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REPORT FROM THE COMMISSION

on barriers posed by codes, standards and legislation to using climate-friendly technologies in the refrigeration, air conditioning, heat pumps and foam sectors

1. INTRODUCTION

Regulation (EU) No 517/2014¹ requires a reduction in the quantities of hydrofluorocarbons (HFCs) companies may place on the market in the EU, i. e. through import or production, and thus will lead to a reduction in emissions of these powerful greenhouse gases to the atmosphere. This phase-down started in 2015 and will reduce the permitted supply of HFCs: a decrease of 79% in 2030 compared to 2009-2012. As a result, two-thirds of emissions will be saved in 2030 compared to a business as usual scenario.² Thus it will make a significant contribution to meeting the Union's climate targets.³

HFC emissions are also being addressed at global level. Under the Montreal Protocol on Ozone Depleting Substances an agreement has been reached this year to phase down the global consumption and production of HFCs. This will facilitate a worldwide reduction in greenhouse gas emissions in the context of the Paris Agreement.⁴

Manufacturers of equipment and products using HFCs must therefore shift to the use of more climate-friendly alternatives. As technological progress has made large strides in recent years, a shift to suitable and energy-efficient alternatives with a low global warming potential (GWP) has become feasible for many types of equipment and products.⁵ However, non-technological barriers may put this transition to more climate-friendly alternatives at risk and result in higher costs than necessary.

In order to smooth the introduction of the HFC phase-down measure and support the development of green technologies, the co-legislators decided to ask the Commission to map potential restrictions on the placing of climate-friendly alternatives on the market. Article 11(6) of Regulation (EU) No 517/2014 mandates the Commission to "*collect, on the basis of available data from Member States, information on national codes, standards or legislation of Member States with respect to replacement technologies using alternatives to fluorinated greenhouse gases in refrigeration, air-conditioning and heat pump equipment and in foams.*" The Commission shall publish a synthesis report on the information collected by 1 January 2017.

¹ OJ L 150, 20.05.2014, p.195.

² Commission Staff Working Paper: Impact assessment - Review of Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases, 7.11.2012, SWD(2012) 364 final. http://ec.europa.eu/clima/policies/f-gas/legislation/docs/swd_2012_364_en.pdf.

³ Communication from the Commission to the European Parliament, the Council, the European Economic and Social committee and the Committee of the Regions: A policy framework for climate and energy in the period from 2020 to 2030, COM(2014)/015 final: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0015>

⁴ Communication from the Commission to the European Parliament and the Council: *The Road from Paris: assessing the implications of the Paris Agreement and accompanying the proposal for a Council decision on the signing, on behalf of the European Union, of the Paris agreement adopted under the United Nations Framework Convention on Climate Change*, COM(2016) 110 final: <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-110-EN-F1-1.PDF>

⁵ Study on alternatives for high ambient temperatures, Öko-Recherche, November 2014: http://ec.europa.eu/clima/policies/f-gas/legislation/studies_en.htm

In addition to analysing the situation at a national level, this report covers legislation and standards at a European and an international level, as these standards establish benchmarks, widely used by companies, for the safe use of equipment throughout Europe. Many developing countries adopt European and international standards and make them mandatory in their own legislation. Hence, **if such standards pose unjustified barriers to the uptake of climate-friendly technologies, the undesirable impact of these standards reaches markets far beyond the EU.**

To facilitate addressing these issues the Commission has since the adoption of Regulation (EU) No 517/2014 conducted extensive consultations with stakeholders, including deliberations within the Consultation Forum established pursuant to Article 23 of the Regulation as well as tasked an external consultant to provide an analysis, including carrying out a questionnaire seeking input from Member States' authorities. This report draws upon this analysis and consultation process.

2. RELEVANCE OF CODES, STANDARDS AND LEGISLATION

Codes, standards and legislation may indirectly impact the use of alternatives to HFCs by specifying requirements for the design or manufacture of equipment and its components, the installation of equipment as well as its service, maintenance and dismantling that are not consistent with the use of a particular alternative technology.

While they may often be more climate-friendly and energy-efficient than HFCs, suitable alternatives have their own limitations such as flammability, poor material compatibility, toxicity or may require higher operating pressures. These characteristics can, however, usually be addressed through suitable product design and proper maintenance of equipment. Climate-friendly alternatives that can be used include: carbon dioxide (CO₂), ammonia (NH₃), hydrocarbons and unsaturated HFCs (HFOs).

While **safety levels should be maintained and risks minimised**, standards, codes and legislation should be adapted to technological progress and, in the context of a phase-down of HFCs and the Paris Agreement, allow the use of more climate-friendly alternatives where it is safe to do so.

2.1 Overview of relevant European level legislation and standards

Product and equipment manufacturers, installers and end-users need to comply with a range of legislation and standards applying at a European level. Some of the requirements relate to the safe use of refrigerants or foam blowing agents. However, most of the requirements do not directly relate to the use of a particular refrigerant or foam blowing agent, but cover general safety aspects.

