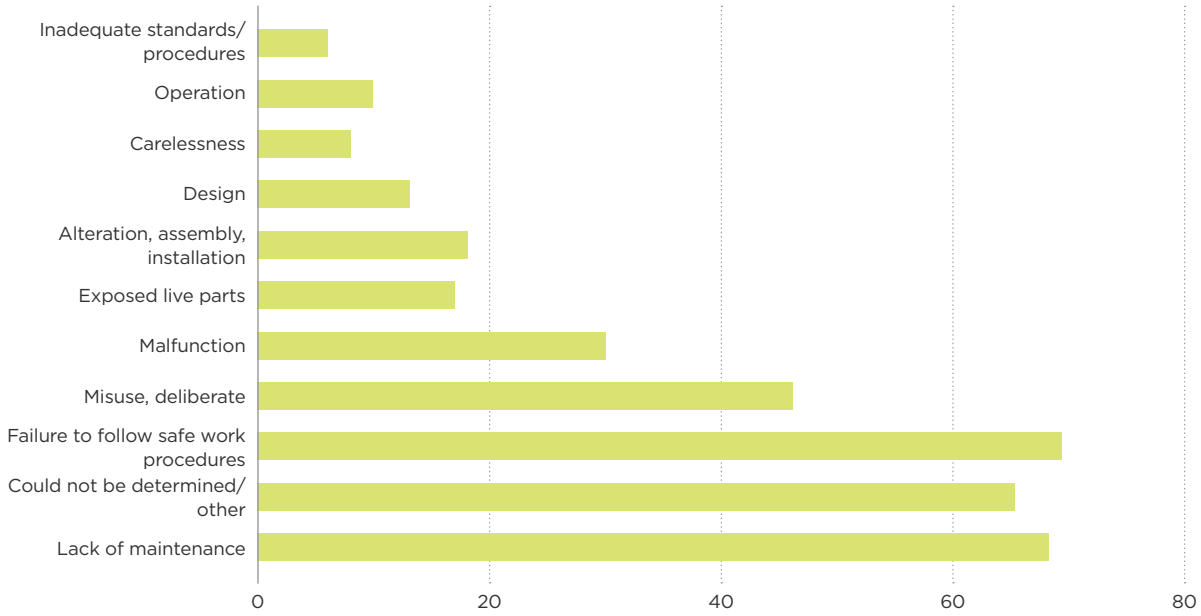

FIGURE 1F: Notifiable electrical accidents by causal factor

	PERIOD 1993–2024	PERIOD 2020–2024
Main causes	– Lack of maintenance (23%) – Failure to follow safe work procedures (23%) – Misuse (15%)	– Malfunction (33%) – Failure to follow safe work procedures (33%)

TABLE 5: Factors in notifiable electrical accidents involving members of the public

3.6 Equipment

Over 90% of notifiable and non-notifiable accidents that involved members of the public were associated with one of five categories of equipment (see Figure 1G and Figure 1H):

- appliances (29% notifiable and 15% non-notifiable)
- domestic installation (include extension lead) wiring (17% and 27%)
- installation fittings[10] (19% and 9%)
- works or distribution cable (19% and 20%)
- works distribution fittings (12% and 19%).

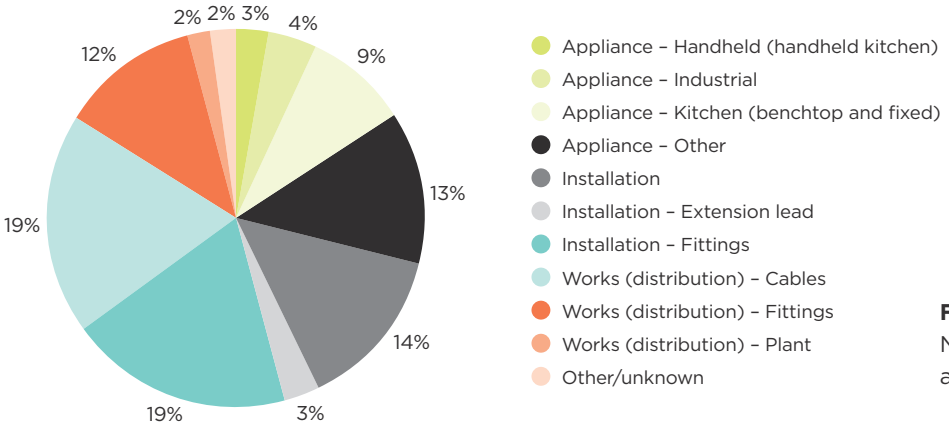

FIGURE 1G: Notifiable electrical accidents by equipment

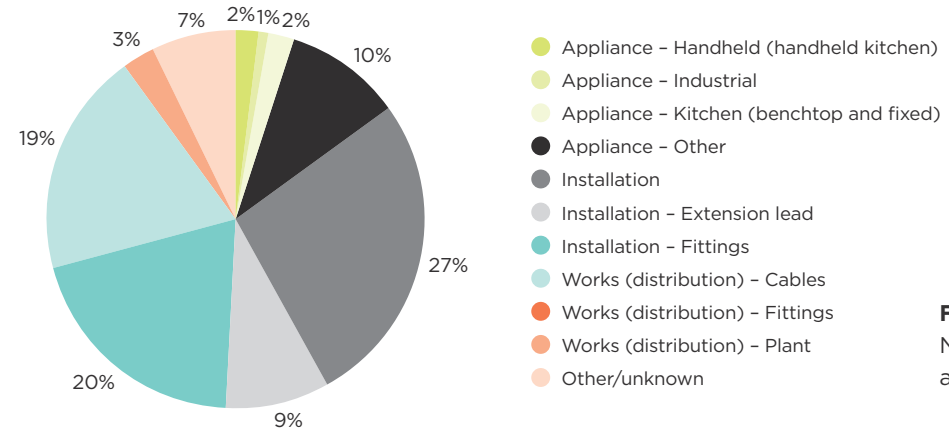

FIGURE 1H: Non-notifiable electrical accidents by equipment

[10] Domestic installation fittings include switches, plugs and light fittings.

3.7 Environment

Figure 1I gives a more detailed breakdown of notifiable electrical accidents by environment type. Over half (56%) of the accidents occurred in a domestic environment. Sixteen percent of accidents occurred in a commercial environment and a similar level (17%) of accident occurred near works.

Figure 1J gives a detailed breakdown of non-notifiable electrical accidents by environment type. Over half (58%) of the accidents occurred in the domestic environment and 16% of accidents occurred in the commercial environment.

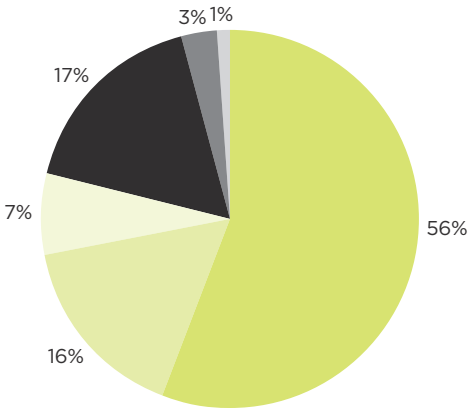

FIGURE 1I: Notifiable electrical accidents by environment

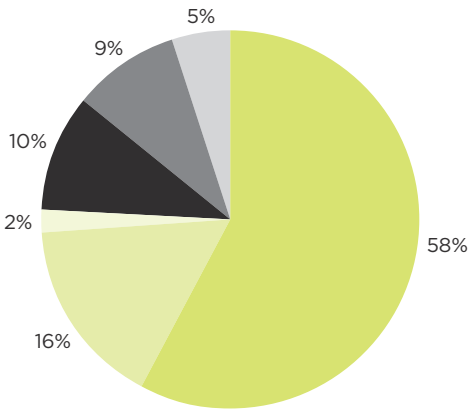

FIGURE 1J: Non-notifiable electrical accidents by environment

Our analysis shows

- 33 accidents (62%) of the 53 fatal accidents and 135 (53%) of the 254 injury accidents occurred in a domestic environment. 230V domestic systems were involved in 30 of the 33 domestic environment fatal accidents and in 116 of the 135 injury accidents
- 10 (19%) of the 53 fatal accidents and 43 (17%) of the 254 injury accidents occurred in a work environment. Four fatal and 23 injury accidents involved 11,000V systems.

4.0
Natural gas accidents

IN THIS SECTION:

4.1 Current trends

4.2 Longer term trends

4.3 Causal factors

4.4 Equipment type

Notifiable and non-notifiable accidents (natural gas) reported to us.

