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## **Long Report**

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## 3.6 ECCP – WG 5 “Industry”

### 3.6.1 ECCP - WG 5 "Industry": Fluorinated Gases

#### 3.6.1.1 MANDATE AND SCOPE

The objective of the Working Group on fluorinated gases under the ECCP was to develop the basis for a framework of an EU-policy to reduce emissions of the fluorinated greenhouse gases addressed by the Kyoto Protocol (HFCs, PFCs and SF<sub>6</sub>) in a cost-effective way.

In line with the ECCP, **specific objectives** of the Working Group on fluorinated gases were:

- Identification of the most relevant applications that should be subject to common and co-ordinated policies of the European Community,
- Elaboration of a proposal for cost-effective instruments for each of the investigated applications.

The group of experts involved in the ECCP Working Group on fluorinated gases comprised participants from Industry, Environmental NGOs, Academia, Consultancy, Member States and the Commission. Under the work programme of the group, all major sectors accountable for emissions of fluorinated gases have been covered in 9 full-day meetings between June 2000 and April 2001.

#### 3.6.1.2 GENERAL CONCLUSIONS

Participants broadly agreed with the consultants' estimates that fluorinated gases contributed about 2% (65 MT CO<sub>2</sub> eq.) of overall EC greenhouse gas emissions in 1995. Views on the likely future evolution of these emissions levels varied but fell into the range of 2-4% of total emissions by 2010. The group agreed that this potential growth warrants specific action from regulators and industry to limit emissions of fluorinated gases.

It was clearly established that there is significant potential for the reduction of emissions of fluorinated gases from business as usual scenarios in most markets segments. It was recognised by the group that there have already been noticeable emission reductions in certain market segments.

Emissions of fluorinated gases emanate from a wide range of sources in markets with very different characteristics. At one extreme, a handful of factories produce a significant percentage of EU emissions of fluorinated gases as a by-product of a manufacturing process (e.g. 10 plants making HCFC 22 and 21 aluminium smelters). At the other extreme, products containing fluorinated gases are used by millions of consumers (e.g. medical and technical aerosols, domestic refrigerators, car air-conditioning). There was agreement, that it is necessary to take account of these widely varying market and use conditions when making policies to reduce emissions from particular sources.

The techniques for emission reduction can be categorised into four main areas:

1. Improved containment of fluorinated gases during the life cycle of equipment (manufacture, use and decommissioning)
2. Use of alternative fluids with a zero/low global warming potential (GWP)
3. Use of not-in-kind (NIK) technologies
4. Process modifications to avoid by-product formation or emission

The estimated cost effectiveness of individual emission reduction measures varies considerably. The following general findings were made:

- Very few of the measures for an emission reduction of fluorinated gases have the excellent cost effectiveness exhibited by certain energy related CO<sub>2</sub> reductions (i.e. emission reduction combined with cost savings).
- Many measures have good or reasonable cost effectiveness in the range of €1 to €50 per tonne CO<sub>2</sub> saved. It is estimated that some 30 MT CO<sub>2</sub> eq. per year (of projected 98 MT CO<sub>2</sub> eq. per year total business as usual emissions in 2010) can be reduced at less than €20 per tonne CO<sub>2</sub> eq. and another 20 MT CO<sub>2</sub> eq. per year at less than €50 per tonne of CO<sub>2</sub> eq.

- Some measures are much more costly, in the range of €100 to €500 per ton, and would not necessarily be the best use of resources in the first commitment period.

For some measures there was information available to generate sufficient consensus among the Working Group to support clear recommendations for regulatory action on Community or Member State level. This particularly refers to containment opportunities of fluorinated gases, but also includes other techniques such as destruction of HFC-23 from HCFC-22 plants and elimination of certain uses of SF<sub>6</sub> in applications such as double-glazing and car tyres.

For other measures it was not possible to reach consensus, partly because of insufficient information and opposing views. It became clear in the process of the Working Group that a comprehensive policy on emission reduction of fluorinated gases cannot be developed in one go. In many areas technological developments as regards the use of fluorinated gases are rapidly progressing. In various cases it was considered more appropriate to work with “soft” policy measures such as voluntary action from industry than to set stringent regulatory rules now. This was, for example, the case as regards the use of alternative fluids, where there are complex interactions that must be evaluated between parameters such as capital cost, safety, product effectiveness and energy use. However, there was a strong consensus that development of such alternatives should be vigorously encouraged in the hope that any doubts about the technical or economic effectiveness could be eliminated at some future date.