European standards are set by the European Standardisation Bodies, CEN and CENELEC, and rely on the participation of industrial stakeholders to set the technical specifications. Contrary to legislation, the use of the standards is generally not mandatory (unless specifically taken up in legislation or in commercial contracts) but it is widely accepted that adherence to a relevant European standard is an important way of showing that the equipment is safe to

use. Consequently, despite the fact that they may not be mandatory, **standards are widely applied and thus have a significant impact.**

Some of the standards adopted at the European level are aligned with broader international standards and codes such as IEC and ISO standards. An overview of the most relevant European standards related to the use of refrigerants and foam blowing agents is shown in Table 1.

Table 1: Summary of European level standards related to applications in refrigeration, air conditioning, heat pump and foam sectors

Standard	Purpose
EN 378: 2008	Refrigerating systems and heat pumps – safety and environmental requirements. EN 378 provides practical rules to define important parameters such as maximum refrigerant charge. It is harmonised with some of the above EU directives.
IEC EN 60335-2-24	Safety requirements for household and similar electrical appliances
IEC EN 60335-2-40	Safety requirements for electrical heat pumps, air conditioners, and dehumidifiers
IEC EN 60335-2-89	Safety requirements for commercial refrigerating appliances
EN 1127-1	Explosive atmospheres — explosion prevention and protection
EN 60079	Requirements for electrical systems used in potentially explosive atmospheres; a broad set of standards some of which are very relevant to refrigeration, air conditioning and heat pumps
EN 13463	Non-electrical equipment for use in potentially explosive atmospheres

The most relevant standards for refrigeration, air conditioning and heat pumps are EN 378, as well as the product standards IEC EN 60335-2-40 (for air-conditioning systems) and IEC EN 60335-2-89 (for integral and remote commercial refrigeration appliances) which take precedence over EN 378. EN 378 has just recently been revised. Its parallel standard at the international level is ISO 5149. At international level, amendments to standards IEC 60335-2-40 and IEC 60335-2-89 are currently being discussed in the relevant IEC committees. Once a new version of these standards has been agreed, the parallel European standards IEC EN 60335-2-40 and IEC 60335-2-89 are likely to be modified accordingly. The responsible standardisation technical committees for these standards at a European level are CEN/TC 182 "Refrigeration systems, safety and environmental requirements" and CLC/TC 61 "Safety of household and similar electrical appliances".

2.2 Information communicated by Member States on national codes, standards and legislation

On the basis of a survey⁶, a majority of Member States did not identify relevant national codes, standards or legislation that go beyond the legislation and standards at a European level. In particular, Member States did not specify any national codes or legislation impeding the use of climate-friendly alternative foam blowing agents. Member States also did not report any significant national restrictions going beyond European requirements for refrigeration, air conditioning and heat pumps related to the use of ammonia or CO₂, even though some stakeholders identified some restrictive rules on ammonia use in France.⁷ Some Member States also report **restrictions related to the use of flammable alternative refrigerants, such as hydrocarbons and HFOs:**

- Italy, France and Spain reported a number of national decrees that severely restrict the use of flammable refrigerants for use in air conditioning equipment in certain types of public access buildings. These requirements go well beyond the rules permitting such uses by European and international standards such EN 378 or ISO 5149.
- Sweden reported that additional risk assessments are required for the use of flammable refrigerants, leading to additional time and cost constraints.
- In many Member States local building codes and fire regulations as well as transport⁸ and storage-related codes can severely restrict the use of flammable refrigerants.

Restrictions are inconsistently applied across national territories. Particularly in federal states barriers may exist at lower levels of government that are difficult to identify and address. Some codes at a regional or local level may be unnecessarily strict, and rules applied locally by safety authorities often leave room for interpretation, which can hinder the widespread use of flammable refrigerants.

Germany reported that national rules for hydrocarbons are actually less restrictive than the standards at European or international level. However many end-users prefer following the more restrictive European standards.

2.3 Barriers posed by codes, standards and legislation

2.3.1. Barriers for the use of ammonia and CO₂ as refrigerants

Codes, standards or legislation at either a European or national level do not seem, for the most part, to pose a significant barrier to the use of ammonia or CO₂ as a refrigerant. They ensure the safe use of these refrigerants while allowing for a greater market penetration of systems and equipment using these substances. Experts agree that ammonia is a refrigerant to be used with care but that adherence to the requirements in current safety standards such as EN 378 are an appropriate way forward. Further national prescriptions do not seem to be overly

⁶ Response rate: 24 Member States representing 95% of EU population

⁷ See 1st meeting of Consultation Forum, 10 September 2015:
http://ec.europa.eu/clima/events/articles/0106_en.htm

⁸ Including for the use inside tunnels

restrictive in most Member States. Similarly, for equipment using CO₂ the requirements in current safety standards such as EN 378 and the Pressure Equipment Directive provide an appropriate framework for the safe use of such systems in the future.

2.3.2. Barriers for the use of flammable refrigerants: hydrocarbons and HFOs

Limiting the charge size (i.e. the amount of refrigerant used) of equipment has been the main, practical way of minimising risks for all flammable refrigerants in the past. Traditionally the approach in standards on charge sizes has been very conservative and the allowed charge sizes were kept at very small amounts, e.g. 150 grams. These charge size constraints commonly used in existing standards limit the use of flammable refrigerants for many equipment types, applications and locations.

