



# FLAMMABLE REFRIGERANTS – *BE INFORMED, BE AWARE*

## Introduction and overview

This fact sheet looks at the background and context for flammable refrigerants and their increasing use in stationary air conditioning and refrigeration systems.

Heating, ventilating, air conditioning and refrigeration [HVACR] impact every aspect of modern society. They sustain the way we have chosen to live.

Environmental, conservation and economic factors are driving changes that could, in certain circumstances, cause serious harm to the processes, buildings and environments we inhabit.

Global warming potential [GWP], ozone depleting potential [ODP], low-carbon strategies are leading us from non-flammable refrigerants to low-GWP, low-ODP potentially flammable refrigerants.

Initial work has highlighted a lack of awareness within New Zealand industry of the implication of the change to a flammable refrigerant environment, including shortages and withdrawal from market of current refrigerants and the unlicensed nature of the HVACR industry.

The Tamahere coolstore in New Zealand and Hotel Rochester in Australia are two severe outcomes from incompetent practices.

The impact of this transition has cost, energy and safety implications. Anyone owning, procuring, installing, operating or maintaining cooling/heating systems needs to be aware of these issues to mitigate and control their risk.



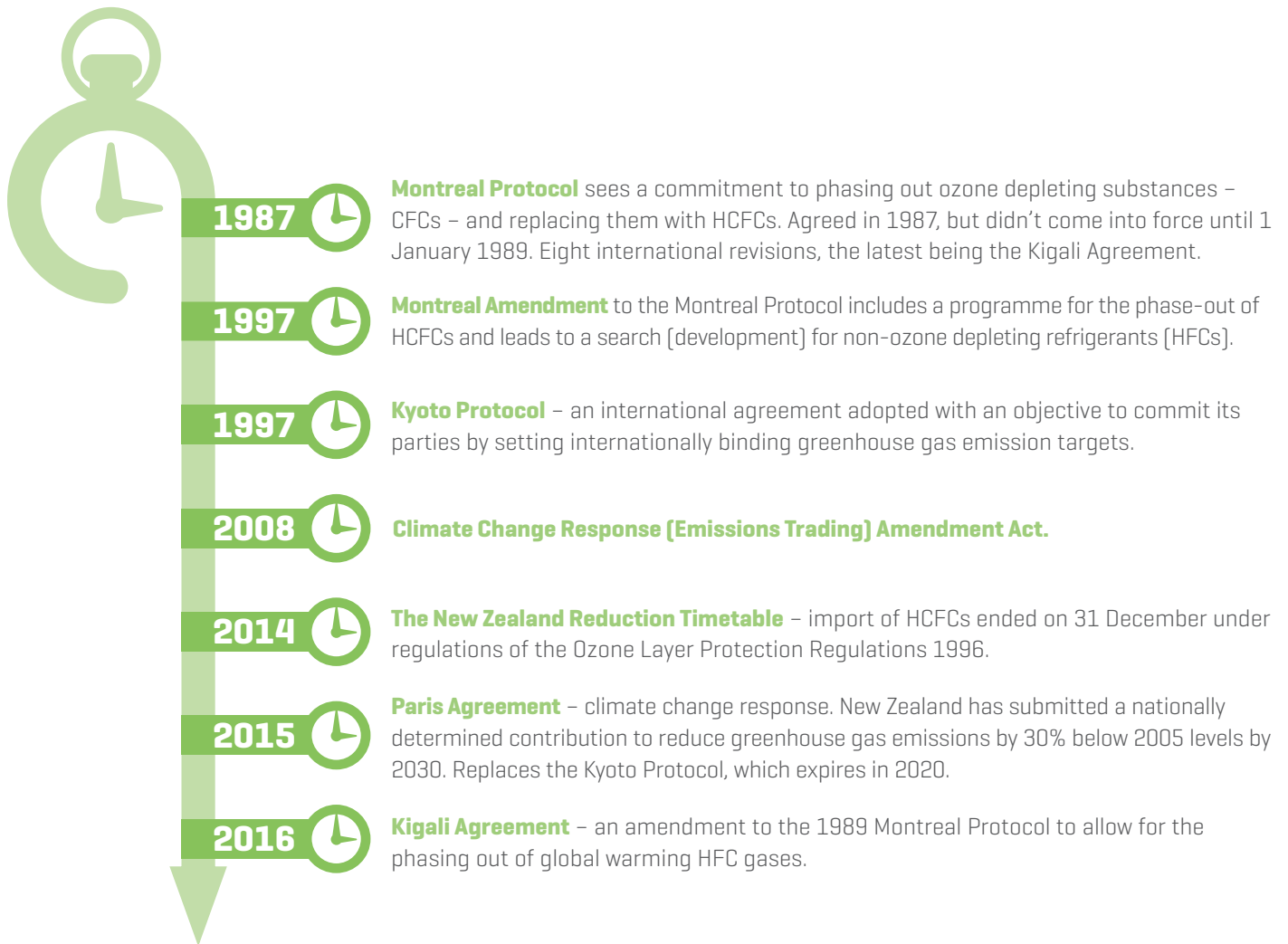
Tamahere coolstore fire.