We analyse natural gas-related accidents of all types, including fires and explosions, whether or not there were fatalities, or any loss related to property. All non-notifiable accidents, except for those reported in bulk,[11] is included in this analysis.

This analysis examines accidents involving members of the public for 2024 and also for the 32-year period from 1993 to 2024. It includes a comparison between the base period (1993–1997) and the current five-year period (2020–2024).

Historically, data relating to gas accidents did not include the age of the victim. Recording data related to the age group of the victim for gas started with the introduction of an integrated case management system (ESI) in 2008. This section identifies general trends and examines general categories of appliances and other equipment involved in accidents.

4.1 Current trends

Analysis of notifiable gas accidents shows that during 2024:

- There was one notifiable natural gas accident reported during the year. This accident involved a water heater.
- In the past 32 years there have been 0.2 fatal accidents and 2.0 injury accidents per year on average.
- Three non-notifiable accidents were reported. Distribution system (mains, services, and regulator stations), water heater, and heater are involved in one accident each.
- Over the last 9 years, 14 non-notifiable distribution accidents (involving mains, services, and regulator stations etc) were reported after 5 years of nil accident reporting. The average distribution accident number over the first 18 years (1993–2010) was 16.7. A likely reason for a decline in distribution accident reporting to us was the transfer of responsibility for workplace accidents investigation under workplace safety legislation (then Department of Labour) in 2009.

[11] For a certain period in the 1990s Energy Safety received information (notification) of third-party strikes in bulk. While all were recorded, in general Energy Safety did not investigate these ‘bulk reported’ and other low level incident events.

4.2 Longer term trends

Observations based on analysis of trends, consequence, and frequency for the 32-year period between 1993 and 2024:

- There were a total of 218 notifiable accidents. One hundred and fifty-one (69%) of these were non-casualty accidents that resulted in property damage.
- There have been five fatal accidents (with five fatalities) and 64 injuries accidents injuring 86 people (see Figure 2A). With this small number spread over a 32-year period, it is not possible to identify a trend for fatal and injury accidents.
- The last fatal accident occurred in 2007. Fixed space heaters were involved in three of these fatal accidents, cookers and water heaters were involved in one accident each.
- A total of 663 non-notifiable accidents were reported to Energy Safety. A reduction in non-notifiable accidents is observed over the last 19 years (see Figure 2B).
- Thirty non-notifiable accidents were reported in the last five-years compared with 121 in the initial five-year period, a decrease of about three-quarter (see Figure 2B). The notification of non-notifiable accidents related to gas distribution[12] has dropped in the last 16 years.[13]
- The number of non-notifiable accidents reported by the gas industry has declined to 7 (1.4 per year) over the last 5 years compared to the base period 44 (8.8 per year). More non-notifiable gas distribution accidents were reported by the gas industry during 1998–2002 (18.0 per year) and 2003–2008 (15.3 per year) periods.
- Forty-two percent of non-notifiable accidents were reported to Energy Safety by the gas industry.

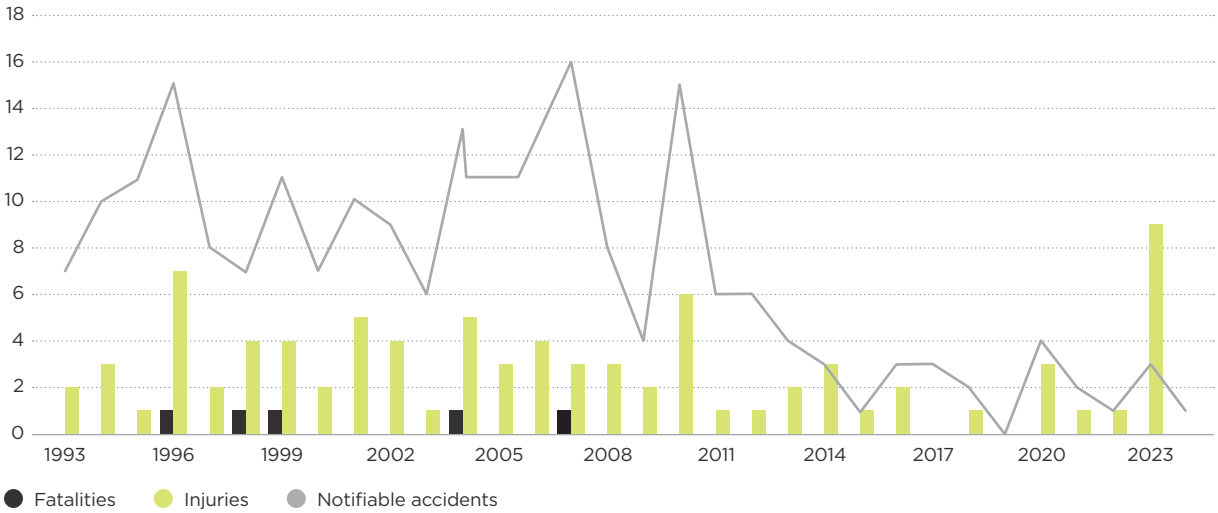

FIGURE 2A: Notifiable natural gas accidents

[12] Distribution includes mains, services and regulator stations.

[13] The main reason for this drop is the change of responsibility for reporting and investigating workplace accidents.

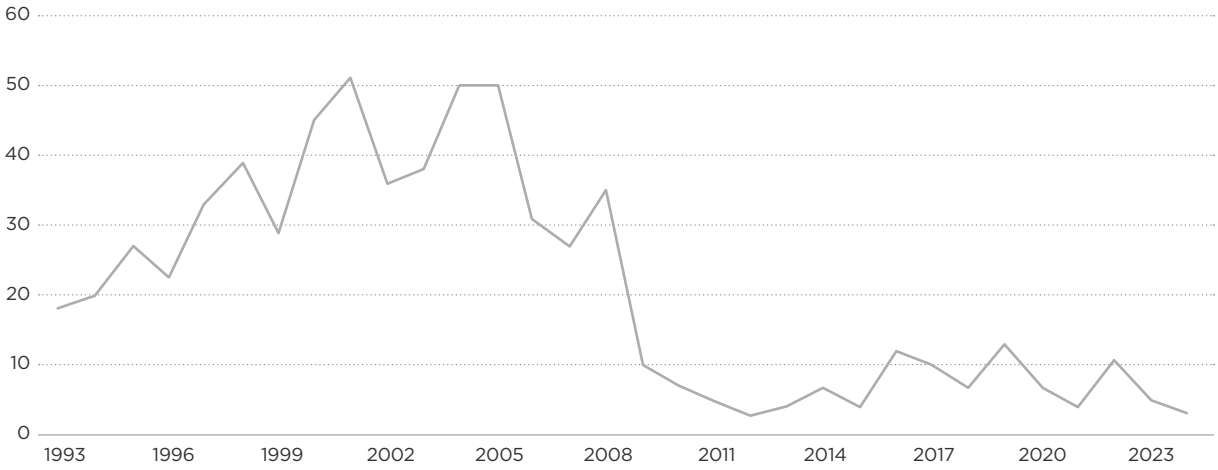

FIGURE 2B: Non-notifiable natural gas accidents

4.3 Causal factors

Table 6 gives the most common causes of notifiable natural gas accidents over the past 32 years, and over the past 5 years.

The most common causes[14] identified of notifiable accidents over the last 32 years (see Figure 2C) were:

- assembly, connection, installation and alteration[15] – 73 (33%)
- lack of maintenance – 41 (19%)
- failure to follow appropriate procedure – 36 (17%)
- appliances too close to combustible products (proximity) – 28 (13%)
- work practices and third-party damage – 29 (13%).

	PERIOD 1993–2024	PERIOD 2020–2024
Main causes	– Assembly, connection, installation, alteration (33%) – Lack of maintenance (19%) – Procedure (17%) – Work practice, interference by third-parties, operation error (13%)	– Assembly, connection, installation, alteration (22%) – Procedure (22%) – Malfunction (11%)

TABLE 6: Factors in notifiable natural gas accidents involving members of the public

[14] Many accidents may have had more than one cause attributed to them.

[15] Incorrect work includes assembly, connection, installation and alteration.