The recent revision of EN 378 introduces a new flammability category for HFCs and HFOs. In this category EN 378 allows higher maximum charges as well as permitting the use of these substances in a larger range of applications and locations. Furthermore, a “risk management approach” allows manufacturers to deploy considerably larger refrigerant charges if certain risk management measures are put in place or considered in the design of the equipment. While these revisions go some way towards easing the use of HFOs, significant barriers remain for the use of hydrocarbons.

The following barriers for flammable refrigerants, in particular for hydrocarbons, require particular attention:

- The European level standards identified above unnecessarily restrict charge sizes beyond what is needed to guarantee a safe use of the equipment. In particular the charge size limits for human comfort cooling and below ground charge limits appear overly restrictive.
- Risk minimisation approaches in system design and use are not sufficiently considered for all flammable refrigerants to determine safe charge size. Although individual risk assessments for a certain equipment type are possible within existing rules, this implies additional expenses for manufacturers. Instead, the market generally chooses to look at the overall, more restrictive rules prescribed by standards as a benchmark.
- Stakeholders in the Consultative Forum emphasised that making changes to standards to facilitate the uptake of climate-friendly alternatives is a challenge in itself, as:
 - Updates of standards are usually made at intervals of 5 years or longer. Thus making the necessary changes in a timely manner is a real challenge.
 - Product standards such as EN 60335-2-40 and EN 60335-2-89 are based on IEC standards that are set at international level. Hence EU companies and policy makers can only partly influence the outcome.
 - In addition to the considerable time needed to agree changes at the international level, the time lag between agreeing international amendments and having them reflected in the European product standards is often another 1-3 years. This is a

very serious issue since product standards take precedence over general standards such as EN 378.

- SMEs find it difficult to find the resources to participate in the lengthy and resource-intensive standard-setting processes and only a few experts on hydrocarbons are currently involved in these processes.
 - Providing data and conducting the necessary risk assessments that would enable companies to market innovative solutions using climate friendly alternatives is a challenge, in particular for SMEs.
 - Transparency and understanding of the complex standardisation process are low for non-participants, thus it is difficult to influence the outcome.
 - The perception of risk can be distinct from the actual risk and is often not based on empirical evidence. End-users may be reluctant to have flammable refrigerants installed and manufacturers are wary of liability laws and public perception, especially if equipment is not properly maintained. The issue of risk is generally divisive as it can be used to promote the commercial interests of one technology versus another.
- In some EU Member States there are national codes, standards and legislation that simply ban flammable refrigerants in certain applications. These create severe barriers for their use as alternatives to HFCs.

2.3.3. Foam blowing agents

No major barriers created by standards or legislation at either a European or national level in relation to the use of climate-friendly alternatives to foam blowing agents were identified. The main barriers to the introduction of alternative foam blowing agents are their price, bearing in mind that blowing agents represent a significant proportion of the total cost of foam raw materials, and the time and costs related to product development and testing.⁹

3. CONCLUSIONS AND NEXT STEPS

On the basis of input from Member States' authorities and consultations with stakeholders it can be concluded that standards (at international, European and national level) regarding the use of flammable refrigerants appear to be an important barrier to the uptake of climate-friendly alternatives to HFCs.

To facilitate the achievement of the EU HFC phase-down and emission reductions in the EU and third countries as required by the Paris Agreement in the most cost-efficient way, these barriers should be addressed with urgency as already anticipated (based on preliminary findings) in the recent EU Strategy on Heating and Cooling.¹⁰ Also for this reason the present

⁹ Some stakeholders insisted however that the process of amending standards takes considerable time and resources and also has an impact on the commercialisation of new insulation products

¹⁰ COM(2016) 51 final: <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-51-EN-F1-1.PDF>

review has been launched immediately following the entry into force of Regulation (EU) No 517/2014.

In particular, the analysis points towards a need for:

- European standardisation organisations to facilitate the update of relevant standards at the European level. All stakeholders involved including industry and Member States are also strongly encouraged to contribute, including to parallel activities at the international level.
- Companies and researchers to collect data and evidence enabling better risk minimization approaches for all flammable refrigerants and to make such information available to the relevant standard committees.
- Member States that have restrictive national codes, standards or legislation to consider a review in the light of technical developments that would allow the safe use of alternative refrigerants. Stakeholders also pointed out that green public procurement approaches could help boost the market for alternative technologies and showcase their safe use.

In addition, the Commission envisages the following actions:

- A request to the European standardisation organisations in support of updating relevant standards at the European level, ensuring a technology neutral and consistent approach. In particular, there is a need to maximise charge sizes without compromising safety as well as allowing a more general use of risk management approaches for all refrigerants. A mandate for this request is under preparation.
- Facilitating at an international level an exchange of information on standards, their review and related processes between Parties to the Montreal Protocol, standardisation bodies, industry as well as other stakeholders involved in standard setting.