Another important issue was the possible conflict between policy measures that could be set at an EU level and those that could be set by Member States. This latter issue needs to be addressed further in preparation of any policy measures on fluorinated gases by the competent authorities on Member State and Community level.

It was agreed that, in certain markets, the influence of energy usage is a very important factor in selecting the best technologies to reduce emissions of fluorinated gases. If policy makers ignored the energy issue it could lead to “perverse” legislation that encourages technologies with lower emissions of fluorinated gases but higher overall greenhouse gas emissions. While the Working Group on fluorinated gases and the ECCP Working Group on energy efficiency were unable to evaluate these issues in sufficient detail to fully understand the interactions, the subgroup underlined the importance to take account of energy efficiency aspects when devising policies on fluorinated gases.

It was agreed that current levels of monitoring and verification of emissions of fluorinated gases are insufficient and that it will be important to improve this situation if we are to effectively measure the progress of any policies to reduce emissions of fluorinated gases.

The Working Group reviewed a wide range of policy instruments that could be used to reduce emissions of fluorinated gases. These included legislative measures, fiscal measures and voluntary/negotiated agreements. There was consensus that it would be necessary to implement a policy mix comprising a number of different policy instruments and measures in order to take account of:

- The enormous differences between the characteristics of the 30+ market segments.
- The large number of existing and planned measures of industries and on Member State level that are already part of the programmes being put in place in various Member States.
- The necessity to find a balance, within the limits set by the European Treaty, between the requirements of the internal market and international trade obligations and the freedom needed by Member States to accomplish their reduction targets under the Kyoto Protocol.

Although some stakeholders favoured the use of fiscal mechanisms such as taxation, there was no consensus on this issue. It was considered very difficult to implement a tax mechanism at the EU level. Some stakeholders advocated further investigations on this subject. One Member State informed that it had decided to apply fiscal measures in order to reduce the use of fluorinated gases. There was a general lack of consensus in the group over restricting the use of fluorinated gases in specific applications, with the exception of a small range of uses such as SF<sub>6</sub> in car tyres and double glazing and the use of HFC aerosols for certain novelty products.

### 3.6.1.3 GENERAL RECOMMENDATIONS

#### **Recommendation 1: Make a clear statement on the importance of reducing fluorinated gas emissions**

The Working Group agreed that there is significant potential to reduce fluorinated gas emissions from all sources. It is recommended that a clear political statement be made to ensure that all reasonable efforts to reduce emissions are undertaken.

**Recommendation 2: Establish a regulatory framework in a “Community Directive on Fluorinated Gases”**

A key recommendation of the Working Group is the elaboration and adoption of a “Community Directive on Fluorinated Gases”. The key objectives of such a Directive would be:

- **Improved monitoring and verification of emissions of fluorinated gases.** The Directive should ensure that significant improvements are made to the coverage and accuracy of emissions monitoring within the EU. The Directive should place reporting obligations on organisations, either through trade associations or companies, such as:
  - fluid manufacturers and importers
  - purchasers of fluids (e.g. manufacturers, users and maintainers of refrigeration equipment, fillers of aerosol cans, foam producers)
  - fluid recyclers and destroyers.
  - owners of facilities from which fluorinated gases are emitted as by-products

These obligations would enable accurate estimates of emissions from each major market segment to be established at both Member State and EU levels.

- **Improved containment of fluorinated gases.** The Directive should ensure that when fluorinated gases are used in products and equipment that optimal technologies are used to minimise emissions during equipment manufacture, equipment life and at end of life. To the extent practicable, the Directive should place obligations on manufacturers, users and maintainers of equipment to achieve defined standards of performance in relation to emissions. Legislation of this type already exists on Member State level; for example the Netherlands refrigerant leakage regulation was considered by the Working Group as an important reference.
- **Marketing and use restrictions in certain applications.** The Directive (or the Community chemicals legislation) could be used to ban the use of fluorinated gases in a certain number of applications such as car tyres, double-glazing and potentially certain novelty aerosols.

The group suggested that in a number of matters (e.g. monitoring) the Directive should build on requirements and instruments created under the EC Regulation 2037/2000 on Ozone Depleting Substances.