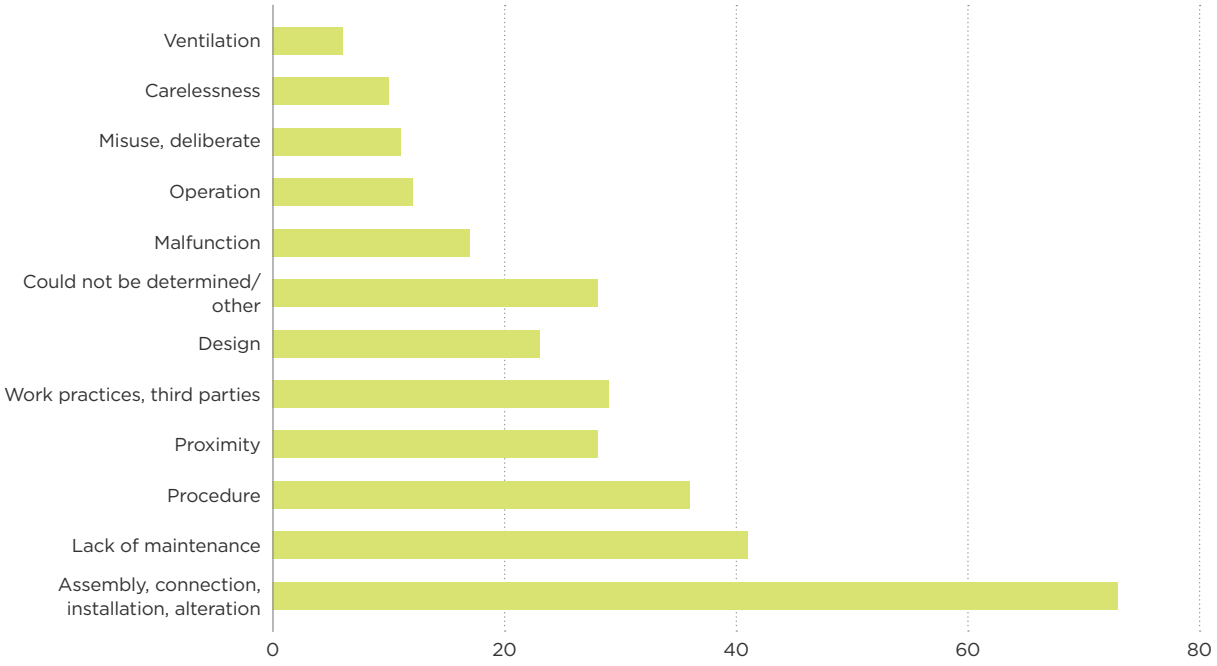

FIGURE 2C: Notifiable natural gas accidents by causal factor

About a third (200) of the non-notifiable accidents reported were caused by failure to follow correct work practices, including third-party incidents involving non-gas industry workers. 125 (19%) were caused by lack of maintenance, 74 (11%) by assembly, connection, installation, alteration[16] and 88 (13%) by not following correct procedures (see Figure 2D).

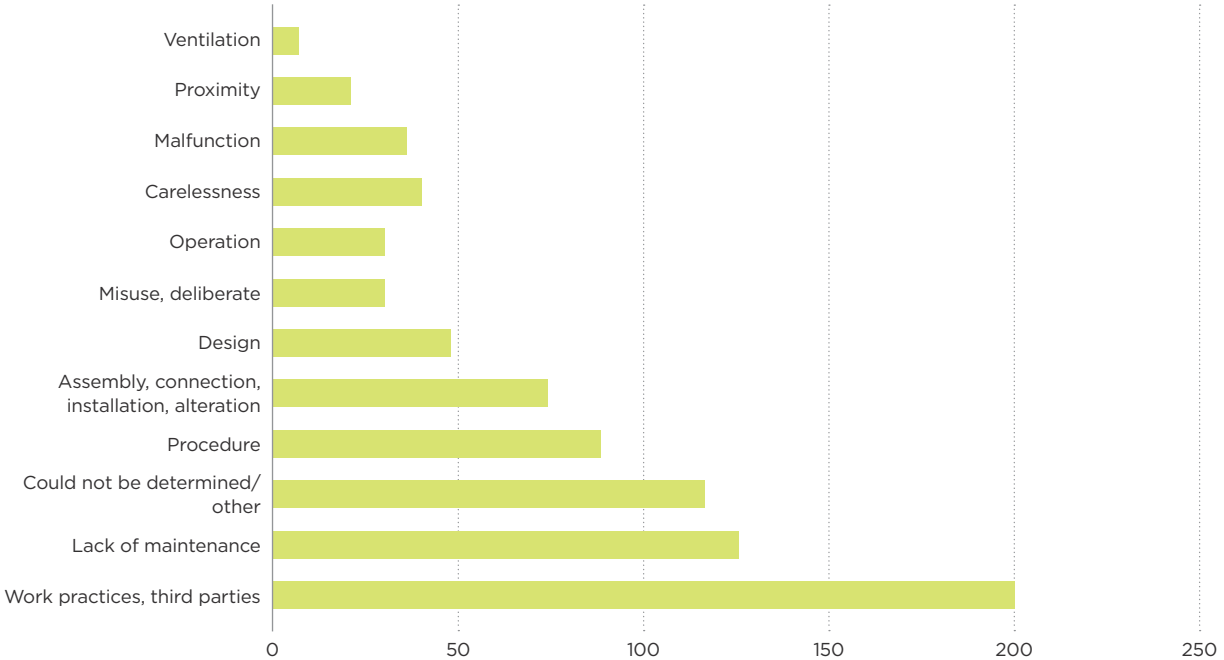

FIGURE 2D: Non-notifiable natural gas accidents by causal factor

[16] Incorrect work includes incorrect assembly, connection, installation and alteration.

4.4 Equipment type

Table 7 and 8 give a more detailed breakdown of natural gas casualty and all natural gas accidents by equipment type. Three categories of appliance were involved in 79% of notifiable accidents (see Figure 2E).

- Water heaters or boilers – 72 (33%).
- Space heaters – 60 (28%).
- Cooking appliances – 38 (17%).

About 90% of these accidents involved a fire or explosion.

	FATAL		INJURY	
EQUIPMENT TYPE	**CONSEQUENCE[17] (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**	**CONSEQUENCE (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**
Cookers and ovens	1 (1)	0 (0)	14 (11)	0 (0)
Space heaters	3 (3)	0 (0)	22 (14)	9 (2)
Water heaters	1 (1)	0 (0)	20 (17)	1 (1)
Mains/service and regulator stations	0 (0)	0 (0)	17 (13)	2 (1)
Total	5 (5)	0 (0)	85 (64)	14 (5)

TABLE 7: Breakdown of natural gas casualty accidents involving members of the public by equipment type

	NOTIFIABLE		NON-NOTIFIABLE	
EQUIPMENT TYPE	**ACCIDENTS[18] (per year) 1993–2024**	**ACCIDENTS (per year) 2020–2024**	**ACCIDENTS (per year) 1993–2024**	**ACCIDENTS (per year) 2020–2024**
Cookers and ovens	38 (1.2)	1 (0.2)	78 (2.4)	3 (0.6)
Space heaters	60 (1.9)	3 (0.6)	135 (4.2)	6 (1.2)
Water heaters	72 (2.3)	2 (0.4)	41 (1.3)	7 (1.4)
Mains/service and regulator stations	27 (0.8)	2 (0.4)	315 (9.8)	9 (1.8)
Total	218 (6.8)	11 (2.2)	664 (20.8)	30 (6.0)

TABLE 8: Breakdown of natural gas accidents involving members of the public by equipment type

[17] The first number represents casualties and the bracketed number represents accidents.

[18] The first number represents accidents and the bracketed number represents accidents per year.