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## WHO NEEDS TO KNOW?

- You may own, control or operate a system containing flammable refrigerants.
- You may be a person conducting a business or undertaking (PCBU) and wish to be informed on the risks and opportunities posed by the changing landscape.
- You may be insuring, assessing or valuing an asset and need to know the risk profile for that system, process or building.

## WHAT HAPPENED?



## WHERE ARE WE AT?

The Emissions Trading Scheme [ETS] resulting from the Kyoto Protocol penalises high GWP refrigerants and drives up their price. At the same time, the HFC phase-down [resulting from the Montreal Protocol] limits their availability and again impacts the price.

These two factors are motivating the move to new, alternative low-GWP, low-ODP refrigerants to minimise the use of ozone depleting and synthetic greenhouse gases.

These new gases include HFOs or blends of HFO and HFCs and HCs that are flammable as well as ammonia that is toxic and CO<sub>2</sub> that operates at high pressure. These new refrigerants have risks associated with their application. All refrigerants are dangerous if misused.

## CONTEXT

The Health and Safety at Work (Hazardous Substances) Regulations 2017 sets out the requirements of a PCBU or those who have a management or curatorial responsibility with respect to hazardous substances.

### Regulation 10.10

*Requirements for refrigeration systems containing LPG, propane, butane, isobutane, or other flammable refrigerant*

1. A PCBU with management or control of a refrigeration system that contains LPG, propane, butane, isobutane, or other flammable refrigerant as an integral part of that refrigeration system must ensure that the quantity and the means of containing the LPG, propane, butane, isobutane, or other flammable refrigerant comply with:
  - a. AS/NZS 5149:2016; or
  - b. a relevant safe work instrument that sets out the requirements for containing LPG, propane, butane, isobutane, or other flammable refrigerant in a refrigeration system.



## RULES AND REGULATORS

Hazardous substances are any chemicals or mixture of chemicals that meet hazardous classification criteria.

These criteria include explosiveness, flammability, toxicity to people, ability to cause cancer, toxicity to the environment and their ability to generate a different hazardous substance on contact with air or water.

The rules and regulators for hazardous substances are:

### Environmental Protection Authority (EPA)

- Runs the Emissions Trading Scheme.
- Puts rules in place, called controls, that manage the risk of hazardous substances.

- Administers hazardous waste and ozone-depleting substances.

### WorkSafe NZ

- Enforces the rules relating to the use, handling and storage of hazardous substances in the workplace, under the Health and Safety at Work (Hazardous Substances) Regulations 2017.

### Health and Safety at Work (Hazardous Substances) Regulations 2017

- Effective 1 December 2017.
- Sets the rules that apply to hazardous substances in workplaces.

