

Ireland needs to modify how it meets its Cooling Needs – *progressive and significant changes in refrigerant gas supply*

Key Points

Updated EU Regulation: Updated EU F-gas Regulations aim to cut the EU's Fluorinated gas (F-Gas) emissions and reduce HFC refrigerant gas (a category of F-Gases) supply significantly by 2030. High Global Warming Potential (GWP) refrigerant gases will be considerably impacted through the HFC phase down and restrictions on their use for maintenance of equipment. The F-gas phase down is being administered by the European Commission using a quota system.

The Quota system and its impact: Each producer or importer of bulk HFC refrigerant gases (with some exceptions) must obtain quota in order to place them on the market. The F-gas phase down reduces the quota available between 2015 and 2030 by 79% in a stepwise fashion. The commercial impact of this phase down will reduce the availability of higher GWP gases and make them more expensive.

Use of F-gases in Ireland: The maintenance of critical refrigeration, air conditioning, heat pump and fire suppressant equipment in Ireland relies heavily on HFC refrigerant gases and in particular HFCs with a high GWP. Over 90% of the bulk gas purchased in 2015 for distribution in Ireland consisted of HFCs.

Irish uptake of alternative gases: Although low-GWP HFC's and HFC-free alternatives such as CO₂ and ammonia are available and well established in Europe as refrigerant gases, uptake across Irish users is slow.

Options for end-users: The most straightforward option to comply with the HFC phase-down is to avoid installing new equipment that relies on HFCs and to modify existing equipment to use refrigerant gases with lower GWP pending replacement by more permanent solutions.

Irish Quota: Irish gas distributors only held enough quota to potentially satisfy 21% of their HFC needs in 2015. Irish distributors are highly reliant on quota held by companies in other EU Member States, particularly the UK.

Implications of Brexit: Brexit may impact on the purchase of gases from the UK as these gases may in future require quota to be placed on the Irish market from the UK. An EU solution needs to be found.

Reclamation of gas in Ireland: There are currently no refrigerant gas reclamation facilities in Ireland. High GWP reclaimed gas can be used in maintenance until 2030 under the new Regulations. Gases recovered from business in Ireland are directed to the UK for destruction or reclamation. Brexit may have implications for this practice.

Introduction

In Ireland, the operation and maintenance of refrigeration, air conditioning, heat pump and fire suppressant equipment is heavily reliant on a category of fluorinated greenhouse gases (F-gases) known as hydrofluorocarbons (HFCs). Regulation (EU) No 517/2014 on fluorinated greenhouse gases aims to cut F-gas emissions by two-thirds by 2030 through several measures including a phase down of HFC use. This will require the transition to equipment which relies on either less damaging HFCs or non-fluorinated gases. This paper aims to summarise Ireland's progress towards the HFC phase down and to highlight potential issues around continued operation of critical equipment.

Background

Fluorinated greenhouse gases are a family of man-made gases used in a range of refrigeration, air conditioning, heat pump and fire suppressant equipment. Because they do not damage the atmospheric ozone layer, they have been used as replacement gases for the now-banned ozone-depleting substances. However, F-gases are powerful greenhouse gases and this effect is expressed for each gas through its Global Warming Potential (GWP) value¹. F-gases have various GWP values up to 23,000 tCO₂eq.

The European Union has taken action to control F-gases as part of its policy to combat climate change. The first F-gas Regulation was adopted in 2006 and succeeded in stabilising F-gas emissions at 2010 levels². However, during 2015 F-gases still accounted for approximately 3% of overall EU greenhouse gas emissions³. The most recent F-Gas Regulation (EU No 517/2014) aims to substantially reduce F-Gas emissions by the following measures:

- **Placing on the Market⁴ Bans for Equipment Relying on HFC Refrigerants for their function (Article 11, Annex III):** Bans on the sale of specified categories of equipment by gas type and/or quantity are set for various dates from July 2007 until January 2025. For instance, stationary refrigeration that relies on refrigerant gases with a GWP \geq 2,500 cannot be placed on the market from January 2020.
- **Control of Use of HFC Refrigerants (Article 13):** The service and maintenance of equipment containing \geq 40 tCO₂eq of F-Gases with a GWP \geq 2,500 will be prohibited from January 2020 for virgin gases with the use of recycled and reclaimed gases allowed until January 2030; and,
- **Reduction in the Quantity (Phase Down) of HFC Refrigerants placed on the Market⁵:** Since 2015, the amount of bulk HFC gases that can be placed on the market by importers or producers has been subject to quantitative limits. These limits will decrease in a series of step-downs until 2030 when the annual quantity of HFCs placed on the market and available to operators will be

