THE EU REGULATIONS – EMISSION LEVELS, ENERGY EFFICIENCY AND TECHNICAL QUALIFICATIONS

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Abstract

Fluorinated greenhouse gas emissions are on track for the levels targeted in the European Climate Change Program. Since the contribution of F-gases is likely to remain below 2% of total greenhouse gas emissions, greater focus should be given to achieving substantial improvements in energy efficiency, and thereby CO2 emissions which currently represent over 80% of total Greenhouse gas emissions in the EU.

Both the EPBD and the EuP directive provide ample scope in this respect. The EPBD in particular may well offer the best opportunity as it sets targets, but refrains from being prescriptive with regard to choice of technology.

Technical qualifications of servicing personnel should not just focus on emission prevention for F-gases. They should rather cover the whole range of maintenance activities aimed at ensuring a high level of performance of equipment over the full life-cycle of the equipment concerned. Of equal importance is the proper design of systems to ensure that they can be properly maintained and decommissioned.

Both monitoring and enforcement are a source of concern in the draft F-gas regulation.

Introduction

On March 7, 2004 the Council of the European Union has finally published its Common Position on the European Commission's proposal for a F-gas Regulation[1]. The Common position completes the First Reading of the proposal. European Parliament (EP) will start the Second Reading of the proposal in September. Since the opinion of the EP and the Council do not seem to diverge too strongly, the working assumption is that the final Regulation will essentially reflect the Common Position.

The key objective of the Regulation is to ensure that the projected growth of F-gas emissions as estimated in the European Climate Change Program from 65 million tons of CO_2-equivalent ($mtCO_2$-eq) in 1995 to 98 $mtCO_2$-eq in 2010 will not occur.[2] In other words, the goal is stabilization of F-gas emissions at 1995 levels in the European Union. To achieve this goal, the Regulation relies strongly on containment and emission prevention in the Refrigeration, Heat Pump and

Air-Conditioning sectors. This approach recognizes the value F-gases bring in terms of safety, energy efficiency and cost-effectiveness.

The predominant instruments to achieve effective containment are:

- Frequent Inspections and mandatory repair of faulty systems
- Logbooks, recording losses and repairs
- Certification of personnel authorized to inspect and repair equipment
- Mandatory recovery for recycling, reclamation and end-of-life destruction.

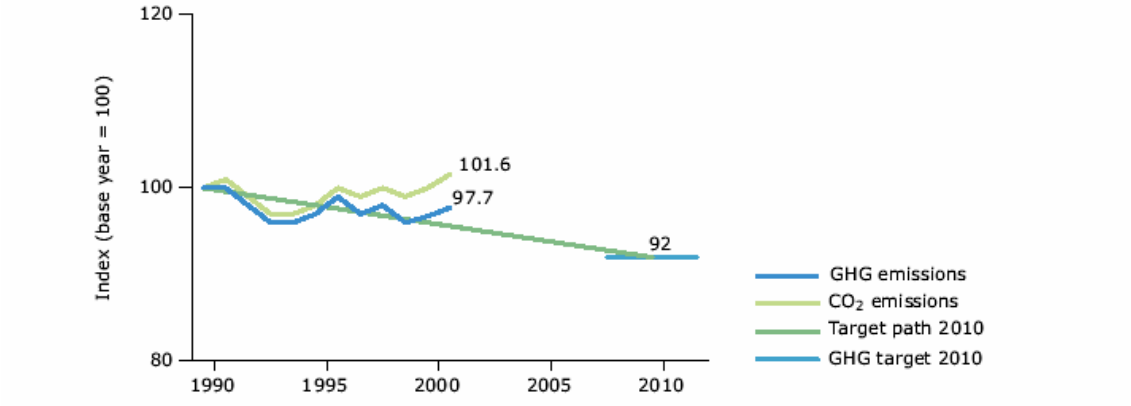
At the same time, the EU is developing or has developed extensive legislation with a view to enhance the energy efficiency of equipment and buildings. Prime examples are the Energy Performance of Buildings Directive (EPBD)[3], and the draft directive on Energy Using Products (EuP)[4]. The obvious goal of these initiatives is to reduce CO_2 emissions in the EU resulting from energy consumption.

This paper attempts to assess the extent to which the F-gas regulation and these other initiatives are complementary or conflicting.