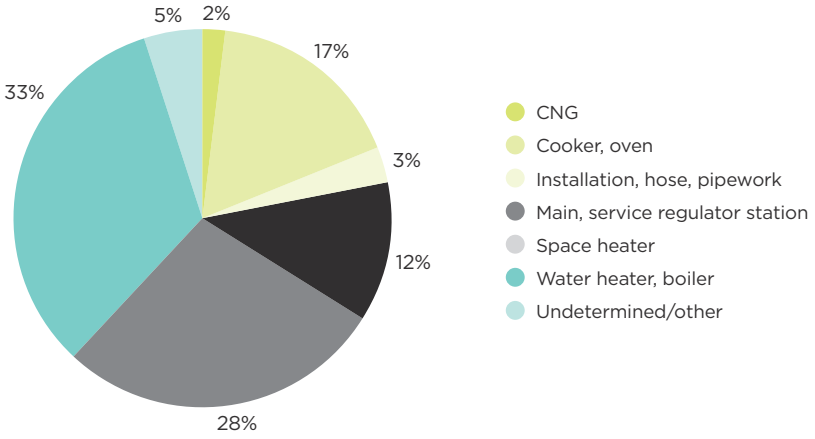

FIGURE 2E:
Notifiable natural gas accidents by equipment

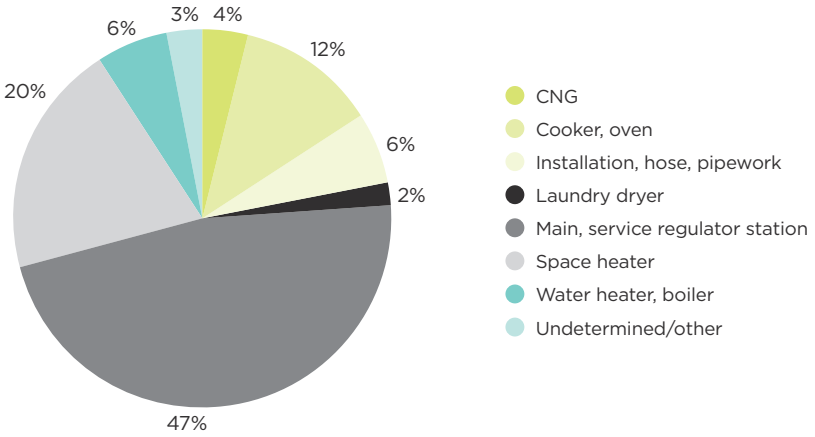

FIGURE 2F:
Non-notifiable natural gas accidents by equipment

- Approximately half (13 of 27) of the notifiable accidents in the distribution system caused injury to 17 people.
- Approximately half (315) of the 664 non-notifiable accidents reported to Energy Safety involved distribution equipment[19] (see Figure 2F) with a gas leak or escape being the outcome in over 81% of cases, and fire in 9% of these cases. Approximately 56% of distribution accidents, including third-party strikes, involved failure to follow correct work practices.
- Approximately one-third (32%) or 213 out of the 664 non-notifiable accidents reported to Energy Safety, involved heating equipment or cooking equipment. Fire was the outcome in about three quarters of these accidents.

Cookers and ovens

- Seventeen percent (38) of the 218 notifiable accidents and 12% (78) of the 664 non-notifiable accidents involved cookers or ovens. Cookers and ovens were involved in one fatality (in 1999) and injury to 14 people (within 11 injury accidents), see Figure 2G.

[19] This includes mains, services, regulator stations and meters.

FIGURE 2G: Natural gas cooker and oven accidents

- Eleven (17%) of the total natural gas notifiable injury accidents (64) involved gas cookers or ovens. In the past 32 years there have been, on average, 1.2 notifiable accidents and 2.4 non-notifiable accidents involving cookers per year.
- Fifteen (39%) notifiable cooker accidents reported were caused by lack of maintenance and 12 (32%) were caused by assembly, connection, installation and alteration.
- Twenty-two (28%) non-notifiable cooker accidents reported were caused by lack of maintenance, 13 (17%) were caused by operation issue and 18 (23%) caused by assembly, connection, installation and alteration.

Space heaters

- Twenty-eight percent (60) of the 218 notifiable accidents and 20% (135) of the 664 non-notifiable accidents involved space heaters. Space heaters were involved in three fatalities (three fatal accidents) and injury to 22 people (within 14 injury accidents). The last fatal accident involving a space heater occurred 17 years ago in 2007 (see Figure 2H).
- Fourteen (22%) of the total injury accidents involved space heaters in the past 32 years. In the past 32 years there have been, on average, 1.9 notifiable accidents and 4.2 non-notifiable space heater accidents per year.
- Sixteen of 60 notifiable space heater accidents caused three fatalities and injury to 22 people.
- Twenty-four (40%) notifiable heater accidents reported were caused by assembly, connection, installation and alteration. 15 (25%) were caused by design[20] fault and 13 (22%) were caused by proximity to a combustible product.
- Thirty-two (24%) non-notifiable accidents reported were caused by assembly, connection, installation and alteration. 38 (28%) were caused by design fault and 39 (29%) were caused by lack of maintenance.

[20] This includes engineering problems with structure/material specifications or plans. Also clear ergonomic problems (making misuse or operation error likely).

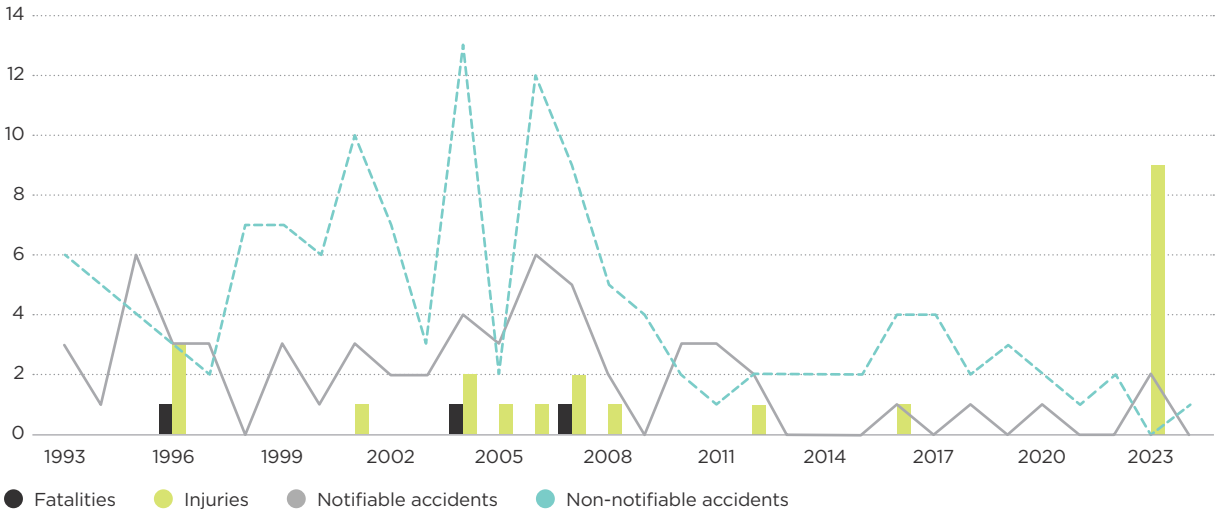

FIGURE 2H: Natural gas space heater accidents

Water heaters and boilers

- Thirty-three percent (72) of the 218 notifiable accidents and 6% (41) of 664 non-notifiable accidents involved water heaters. Water heaters were involved in one fatality (in 1998) and injury to 20 people (within 17 injury accidents), see Figure 2I.
- In the past 32 years, 23% of the total 86 injuries involved water heaters. There have been, on average, 2.3 notifiable accidents and 1.3 non-notifiable water heater accidents per year.
- Seventeen (24%) notifiable water heater accidents reported were caused by lack of maintenance and 28 (39%) caused by assembly, connection, installation and alteration.
- Twelve (29%) non-notifiable accidents reported were caused by lack of maintenance, 10 (24%) were caused by proximity to a combustible product and 9 (22%) were caused by assembly, connection, installation and alteration.

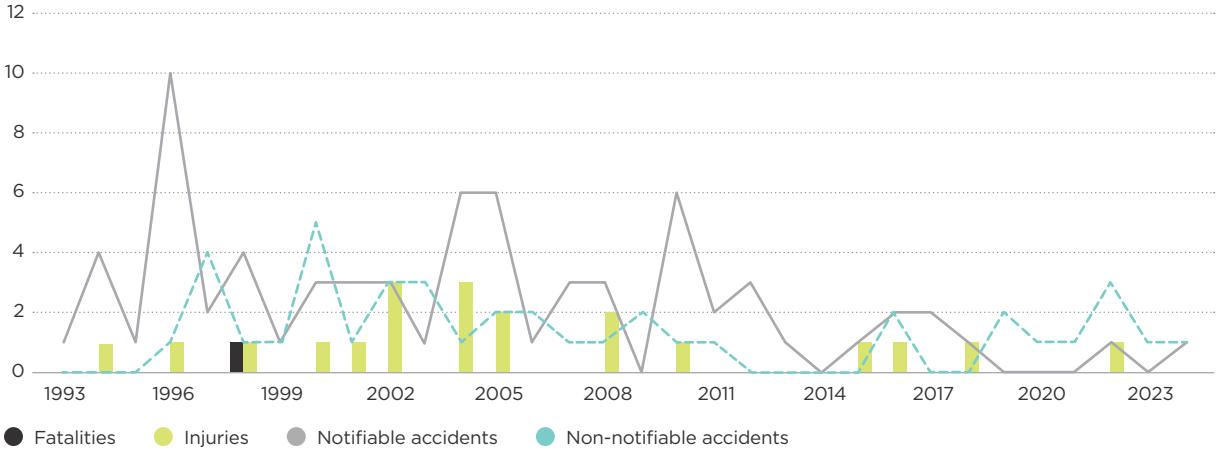

FIGURE 2I: Natural gas water heater and boiler accidents

5.0 Liquefied petroleum gas (LPG)

IN THIS SECTION:

5.1 Current trends

5.2 Longer term trends

5.3 Casual factors

5.4 Equipment

5.5 Environment

Notifiable and non-notifiable accidents reported to Energy Safety involving liquefied petroleum gas (LPG).