¹ Global Warming Potential or GWP means the climatic warming potential of a greenhouse gas relative to that of carbon dioxide (CO₂), calculated in terms of the 100-year warming potential of 1 kilogram of a greenhouse gas relative to 1 kilogram of CO₂. GWP is measured in tones carbon dioxide equivalent (tCO₂eq)

² https://ec.europa.eu/clima/policies/f-gas_en

³ Fluorinated Greenhouse Gases 2015 – summary of data reported by companies on the production, import and export of fluorinated greenhouse gases in the European Union (European Environment Agency, EEA Report No 33/2016)

⁴ 'Placing on the market' means supplying or making available to another party in the Union for the first time, for payment or free of charge, or using for its own account in the case of a producer, and includes customs release for free circulation in the Union.

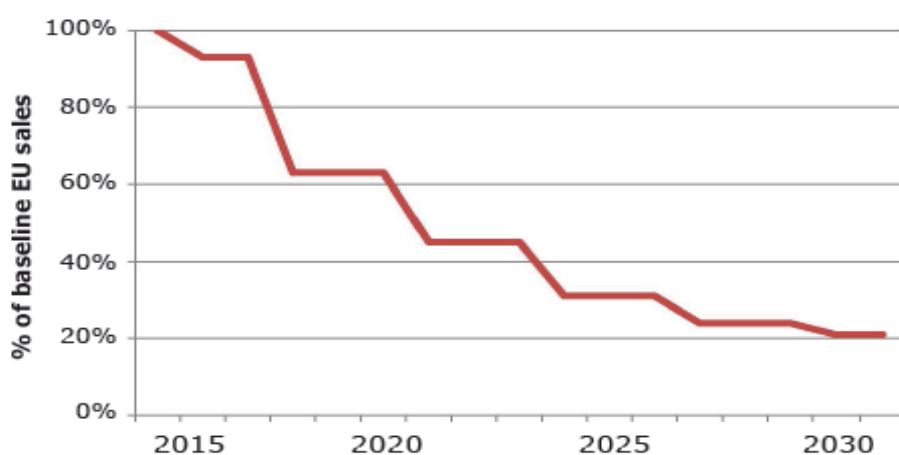
⁵ Various exemptions to these measures such as their use in semiconductor etching and metered dose inhaler manufacture are not discussed in this paper as they are not relevant to its purpose. Refer to EPA guidance for more information on the HFC phasedown at

<http://www.epa.ie/pubs/advice/air/ods/6irlsummaryguidetothehfcphasedownv10.html>

reduced by 79% of the baseline (see Figure 1). Baseline data is the annual average of gas sales from 2009-2012.

This cap and phase-down of HFCs is implemented through an annual quota system, calculated on a CO₂ equivalent basis, which is operated and tracked by the European Commission. Thus, each company must hold sufficient quota to legally place HFC bulk gases on the EU market for the first time. It is worth noting that quotas are allocated directly to companies by the EU Commission rather than to Member States.

Fig. 1: HFC Phase down Schedule



In addition to bulk gas production and imports, the gases in refrigeration, air conditioning and heat pump equipment precharged with HFCs must be accounted for from the quota since January 2017 (Article 14). Precharged equipment typically consists of smaller items such as domestic appliances and vehicle air conditioning systems.

The use and import of HFCs in precharged equipment is implemented by means of authorisations issued by a quota holder which permits the use of their quota by precharged equipment manufacturers or importers. An authorisation is considered placed on the market by the importer or producer of bulk gases (the quota holder) at the time when it is given, even if it is used in a later year. On the other hand, unused bulk gas quota cannot be carried over by a quota holder from one year to the next.

