F-Gas Regulation Briefing Note – Commercial Refrigeration

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Commercial refrigeration is poised to eliminate HFCs

This fact sheet provides information on phasing out hydrofluorocarbons (HFCs) in commercial refrigeration in the European Union. It is intended to inform revisions to the F-Gas Regulation, which are currently under consideration. The term "commercial refrigeration" covers several applications such as stand-alone systems, condensing units and centralized systems.

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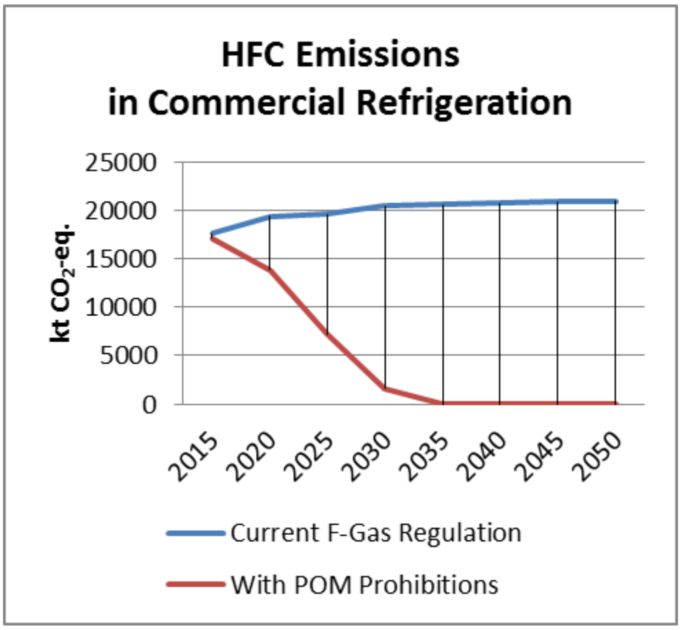
Emission trends and alternatives

HFC emissions from commercial refrigeration will continue to undermine climate objectives unless action is taken soon. Assuming full implementation of the F-Gas Regulation, HFC emissions from this sector will rise steadily over time without additional measures.[1] With the average lifetime of the equipment ranging from 10 to 15 years, there is a need to prevent new HFC-based equipment from being placed on the market to achieve climate targets in 2030 and beyond.



Several recent studies have identified technically feasible and safe alternatives already in use in the European Union.[2] The alternatives vary for each application, but mostly rely on natural refrigerants such as isobutane, propane, and carbon dioxide.[3] A recent European Commission-funded study analyzed the market penetration of alternatives and found that new HFC-based equipment could be prohibited from being placed on the market in 2020.[4] These additional measures would prevent over 559 Mt/CO_2-eq. emissions through 2050,[5] resulting in significant reductions of HFC emissions on a timescale responsive to climate science.

Energy efficiency

All HFC-free alternatives achieve at least equal energy efficiency and more often result in energy savings compared to HFC-based equipment – up to 7.5%.[6] This is particularly relevant in light of the EU Energy Efficiency Plan, which sets out a 2020 target of 20% reduction in energy consumption compared to projections.[7] Increased energy efficiency decreases reliance on fossil fuels and reduces running costs for consumers.

Cost effectiveness

On a CO_2-equivalent basis, alternatives are very cost-effective. Banning the use of HFCs in this sector with placing on the market (POM) prohibitions will achieve significant GHG reductions, generally at much lower costs than containment and recovery measures, as demonstrated in Table 1.[8]

* The Environmental Investigation Agency (EIA) is an independent campaigning organisation committed to bringing about change that protects the natural world from environmental crime and abuse. For more information, contact ukinfo@eia-international.org.

Table 1: Effectiveness of Placing HFC-Based Equipment and Alternatives on the Market

Subsector	Containment and Recovery		POM Prohibition	
	GHG Emissions Abated	Abatement Cost (t/CO_2-eq.)	GHG Emissions Abated	Abatement Cost (t/CO_2-eq.)
Stand-Alone Systems	40%	€ 125.0	99.9%	- € 0.79
Condensing Units	42%	€ 87.1	99.9%	€ 1.2
Centralized Systems	40%	€ 6.4	99.9%	€ 23.73

By comparison, the Stern Review suggests that the social cost of carbon today is approximately €64.5/t CO_2-eq.,[9] a figure well above the abatement costs in this sector, including centralized systems. Switching to HFC-free alternatives is sound public policy.