This section includes LPG fuel gas-related accidents of all types, including fire and explosion, whether there were casualties or property loss. All non-notifiable accidents, except for those reported in bulk[21] are included in this analysis.

This analysis examines accidents involving members of the public in 2024, and also for the 32-year period from 1993 to 2024. It includes a comparison between the base period (1993–1997) and the current five-year period (2020–2024). In addition to accidents involving members of the public, Energy Safety retains an interest in equipment which is reflected in this analysis.

Historically, data relating to LPG accidents did not focus on the victims' age. The recording of data related to the age group of the victims for gas, began with the introduction of an integrated case management system (ESI) in 2008. This section identifies general trends and examines general categories of appliances and other equipment involved in accidents.

LPG is normally used as a fuel for heating, cooking or lighting. However, in a few cases, LPG is deliberately inhaled with serious consequences. (Energy Safety is not the lead agency for investigating incidents that involve the deliberate inhalation of LPG.)

Deliberate LPG inhalation accidents differ from other LPG accidents as the fuel is knowingly misused or handled without any fault in the equipment or fuel. Analysis that included this data might give the impression that LPG is a more dangerous fuel than it actually is in normal use. Deliberate LPG inhalation accidents are not included in the LPG accident analysis.

5.1 Current trends

Examination of notifiable LPG accidents shows that during 2024:

- There were 3 notifiable accidents that involved injury or significant property damage. The average annual notifiable accident number is 14.4 over the past 32 years.
- There was not a single fatal LPG accident this year. Over the last 32 years the average number of fatal accidents has been 1.2 per year and 1.4 fatalities per year.
- One notifiable injury accident injured one people. The average for the last 32 years of 6.9 notifiable injury accidents caused an average of 9.7 injuries.

[21] For a certain period in the 1990s, Energy Safety received information (notification) of minor incidents in bulk. While all were recorded, in general Energy Safety did not investigate these 'bulk reported' and other low level incident events.

- Cookers are involved in all three notifiable accidents. Only one of the notifiable cooker accidents causing injury to tone person.
- Ten non-notifiable accidents were reported to Energy Safety. This is about half of the annual average number (19.8) over the last 32 years. All these non-notifiable accidents resulted in fires.

5.2 Longer term trends

Observations based on analysis of trends, consequence and frequency for the 30-year period between 1993 and 2024:

- Thirty-nine fatal accidents (1.2 per year) resulted in 46 fatalities (1.4 per year).
- Cooking equipment was involved in 15 (36%) fatal accidents resulting in 19 (41%) fatalities.
- Cabinet heaters were involved in 12 (31%) of fatal accidents resulting in 13 (28%) fatalities. The last cabinet heater fatal accident occurred in 2015.
- A fatal accident involving fire or explosion is more frequent than a fatal accident involving carbon monoxide poisoning, but carbon monoxide poisoning is more deadly. 24 of these 46 fatalities involved fire or explosion (in 22 accidents) and 21 fatalities involved carbon monoxide poisoning in 16 cases. An average of 1.1 fatalities occurred per fire or explosion accident while an average of 1.3 fatalities occurred for carbon monoxide poisoning accidents.
- There is no clear long-term trend to indicate any change in the number of fatal accidents over the last 32 years (see Figure 3A). However, there appears to have been a spike in the number of fatal cabinet heater accidents between 2007 and 2012 compared to the long-term trend. Seven of the 12 fatal accidents occurred in the six-year period (2007–2012) in comparison to three fatal accidents (four fatalities) in the previous 14 years (1993-2006). There were two fatal cabinet heater accidents occurred in 2015 and since then there have been no cabinet heater fatality.

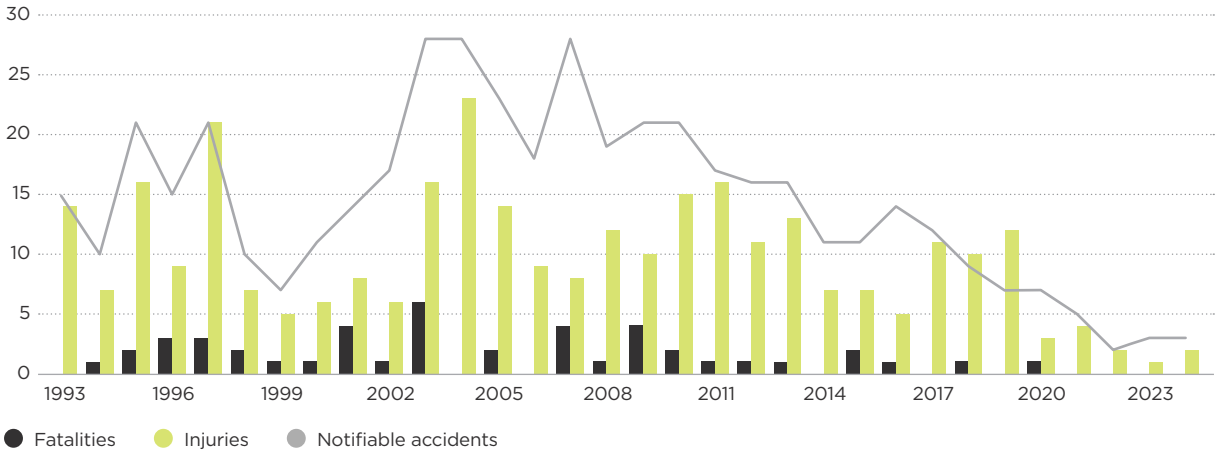

FIGURE 3A: Notifiable LPG accidents

- There have been 460 notifiable accidents. One hundred and 57 (34%) of the total notifiable accidents and 239 (38%) of the 634 non-notifiable accidents were caused by poor assembly, connection, and installation of or alteration to, an appliance. When analysing gas related accidents, it is worth noting that many of these accidents may have had more than one cause attributed to them.
- A total of 222 notifiable injury accidents caused injuries to 309 people.
- Tables 9 and 10 give a more detailed breakdown of LPG casualty and all LPG accidents by equipment type. Cooking appliances were involved in 39% and cabinet heaters in 25% of injury accidents. Two-thirds of injuries were caused by these two types of equipment.
- Of the total 460 notifiable accidents, 422 (92%) involved fires or explosions and 48% (202) of these fire accidents resulted in injuries.
- A total of 634 non-notifiable accidents were reported to Energy Safety, see Figure 3B.
- One hundred and seventy-three (27%) non-notifiable accidents involved cabinet heaters; 97 (15%) involved containers; 104 (16%) barbecues; and 107 (17%) cooking equipment.
- Over 72% (457) of non-notifiable accidents involved fires or explosions, and about 23% (147) involved gas escaping.
- Ninteen percent of the total 1094 notifiable and non-notifiable accidents were reported by Health and Safety Inspectors, and 29% were reported by the New Zealand Fire Service (now Fire and Emergency New Zealand). However, notifications by Health and Safety Inspectors have significantly reduced since 2009 (last fifteen-years, only 1.3% of accident reported).

	FATAL		INJURY	
EQUIPMENT TYPE	**CONSEQUENCE[22] (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**	**CONSEQUENCE (frequency) 1993–2024**	**CONSEQUENCE (frequency) 2020–2024**
Cookers and ovens	19 (15)	2 (2)	130 (88)	5 (5)
Cabinet heaters	13 (12)	0 (0)	67 (55)	0 (0)
BBQ	0 (0)	0 (0)	7 (6)	0 (0)
Refrigerator	6 (5)	0 (0)	12 (10)	0 (0)
Containers (refillable)	4 (4)	0 (0)	20 (13)	0 (0)
Canister and canister equipment (mainly cookers) (non-refillable)	6 (3)	0 (0)	55 (32)	1 (1)
Total	46 (39)	2 (2)	309 (222)	11 (10)

TABLE 9: Breakdown of LPG casualty accidents involving members of the public by equipment type

[22] The first number represents casualties and the bracketed number represents accidents.