Current and Projected Fluorinated Greenhouse Gas Emissions

In its 2003 report the European Environmental Agency presented the graph (figure 3) below on the state of play of Greenhouse gas emissions[5]:

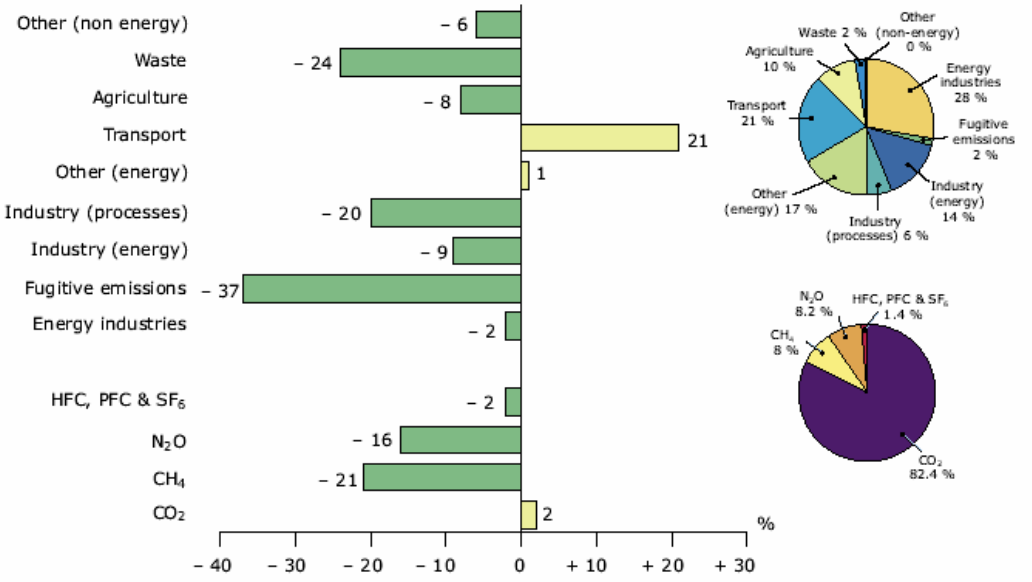
Figure 3 **EU greenhouse gas emissions compared with the Kyoto target for 2010 (excluding LUCF)**



The graph clearly shows that non CO_2-emissions are declining rapidly, taking into account that CO_2-emissions account for over 80% of total greenhouse gas emissions.

Since F-gases were hardly used in the baseline years (1990 or 1995), it should come as no surprise that their emission levels have increased during the past decade. They still represent less than 2% of overall emissions as shown in the graph below[5]:

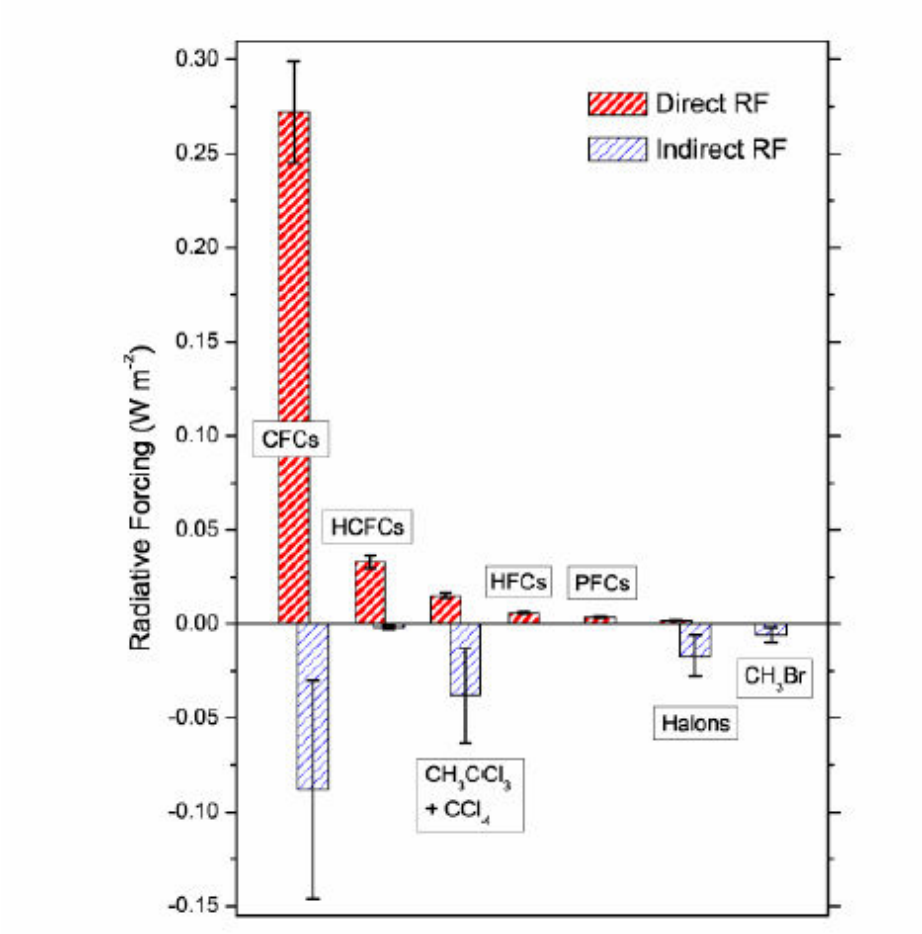
Figure 4 **Change, base year to 2001 for EU-15 greenhouse gas emissions by sector and gas and their share in 2001**