EU Progress on the Phase Down of HFC Refrigerant Gases

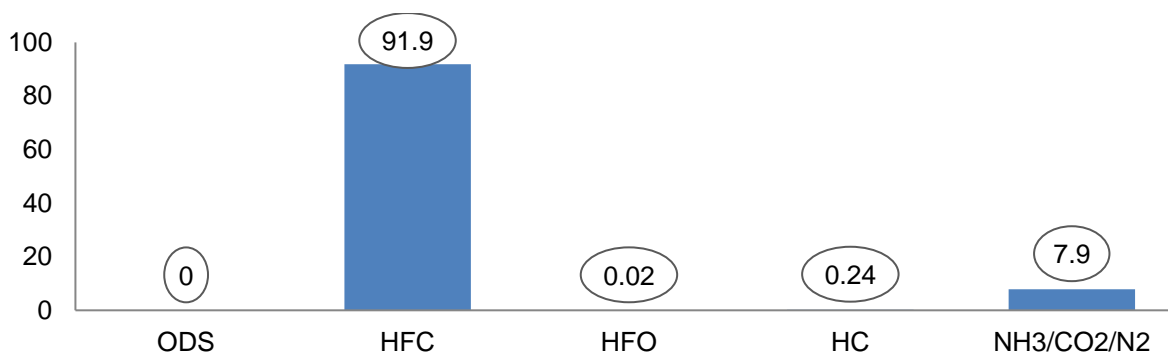
The monitoring of the HFC phase-down relies on the annual reporting of HFCs placed on the market by quota holders to the EU Commission through an EU wide electronic registry. For the EU as a whole, a quota of 183 million tonnes CO₂ equivalent was allocated for placing on the market during 2015 (the first year of the HFC phase down process). The total amount of compliance-relevant HFCs actually placed on the market for 2015 amounted to 168 Mt CO₂eq, meaning that 8% of the 2015 quota was unused.

Survey of Bulk Refrigerant Gases Purchased in Ireland during 2015

There are six distributors in Ireland that supply bulk refrigerant gases. The EPA surveyed these in order to obtain their bulk gas purchase data for 2015.

A total of 442 metric tonnes of bulk refrigerant gas was purchased for distribution in Ireland during 2015, mainly originating in the UK with smaller quantities coming from Belgium and Greece. See Figure 2 for a breakdown of gas types. HFCs dominated the market at 91.9% in 2015 and, with GWP values ranging from 1,430 tCO₂eq to 14,800 tCO₂eq, these gases amount to 1.24 million tonnes CO₂ equivalent. This represents 0.7 % of the total HFCs placed on the market in the EU during 2015.

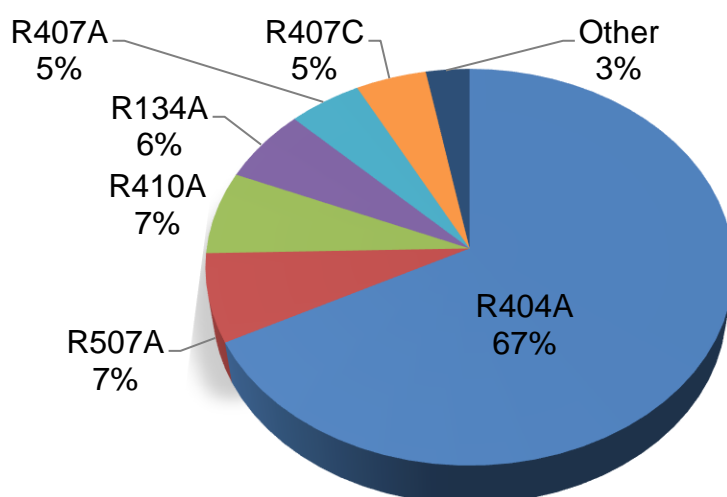
Fig. 2: Percentage bulk gas purchased during 2015*



*Note: HFOs, HC and NH₃/CO₂/N₂ are alternative gases that could be employed in place of HFCs. Also, it is encouraging that no Ozone Depleting Substances were purchased

An analysis of the type of HFC gas purchased by Irish Distributors is shown in Figure 3. HFC gas R404A⁶ accounted for 67% by tCO₂eq of all HFCs purchased, indicating that Irish end-users are hugely reliant on this gas to maintain their systems.

Fig. 3: Bulk HFCs purchased by Irish Distributors in 2015 (in % tCO₂ equivalent)



⁶ Chemical refrigerants are assigned an R number based on a system developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers

Irish Progress on Phase Down

HFC gases were the dominant bulk refrigerant gases purchased (91.9%) in Ireland during 2015 to service refrigeration, air conditioning and fire suppressant systems. A further analysis of the gas profile in Ireland during 2015 shows that 77% by tCO₂eq, of purchased HFCs had a high GWP ($\geq 2,500$). This is a serious concern as these gases are particularly affected by the HFC reduction measures and are becoming increasingly expensive due to the decreased market availability. Thus, it is important that Ireland transitions quickly to low GWP alternatives.

Interim solutions are needed to allow the continued functioning of critical equipment during this transition, this means either replacing high GWP HFC refrigerant gases with low/intermediate GWP HFC gases (by the minor modification of existing equipment), where feasible; and recovery/reclamation and banking of high GWP HFC gases to allow for the ongoing maintenance of existing equipment until 2030 (reclaimed gases are not subject to quota restrictions).

