



WORKSHEET 1: CALCULATING YOUR GREENHOUSE GAS EMISSIONS FROM REFRIGERANTS

This worksheet will assist you in working out your greenhouse gas (GHG) emissions from refrigerants. Below you will find key emission factors and calculation methodologies that will facilitate the process. Overleaf you will find tables to help you calculate emissions for air conditioning and refrigeration your company undertakes.

Many commonly used refrigerants are chemicals referred to as Hydrofluorocarbons (HFCs), which are an important greenhouse gas. Small amounts of HFCs are released from refrigerators and air conditioners (including in vehicles), and any of these units that your company has control over need to be included in your carbon footprint.

KEY TERMS

- **Recharge Capacity** is the amount of refrigerant stored in the refrigerator or air conditioning unit
- **Leakage Rates** is the average amount of refrigerant lost from the unit every year
- **Global Warming Potential (GWP)** is a relative scale which enables a comparison to be drawn between the six Kyoto Protocol greenhouse gases. Each GHG is given a number based on their effect on the atmosphere relative to CO₂ (where CO₂ has a GWP of 1). HFC is a group of these of greenhouse gases with varying GWP 's (See table below).

KEY DATA NEEDED

- Number and type of units releasing refrigerants
- Refrigerant type and kilograms (kg) of recharge capacity and for each unit. This can be sourced from:
 - Air conditioning chillers and modular units – visual readings on the equipment, equipment manuals or maintenance records
 - Refrigeration units – visual readings on the equipment

CALCULATION PROCESS:

1. Find the number of air conditioning and refrigeration units, their refrigerant type and recharge capacity and enter this into **Sections 1, 2, 3 or 4** overleaf depending on the type of unit.
2. In all Sections, multiply the recharge capacity for each unit by the annual leakage rate to calculate the annual refrigerant leakage from each unit.
3. Then multiply this annual refrigerant leakage for each unit by its global warming potential (see table below) to find the greenhouse gas emissions from refrigerants.

CALCULATION METHOD SUMMARY

$$\text{GHG emissions from refrigerants (kg CO}_2\text{-e)} = \text{Recharge capacity (kg)} \times \text{Annual leakage rate} \times \text{Global Warming Potential}$$

KEY EMISSION FACTORS

Annual leakage rates

→ Air conditioners/chillers	0.09 (9%)
→ Commercial refrigeration including supermarket systems	0.23 (23%)
→ Industrial refrigeration including food processing and cold storage	0.16 (16%)
→ Vehicle air conditioning systems	0.15 (15%)

Common HFC refrigerants Global Warming Potential

→ HFC 134a	1300
→ R404a	3260
→ R407b	2285
→ R407c	1526
→ R410A	1725

Source: Department of Climate Change NGA Factors Workbook, November 2008 & AGO Factors & Methods Workbook, Dec 2006
 NB NGA Factors Workbook is generally updated on an annual basis, therefore please ensure you are referring to the most recent edition

KEY RESOURCES:

Department of Climate Change, **National Greenhouse Accounts (NGA) Factors**, November 2008
 World Resources Institute and World Business Council for Sustainable Development, **Greenhouse Gas Protocol**, 2007
 EPA Victoria, **Greenhouse Inventory Management Plan 2006/07**

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SECTION 1: CALCULATING AIR CONDITIONING CHILLERS AND MODULAR UNITS GHG EMISSIONS

Unit	Refrigerant type	Refrigerant recharge capacity (kg)	Annual leakage rate	Global warming potential (GWP)	GHG emissions/year (kg CO ₂ -e)
		X	0.09	X	=

SECTION 2: CALCULATING COMMERCIAL REFRIGERATOR GHG EMISSIONS

Unit	Refrigerant type	Refrigerant recharge capacity (kg)	Annual leakage rate	Global warming potential (GWP)	GHG emissions/year (kg CO ₂ -e)
		X	0.23	X	=

SECTION 3: CALCULATING INDUSTRIAL REFRIGERATOR GHG EMISSIONS

Unit	Refrigerant type	Refrigerant recharge capacity (kg)	Annual leakage rate	Global warming potential (GWP)	GHG emissions/year (kg CO ₂ -e)
		X	0.16	X	=

SECTION 4: CALCULATING VEHICLE AIR CONDITIONING UNITS GHG EMISSIONS

Unit	Refrigerant type	Refrigerant recharge capacity (kg)	Annual leakage rate	Global warming potential (GWP)	GHG emissions/year (kg CO ₂ -e)
		X	0.15	X	=