	NOTIFIABLE		NON-NOTIFIABLE	
EQUIPMENT TYPE	**ACCIDENTS[23] (per year) 1993–2024**	**ACCIDENTS (per year) 2020–2024**	**ACCIDENTS (per year) 1993–2024**	**ACCIDENTS (per year) 2020–2024**
Cookers and ovens	138 (4.3)	10 (2.0)	107 (3.3)	15 (3.0)
Cabinet heaters	143 (4.5)	0 (0.0)	173 (5.4)	3 (0.6)
BBQ	20 (0.6)	0 (0.0)	104 (3.3)	11 (2.2)
Refrigerator	26 (0.8)	0 (0.0)	8 (0.3)	1 (0.2)
Containers (refillable)	26 (0.8)	0 (0.0)	94 (2.9)	3 (0.6)
Canister and canister equipment (mainly cookers) (non-refillable)	38 (1.2)	1 (0.2)	31 (1.0)	7 (1.4)
Total	460 (14.4)	20 (4.0)	634 (19.8)	57 (11.4)

TABLE 10: Breakdown of LPG accidents involving members of the public by equipment type

FIGURE 3B: Non-notifiable LPG accidents

[23] The first number represents accidents and the bracketed number represents accidents per year.

5.3 Causal factors

Table 11 gives the most common causes of LPG accidents over the past 32 years and the last 5 years. The main causes[24] of the notifiable accidents (see Figure 3C) have been:

- incorrect assembly, connection, installation or alteration (34%)
- incorrect operation (14%)
- lack of maintenance (15%)
- operating close to flammable materials (7%).

These causes were also the major contributors to non-notifiable accidents reported to Energy Safety (see Figure 3D)..

	PERIOD 1993–2024	PERIOD 2020–2024
Main causes	– Assembly, connection, installation, alteration (34%) – Operation error (14%) – Lack of maintenance (15%) – Design (7%) – Procedure (9%) – Carelessness (9%)	– Assembly, connection, installation, alteration (20%) – Lack of maintenance (10%) – Procedure (5%) – Carelessness (10%) – Malfunction (30%)

TABLE 11: Factors in notifiable LPG accidents involving members of the public

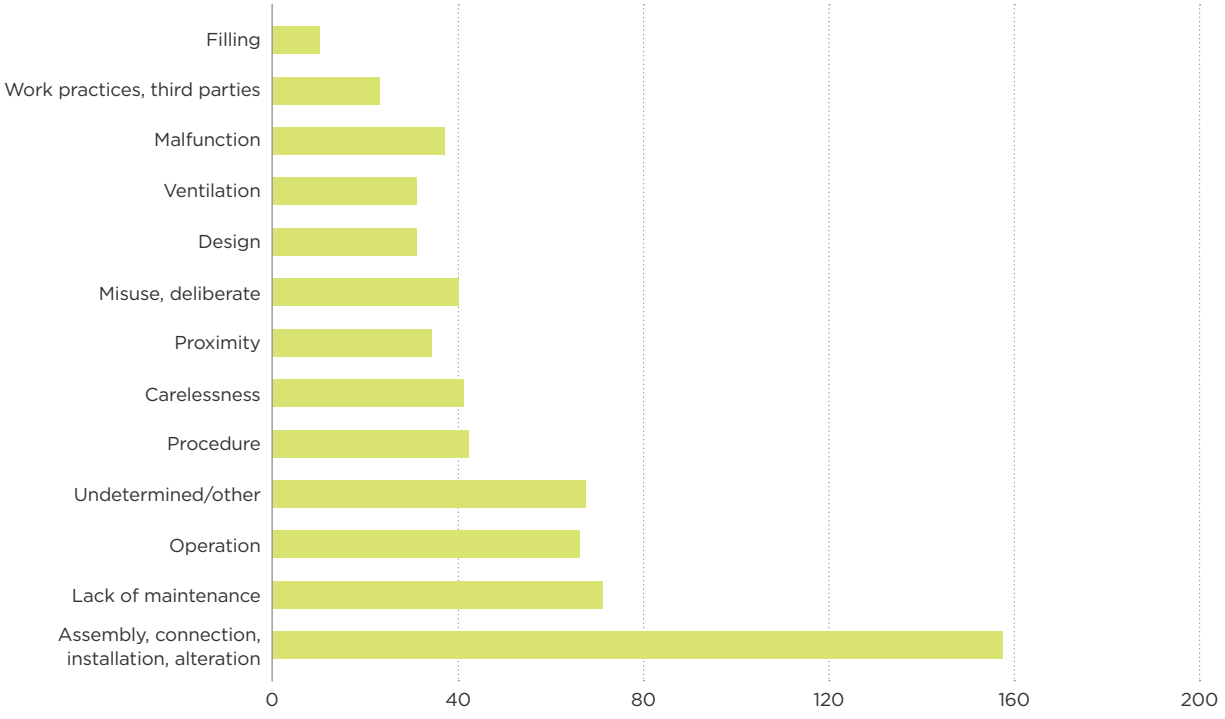

FIGURE 3C: Notifiable LPG accidents by causal factor

[24] Many accidents may have had more than one cause attributed to them.

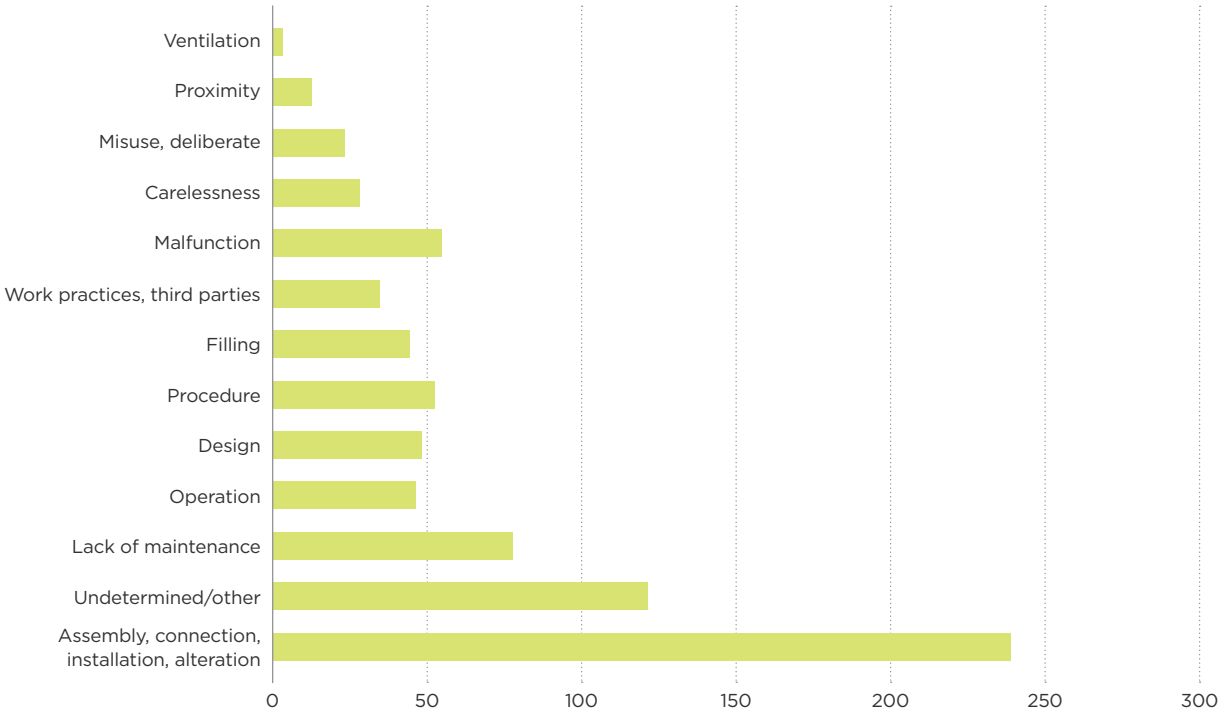

FIGURE 3D: Non-notifiable LPG accidents by causal factor

5.4 Equipment

The major contributors to notifiable accidents (see Figure 3E) have been:

- cabinet heaters 143 (31%)
- containers 30 (7%)
- cookers and ovens 138 (30%)
- space heater 39 (9%).