Another opportunity to reduce HFC consumption is to prevent gas leakage as required under the F-Gas regulation.

Control of Use measures in Ireland

HFCs refrigerant gases with a GWP $\geq 2,500$ accounted for 60% by weight or 77% by tCO₂eq of HFCs purchased during 2015, with the HFC gas R404A alone accounting for 67% by tCO₂eq of all HFCs purchased. No reclaimed gas was purchased for distribution during 2015 in Ireland. This shows that the market for reclaimed gases has not yet developed. At a European level the overall reclamation levels of fluorinated gases are still low at less than 1% of bulk supply in 2015 (no R404A was reclaimed at all⁷). The current significant dependency on HFCs with a GWP $\geq 2,500$ poses a risk to the continued operation of equipment which rely on these gases both due to the Control of Use and the Phase Down measures. Consequently, **new equipment which relies on HFCs with a GWP $\geq 2,500$ should no longer be installed** and existing systems which are not to be decommissioned should have replacement lower GWP gases installed where feasible.

Where is the HFC Quota for gases distributed in Ireland coming from?

Three of the six Irish wholesalers held quota allocated by the EU Commission for 2015 totalling 0.26 million tonnes CO₂ equivalent compared with the 1.24 million tonnes CO₂ equivalent of bulk HFC gas actually purchased. Irish distributors relied on quota held by suppliers or producers in other Member States, and principally the UK, to satisfy Irish demand. Brexit is likely to have implications for Ireland in that gases from the UK may no longer be part of the EU quota system and Irish distributors may need to hold quota to cover their purchases from UK gas suppliers after Brexit. Arrangements are being considered by the EU Commission to deal with this issue at the behest of Ireland.

Alternatively, or additionally, Irish importers may seek alternative sources of gas from other EU quota holders and/or increase the quantity of Irish quota held to meet their needs.

⁷ European Environment Agency - EEA Report No 33/2016

Recommendations

- New equipment which relies on HFCs with a GWP $\geq 2,500$ tCO₂eq should no longer be installed unless there are unavoidable technical reasons. Equipment using natural refrigerants or ultra-low GWP HFC refrigerants should be installed instead.
- Operators should, where feasible, use lower GWP gases as replacement “drop-in” gases *in lieu* of HFC’s with a GWP $>2,500$ tCO₂eq on existing equipment as an interim measure.
- In order to ease difficulties during the transition to low GWP alternatives recovered gases should be banked and reclaimed. This requires infrastructure and smart planning by operators.
- It is essential that additional quota be obtained by Irish gas distributors to guarantee gas supply to the fullest extent possible during the phase down.
- Ireland needs to prepare for the impact Brexit may have on its reliance on the UK for its supplies of F-Gases and as a destination for the reclamation or destruction of recovered gases.
- The promotion of the transition to low GWP or alternative gases amongst operators is essential.
- It is important that contractors who install, service, maintain and decommission F-gases upskill to facilitate the handling of low GWP and alternative gases.

Further Information:

- [Regulation](#) (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
- Summary [Guide](#) to the HFC Phase Down (EPA, 2015, V1.0).
- A [video](#) from EPEE (European Partnership for Energy and the Environment (EPEE) which represents the refrigeration, air-conditioning and heat pump industry in Europe) provides information about the phase down in the new EU F-Gas Regulation.
- EPEE has developed an innovative tool known as the EPEE Gapometer Roadmap to measure compliance with the EU F-Gas Regulation, and in particular the phase down of HFCs. A short [video](#) on this tool is available.
- Fluorinated Greenhouse Gases [2015](#) – summary of data reported by companies on the production, import and export of fluorinated greenhouse gases in the European Union (European Environment Agency, EEA Report No 33/2016). <https://www.eea.europa.eu/publications/fluorinated-greenhouse-gases>
- Information for importers of equipment containing fluorinated greenhouse gases on their obligations under the EU F-gas Regulation (EU Commission): https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/guidance_equipment_importers_en.pdf
- Information for technicians and users of refrigeration, air conditioning and heat pump equipment containing fluorinated greenhouse gases (EU Commission): https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/f-gas_equipment_operators_en.pdf
- Retail Refrigeration -Making the Transition to Clean Cold (University of Birmingham, 2017): <https://www.birmingham.ac.uk/research/activity/energy/research/bei-retail-refrigeration-transition-clean-cold.aspx>
- Chilling Facts VII (European Investigation Agency, June 2017): The latest EIA report focusing on the progress of major supermarket chains in moving away from the use of climate-damaging refrigerants and warning of potential financial problems for slow adopters: <https://eia-international.org/report-category/chilling-facts>