Source: EEA (2004)

Whereas total F-gas emissions have fallen by 2%, CO_2 emissions have increased by 2% vs the baseline, which in the case of F-gases was very small and of CO_2 substantial.

This is all the more striking since, in a recent report, the Intergovernmental Panel on Climate Change expressed the expectation that F-gases in a Business as Usual scenario would contribute to approx. 1% of radiative forcing caused by man-made emissions of Greenhouse Gases by 2015[6]. More interestingly, the IPCC/TEAP report notes a substantial improvement in overall climate change impact associated with Fluorocarbons, taking into account that Ozone Depleting Substances are excluded from the Kyoto Protocol basket of Greenhouse gases, despite their substantial Global Warming Potentials as illustrated by the graph below.



From SROC (Figure SPM-2):
Direct and indirect radiative forcing (RF) due to changes in halocarbons from 1750 to 2000.[1]

These data would seem to confirm that F-gas emissions in the EU are on track to meet the objective of the F-gas regulation. Moreover, the substitution of CFCs by HFCs has resulted in a substantial overall reduction in GWP-weighted emissions.

Energy Efficiency

The second question to address is if the use of F-gases can actually contribute to greater energy efficiency, and thus reduction of indirect CO_2-emissions associated with the combustion of fossil fuels for heating or power generation.

In essence, fluorocarbons are fluorinated hydrocarbons. The fluorination process renders hydrocarbons more stable and therefore reduce or eliminate some undesirable aspects in terms of flammability and explosiveness. At the same time they permit the development of fluids and blends that offer superior performance properties in specific temperature ranges.

There is a wide body of literature[7] that suggests that the design of the system is more important than the selection of fluid, which may bring marginal improvements. To the extent that these fluids require additional engineering to ensure their safe us, this may divert resources that could have been dedicated to the further improvement of energy efficiency[8]and thus CO_2-emissons over the full life-cycle of the system.

The EPB-directive focuses on the total energy performance of a building. Article 9 of the Directive requires a regular inspection of air conditioning systems (and of boilers, but curiously not of heat pumps). The inspection should include an assessment of the air-conditioning efficiency. This is a welcome addition to the inspection requirements of the F-gas regulation which will be discussed further in the next section. What is particularly important is that the EPB-Directive aims to set minimum performance targets, and is not prescriptive on the technologies that can be used. This approach will favor the development of cost-effective technologies and can be expected to enhance the competitiveness of the industry.

The draft EuP directive requires as one of the options a full Environmental Performance Assessment of energy using products and components. It must be noted that there is already legislation on the statute book that permits the EU to set minimum energy efficiency standards for certain categories of electrical equipment[9], as well as providing for ecolabels[10]. The risk is that the EuP directive will lead to a more prescriptive approach as is evidenced in the Ecolabelling regulations. Setting clear performance targets would seem to be simpler, easier to verify and more cost-effective.