This equipment has also contributed to a significant level of non-notifiable accidents (see Figure 3F). Together, these four types of equipment have contributed to 69% of the total number of non-notifiable accidents. Barbecues have contributed to 17% of non-notifiable LPG accidents, but for only about 4% of notifiable accidents.

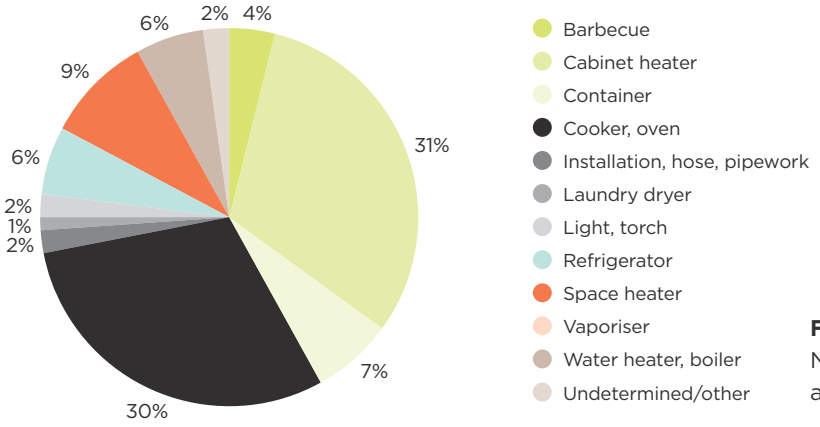

FIGURE 3E: Notifiable LPG accidents by equipment

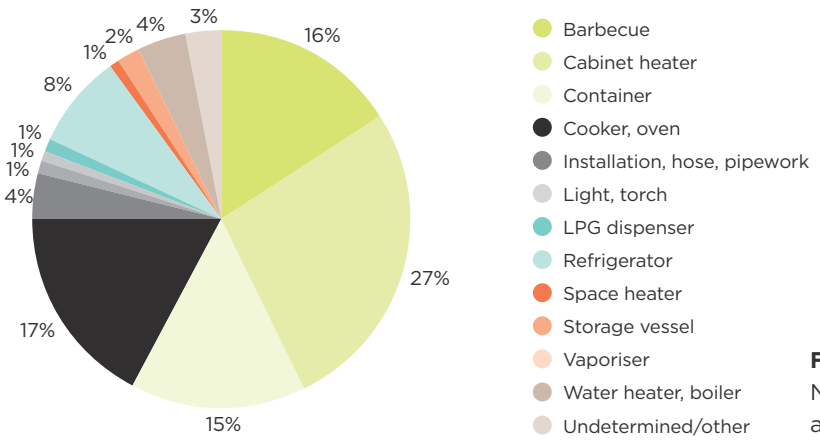

FIGURE 3F: Non-notifiable LPG accidents by equipment

- Gas equipment fuelled by canisters (non-refillable) were involved in 38 notifiable accidents over the last 32-years which is about 8% of the total LPG notifiable accidents.
- Three canister fuelled notifiable accidents caused 6 fatalities (13% of the total LPG fatalities) and 32 notifiable accidents injured 55 people (17% of total LPG injuries).
- Eleven percent (49) of notifiable LPG accidents (460) occurred in caravans. Ten of these were fatal causing 11 fatalities. Twenty-seven of the notifiable accidents injured 41 people, 13% of the total LPG injuries (see Table 12).

ENVIRONMENT	CONSEQUENCE[25] (frequency) 1993–2024	CONSEQUENCE (frequency) 2020–2024
Caravan or campervan	Fatal 11 (10)	Fatal 0 (0)
	Injury 41 (27)	Injury 1 (1)
	Notifiable (49)	Notifiable (2)
	Non-notifiable (22)	Non-notifiable (3)

TABLE 12: Environment factors in LPG accidents involving members of the public

Cookers and ovens

- Thirty percent (138) of the 460 notifiable accidents and 17% (107) of the 634 non-notifiable accidents involved cookers or ovens. Cookers and ovens were involved in 19 fatalities (15 fatal accidents) and injured 130 people (87 injury accidents), see Figure 3G.
- Forty-one percent of total fatalities and 42% of total injuries involved cookers or ovens. In the past 32-years there have been 0.6 fatalities, 4.1 injuries, 4.3 notifiable accidents, and 3.3 non-notifiable accidents per year on average.
- Twenty (15%) notifiable cookers or ovens accidents reported were caused by incorrect operation and 52 (38%) caused assembly, connection, installation and alteration.
- Forty-three (40%) non-notifiable accidents reported were caused by assembly, connection, installation and alteration.

[25] The first number represents casualties and the bracketed number represents accidents.

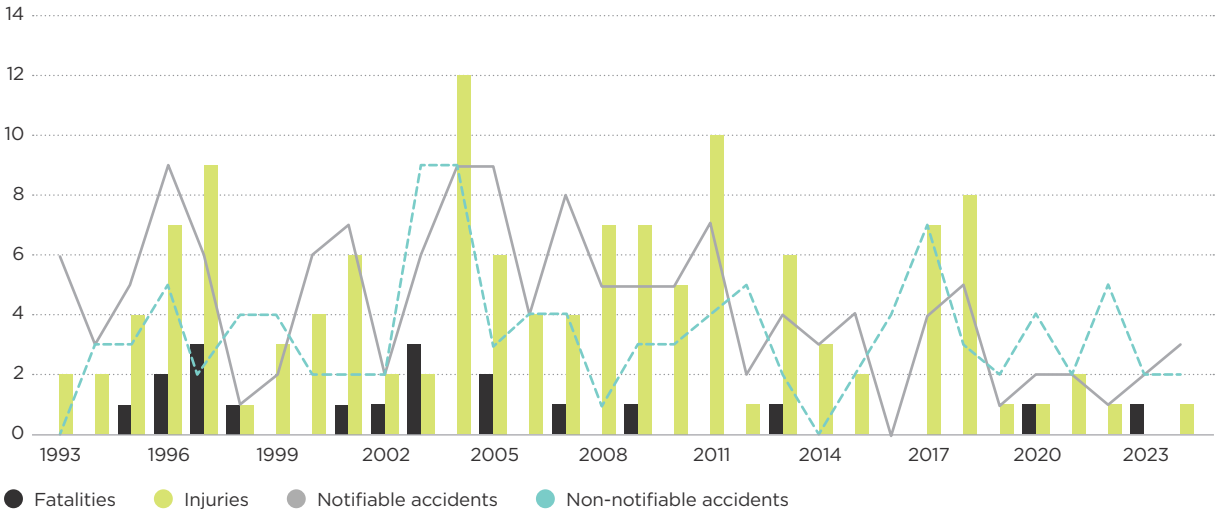

FIGURE 3G: LPG cooker and oven accidents

Cabinet heaters

- Thirty-one percent (143) of the 460 notifiable accidents and 27% (173) of the 634 non-notifiable accidents involved cabinet heaters. Cabinet heaters were involved in 13 fatalities (12 fatal accidents), and injury to 67 people (within 55 injury accidents) (see Figure 3H).
- Twenty-eight percent of total LPG fatalities and 22% of total injuries involved cabinet heaters. In the past 32-years there have been 0.4 fatalities, 2.1 injuries, 4.5 notifiable accidents and 5.4 non-notifiable accidents per year on average.
- Twenty-three (16%) notifiable accidents reported were caused by lack of maintenance, 23 (16%) were caused by proximity to a combustible product and 39 (27%) were caused by assembly, connection, installation and alteration.
- Twenty-six (15%) non-notifiable accidents reported were caused by lack of maintenance and 88 (51%) were caused by assembly, connection, installation and alteration.