From an end-user perspective, consumers can expect to save money over the lifetime of alternatives or only relatively low additional costs, as demonstrated in Table 2.[10] Because HFC-based equipment has achieved significant economies of scale, upfront investment costs are lower. But HFC-based equipment has higher annual running costs due to higher energy consumption, costs of refills and regulatory compliance. For these reasons, many alternative technologies more than make up the higher upfront investment costs during their 10- to 15-year lifetime through lower annual running costs resulting in end-user cost savings. For those that do not payback, the incremental costs are relatively low compared to lifetime costs. Nevertheless, to overcome any barriers to adoption resulting from higher upfront investment costs, especially for small-and medium-sized enterprises (SMEs), Member States can design support schemes to minimize those costs and promote taxes on HFC use.

Table 2: Costs to End Users of HFC-Based Equipment and HFC-Free Alternatives

	Refrigerant	Upfront Costs	Annual Costs	Lifetime Costs	Cost Differential
Stand-Alone Systems	**HFC-134a**	**€ 1,004**	**€ 254**	**€ 3,549**	---
	Isobutane/Propane	€ 1,101	€ 240	€ 3,507	- € 41
	CO_2	€ 1,201	€ 240	€ 3,608	+ € 59
Condensing Units	**HFC-134a**	**€ 8,120**	**€ 3,233**	**€ 56,618**	---
	Propane	€ 9,620	€ 2,976	€ 54,260	- € 2,357
	CO_2	€ 10,292	€ 3,027	€ 55,700	- € 917
	Propane + Liquid	€ 12,008	€ 3,066	€ 58,010	+ € 1,392
Centralized Systems	**HFC-404a**	**€ 323,450**	**€ 25,440**	**€ 628,732**	---
	HC + CO_2 + Liquid	€ 371,315	€ 24,545	€ 665,858	+ € 37,125
	HC + CO_2 + Cascade	€ 368,288	€ 22,731	€ 641,066	+ € 12,334
	CO_2	€ 384,920	€ 23,326	€ 664,836	+ € 36,104

Policy recommendations

Policymakers should revise Annex II of the F-Gas Regulation to include POM prohibitions on HFCs in commercial refrigeration starting in 2020:

Fluorinated Greenhouse Gases	Products and Equipment	Date of Prohibition
Fluorinated GHG gases	Stand-Alone Systems	1 January 2020
Fluorinated GHG gases	Condensing Units	1 January 2020
Fluorinated GHG gases	Centralized Systems	1 January 2020

In the years leading up to the POM prohibition, policymakers should consider a gradual phase-down of HFC-based equipment through quantitative limits on new units placed on the market. This will promote the progressive uptake of alternatives in advance of the POM prohibition, providing certainty of investment and preventing market disruptions.

Environmental Investigation Agency
May 2012

[1] Öko-Recherche *et al.*, *Preparatory Study for a Review of Regulation (EC) No 842/2006 on Certain Fluorinated Greenhouse Gases, Final Report* (September 2011)[hereinafter "Öko-Recherche Study"], Annex VI, pp. 280-289 (chart produced from data provided by Öko-Recherche).
[2] *See e.g.* Öko-Recherche Study; Umweltbundesamt, *Avoiding Fluorinated Greenhouse Gases: Prospects for Phasing Out* (June 2011, English Version); European Commission, *Report from the Commission on the Application, Effects and Adequacy of the Regulation on Certain Fluorinated Greenhouse Gases (Regulation (EC) No 842/2006)* (September 2011).
[3] Öko-Recherche, Study, Annex V, pp. 245-247 and Annex VI, pp. 280-289.
[4] Öko-Recherche, Study, pp. 262-264, 292 (market penetration of alternatives is close to or over 100%).
[5] *See generally* Öko-Recherche Study, Annex V, pp. 245-247 and Annex VI, pp. 280-289 (figure derived from data provided by Öko-Recherche).
[6] Öko-Recherche, Study, Annex V, pp. 245-247 (chart produced from Öko-Recherche data); *see also* Environmental Investigation Agency, *Chilling Facts III: Supermarkets Are Reducing the Climate Change Impact of Refrigeration* (2011), *available at* www.chillingfacts.org.uk.
[7] European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Energy Efficiency Plan 2011* (8 March 2011), SEC (2011) 280 final, p. 2.
[8] Öko-Recherche, Study, Annex V, pp. 245-247 (abatement cost of containment and recovery determined by dividing the additional annual cost of containment and recovery measures by the GHG reductions achieved from those measures; cost of POM prohibitions already outlined for each subsector).
[9] Stern, N. *et al.*, *The Economics of Climate Change: The Stern Review*, Cambridge University Press (2007).
[10] Öko-Recherche, Study, Annex V, pp. 245-247 (chart produced from Öko-Recherche data; upfront costs represent initial cost of the hardware plus cost of first fill).