## WANT TO KNOW MORE?

- Climate Control Companies Association New Zealand [CCCANZ] – [www.cccanz.org.nz](http://www.cccanz.org.nz)
- Refrigerant License New Zealand [RLNZ] – [www.rlnz.org.nz](http://www.rlnz.org.nz)
- The Institute of Refrigeration, Heating and Air Conditioning Engineers [IRHACE] – [www.irhace.org.nz](http://www.irhace.org.nz)
- Refrigerant Recovery NZ – [www.refrigerantrecovery.co.nz](http://www.refrigerantrecovery.co.nz)
- WorkSafe New Zealand – [www.worksafe.govt.nz](http://www.worksafe.govt.nz)
- Australian Institute of Refrigeration, Air Conditioning and Heating [AIRAH] *Flammable Refrigerants Safety Guide* – [www.airah.org.au](http://www.airah.org.au)

## SHORT GLOSSARY

<b>AC</b>	air conditioning	<b>HVACR</b>	heating, ventilating, air conditioning and refrigeration
<b>CFC</b>	chlorofluorocarbon [for example, R11]	<b>LFL</b>	lower flammability limit
<b>CO<sub>2</sub></b>	benchmark GWP=1 [ODP=0]	<b>NR</b>	natural refrigerant
<b>ETS</b>	Emissions Trading Scheme	<b>ODP</b>	ozone depleting potential
<b>GWP</b>	global warming potential	<b>PCBU</b>	person conducting a business or undertaking
<b>HC</b>	hydrocarbon	<b>R##</b>	refrigerant designation
<b>HCFC</b>	hydrochlorofluorocarbon [for example, R22]	<b>R11</b>	benchmark OPD=1 [ GWP=4000]
<b>HFC</b>	hydrofluorocarbon [for example, R410a, R404a, R32]	<b>RCL</b>	refrigerant charge limitation
<b>HFO</b>	hydrofluoroolefin [R1234yf, R1234ze, R1233zd]		

## SOME COMMON COMPARISONS

R##	Type	Application	ODP	GWP	Flammable	Destiny
R11	CFC	High rise centrifugal AC	1	4660	No – A1	Gone
R12	CFC	Medium temp commercial refrigeration	1	10200	No – A1	Gone
R22	HCFC	Residential and commercial AC	0.04	1760	No – A1	Going
R123	HCFC	Replacing R11	0.014	79	No – A1	Going
R134a	HFC	Medium temp commercial	0	1300	No – A1	Going
R401a	HFC	Medium temp commercial	0.03	1120	No – A1	Going
R404a	HFC	Medium and low temp commercial	0	3922	No – A1	Going
R410a	HFC	Residential and commercial AC	0	2088	No – A1	Going
R32	HFC	Residential, small AC systems	0	677	Lower – A2L	Increasing in interim
R1234yf	HFO	Potentially for motor vehicle AC	0	<1	Lower – A2L	Increasing
R1234ze	HFO	Potentially for medium temp commercial	0	<1	Lower – A2L	Increasing
R744	CO <sub>2</sub>	Supermarket	0	1	No – A1	Increasing
R717	NH <sub>3</sub>	Industrial	0	0	Lower – B2L	Increasing
R600a	HC	Isobutane – potentially most applications	0	3	Higher – A3	Increasing
R290	HC	Propane	0	3	Higher – A3	Increasing
R1270	HC	Propene	0	3	Higher – A3	Increasing

These fact sheets have been produced by the Climate Control Companies Association New Zealand [CCCANZ] supported by BRANZ and in association with the Australian Institute of Refrigeration, Air Conditioning and Heating [AIRAH]. They provide an overview of the key elements of safe operation for flammable refrigerant-based systems and an introduction to the pathways, plans and processes towards a new cooling environment. The fact sheets cover:

1. Introduction and overview [this fact sheet]
2. System design considerations
3. Installing systems with flammable refrigerants
4. Operating and maintaining flammable refrigerant-based systems

Designers/installers/service providers should access the AS/NZS 5149 *Refrigerating systems and heat pumps – Safety and environmental requirements* series in order to ascertain the precise requirements for an individual installation.