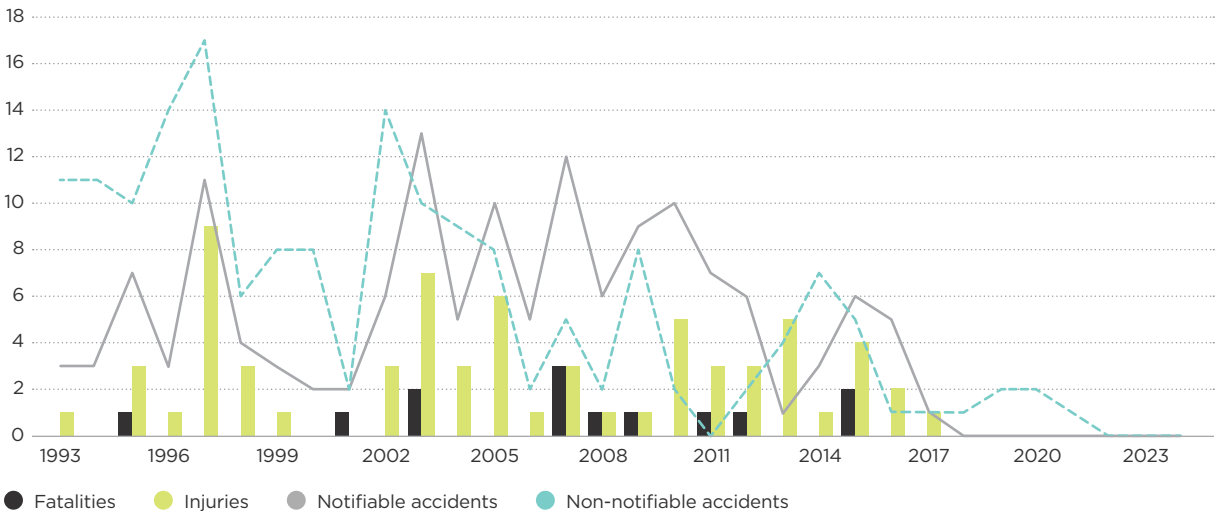

FIGURE 3H: LPG cabinet heater accidents

Barbecue

- Four percent (20) of the 460 notifiable accidents and 16% (104) of the 624 non-notifiable accidents involved barbecues. Barbecues were not involved in any fatalities, but injured seven people (six injury accidents), see Figure 3I.
- In the past 32 years there have been 0.6 notifiable accidents and 3.3 non-notifiable accidents per year on average.
- Six (30%) notifiable accidents and 56 (54%) of non-notifiable accidents reported were caused by assembly, connection, installation and alteration.

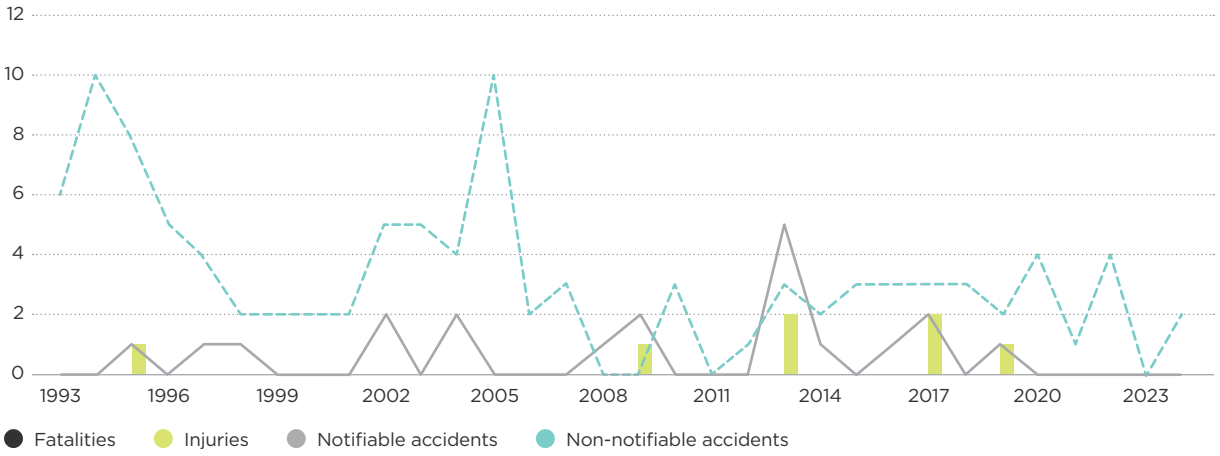

FIGURE 3I: LPG barbecue accidents

5.5 Environment

Caravans and campervans

- Eleven percent (49) of the 460 notifiable accidents and 3% (22) of the 634 non-notifiable accidents occurred in caravans or campervans. Caravans and campervans were involved in 11 fatalities (10 fatal accidents) and injured 41 people (27 injury accidents) (see Figure 3J).
- Twenty-four percent (11) of total fatalities and 13% (41) of total injuries occurred in caravans or campervans. In the past 32-years there have been 0.3 fatalities, 1.3 injuries, 1.5 notifiable accidents and 0.7 non-notifiable accidents per year on average.
- Twenty-three (47%) notifiable accidents and 4 (18%) of non-notifiable accidents reported were caused by assembly, connection, installation and alteration.

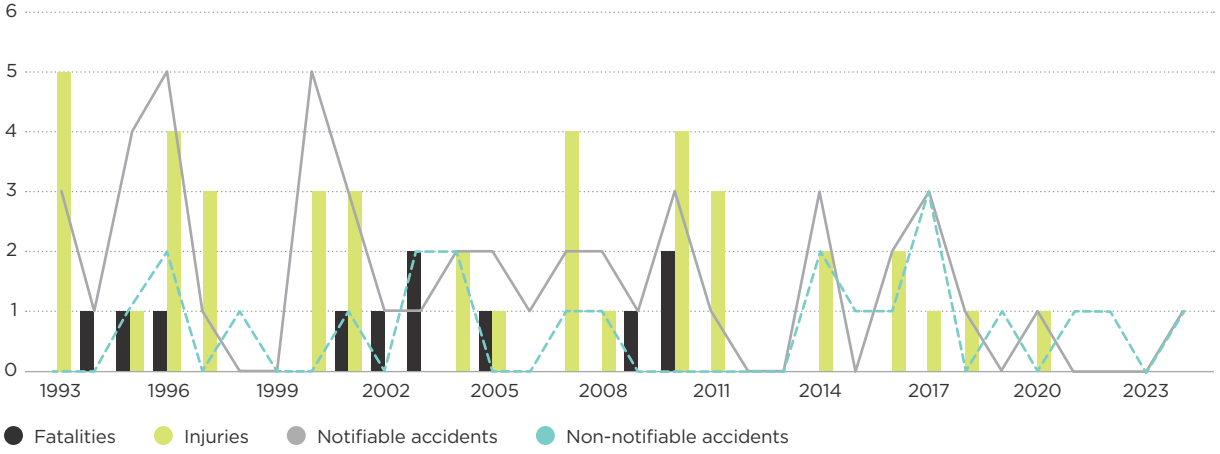

FIGURE 3J: LPG caravan accidents

Appendix

IN THIS SECTION:

Appendix 1: Accidents and accident notification definitions

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The occupier or the person in charge of a non-work related accident area is required by law to report to WorkSafe any accidents that are caused by electricity or gas that result in fatalities, serious injuries or significant damage to property.

A notifiable electrical accident has the same meaning as a 'notifiable accident' in the Electricity Act 1992. A 'notifiable electrical accident' is defined as an accident that is caused wholly or partly by, or involves or affects, electricity, or involves or affects the generation, conversion, transformation, conveyance, or use of electricity, and results in:

i. serious harm to any person, or
ii. damage to any place or part of a place that renders that place or that part of that place unusable for any purpose for which it was used or designed to be used before that accident.

Serious harm means:

- death or injury that consists of or includes loss of consciousness, or
- injury that necessitates the person suffering the injury:
  i. being admitted to hospital; or
  ii. a notifiable injury or illness as defined in section 23 of the Health and Safety at Work Act 2015 (previously it was receiving medical treatment from a medical practitioner).

A notifiable gas accident has the same meaning as a 'notifiable accident' in the Gas Act 1992. A 'notifiable gas accident' is defined as an accident that:

- involves the production, conversion, supply, distribution, or use of gas, and results in:
  i. serious harm to any person, or
  ii. significant property damage.

Serious harm means:

- death or harm that incapacitates, or is likely to incapacitate, the person suffering harm for 48 hours or more
- harm that incapacitates, or is likely to incapacitate, the person suffering harm due to the inhalation of carbon monoxide, or
- a notifiable injury or illness as defined in section 23 of the Health and Safety at Work Act 2015 (previously it was 'harm of the kinds and descriptions that are serious harm under the Health and Safety in Employment Act 1992').

A non-notifiable gas accident is defined as an accident that:

- causes property loss, and/or
- causes injury below the threshold defined in the Gas Act 1992, and is involved with what is supposed to be a safe supply or use of fuel gas.

Notes

Disclaimer

WorkSafe New Zealand has made every effort to ensure the information contained in this publication is reliable, but makes no guarantee of its completeness.

It should not be used as a substitute for legislation or legal advice. WorkSafe is not responsible for the results of any action taken on the basis of information in this document, or for any errors or omissions.

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WORKSAFE
Mahi Haumaru Aotearoa

PO Box 165, Wellington 6140
0800 030 040 **worksafe.govt.nz**