By ensuring the widest possible choice of fluids, including F-gases, and by focusing on high performance targets, the European legislation can make a substantial contribution to an overall reduction of Greenhouse gases.

Technical Qualifications and Emission Prevention

Whereas the proper design of equipment is a very important aspect of achieving energy efficiency, experience shows that proper maintenance is a key factor in achieving the potential efficiency levels. Heat exchangers typically are a major factor in the total performance of a cooling system. Their performance also quickly deteriorates if their surface is affected by dust, etc. In practice, heat exchangers tend to be cleaned once a year at best.

Similarly, even if a system is designed for outstanding performance, if it is not designed for proper maintenance, its performance in practice can be expected to rapidly take a turn for the worse.

These examples show that there is a need for a solid level of technical qualifications across the whole spectrum of activities: design, installation and (de-)commissioning, and maintenance. In this respect, it is doubtful if the requirements of F-gas regulation are either necessary or sufficient. The qualifications should not be related to the use of a particular type of fluid, but more broadly to the performance of the total system. In effect, loss of fluids has an impact on the performance of the system, irrespective if the fluid is a Fluorinated Greenhouse Gas, CO_2, ammonia or a hydrocarbon.

The F-gas regulation quite correctly requires frequent inspections of systems for leakage by properly qualified personnel. It is however questionable if the modalities of the inspections, or indeed the qualifications of the technicians, should be delegated to the Management Committee under the F-gas regulation. Arguably, this level of detail is better delegated to technical standards organizations. EN 378 would seem to be an adequate starting point.

Fortunately, AREA has taken the initiative to broaden the scope of the qualifications with the support of the European Commission under the Leonardo programme[11].

Monitoring and Enforcement

The effectiveness of the F-gas regulation will depend on whether it will result in the desired reduction of F-gas emissions. Curiously, the regulation itself does not provide for an adequate monitoring system. Owners are required to keep a logbook, but there is no obligation on the Member States to aggregate the data recorded. This is a missed opportunity to gather accurate grass roots data on the emission levels.

The EPBD may offer a better opportunity of monitoring, even if there is no provision requiring performance monitoring, apart for the certification process. The current experience suggests that there is a conflict of interest between the owner of large buildings and its occupant(s). The owner has a distinct interest in keeping the capital outlay as low as reasonably possible, enabling to achieve the highest rate of return. The cost of operating the building is incurred by the occupant, which in all likelihood will result in suboptimal total cost of ownership. The EPBD introduces the opportunity of gain sharing, where owner and occupant share the benefits of enhanced energy performance. Through independent third party (distance) monitoring, which is readily available in the market.
Proper enforcement is often the Achilles heel of community legislation. Part of the problem is that the sheer volume of community legislation tends to fragment the available resources in the Member States. Since the character of legislation is more often than not highly technical, Member States increasingly have difficulty in attracting and retaining the properly qualified personnel. An alternative approach may be a public-private partnership, where the private

sector ensures adequate auditing and appropriate corrective actions. The role of the enforcement authorities would be supervisory, and taking sanctions where willful neglect of rules can be established.

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This contribution has been written on personal title and does not necessarily reflect Honeywell's position

Notes:

[1] Council Document reference16056/04 (http://register.consilium.eu.int/)
[2] COM (2003) 492, p. 3
[3] Directive 2002/91/EC of 16 December 2002 on the energy performance of buildings
[4] COM(2003) 453 final
[5] Analysis of Greenhouse gas emission trends and projections in Europe 2003, EEA technical report 4/2004 (http://reports.eea.eu.int/technical_report_2004_4/en/Tech_report_4_web.pdf)

[6] IPCC/TEAP Special Report on Ozone and Climate, Summary for Policy makers, p 6 (2004)
[7] IPCC/TEAP Special Report (2004), various TEAP Reports, US EPA 2003
[8] University of Maryland, Center of Environmental Energy Engineering (2004)
[9] e.g. Directive 96/57/EC on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof (OJEC L 236, 18.9.96).
[10] Regulation (EC) 1980/2000 on a revised Community eco-label award scheme (OJEC L 237, 21.9.2000)
[11] AREA 2004 (http://www.area-eur.be/_Rainbow/Documents/MGfinal.pdf, and http://www.area-eur.be/_Rainbow/Documents/Refrigeration%20Craftsman%20V10%20+%20Competences.pdf)