The Working Group agreed, that the primary objectives described above are best addressed via legislation at EU level. The Directive could address other issues as well, although there was less consensus about the content and scope of such provisions. In particular, it was discussed whether the Directive could provide some guidance about substitution of fluorinated gases by the use of alternative fluids and about addressing the energy efficiency issue

However, there was general agreement that these issues were more difficult to tackle than the primary objectives and it might be more practical to concentrate on the early adoption of a Directive that successfully deals with the primary objectives.

**Recommendation 3: Use existing or planned EU legislation to the extent possible for the reduction of fluorinated gases**

The Commission should ensure that the findings of the ECCP on emissions of fluorinated gases are fully considered in the preparation or revision of certain pieces of EU legislation. Member States should consider recommendations of the Working Group when implementing the Directives. In particular:

- The Working Group noted that policies should not delay the phase-out of ozone depleting substances as mandated by the EC Regulation 2037/2000. Industry emphasises in particular, that HFCs must remain available in those applications in which they are the only technically and economically viable option.
- The IPPC Directive should minimise emissions of fluorinated gases from HCFC-22 manufacture, aluminium smelting and magnesium smelting.
- The Waste Electric and Electronic Equipment (WEEE) Directive should ensure that a maximum fraction of charged HFCs is recovered from all domestic equipment such as refrigerators and freezers.
- The End of Life Vehicle Directive after proper national implementation should ensure that a maximum fraction of charged HFCs is recovered from mobile air conditioning.

**Recommendation 4: Examine the appropriateness of selected voluntary agreements, primarily in the semiconductor, switchgear and foam sector**

In a number of sectors voluntary and/or negotiated agreements are considered to be an appropriate policy instrument, although preferably with a clear link to the recommended Community Directive on Fluorinated Gases. It is envisaged that such agreements might be used in one of three ways:

- In some markets they could provide the primary policy mechanism to achieve emission reductions (e.g. semiconductor industry).
- In some markets they could be used to support one or more of the other measures being implemented. (Voluntary action undertaken by the switchgear industry was found to be very suitable to support such a policy mix).
- They could be used as a temporary measure to make progress in areas of rapid technological change, where there is currently insufficient data to include specific measures in the proposed Community Directive on Fluorinated Gases (e.g. in the case of rigid foams).
- A large number of stakeholders emphasised that voluntary commitments are not a ‘stand-alone-instrument’, as they are normally embedded in a legal framework or linked to other instruments in case of non-fulfilment.

**Recommendation 5: Carry out integrated, independent assessments of relevant technologies in order to facilitate a comparison between the use of fluorinated gases and alternatives**

In some situations it has been difficult for the Working Group to reach robust conclusions because of either:

- A general lack of reliable information about an issue or a technology.
- A dispute over the accuracy or validity of information.

The Working Group therefore recommends that integrated, independent assessments of relevant technologies be carried out. These assessments should facilitate a comparison between the use of fluorinated gases and alternatives in selected key applications. They should cover the environmental effects over the full lifecycle especially energy consumption and greenhouse gas emissions, safety issues, and the technical and economic performance. These assessments should be periodically updated. Standard methods for the assessment of energy efficiency in key applications should be developed.

Policy measures could include the creation of funding sources for further research and development and for investigation of uncertainties (such as the relative energy efficiency of different technical solutions).

**Recommendation 6: Promote the Development and Appropriate Use of Alternative Fluids and Not in Kind (NIK) technologies**

It was agreed within the Working Group, that in many market sectors the use of alternative fluids and NIK technologies could be the best long-term way of reducing direct emissions of fluorinated gases. However, it was also understood that a number of barriers and uncertainties make it difficult for such alternatives to be developed commercially. These uncertainties have also made it difficult for the Working Group to include definitive recommendations regarding alternatives in the proposed Directive.

The Working Group recommended that active steps be taken to maximise the appropriate uptake of alternative fluids and NIK technologies. Specific policy measures should be based on a 2-stage approach:

- Firstly, the use of “soft” mechanisms including voluntary agreements and active EC/Member State support to ensure that development of alternatives continues. Through this process it is expected that the acceptability and cost effectiveness might be improved. Improved information dissemination and market-based initiatives should be supported to promote the commercial availability of such alternatives.
- Secondly, regular reviews of progress in each market sector should be made. If appropriate, this would lead to the use of harder mechanisms (such as inclusion in revised versions of the EC-Directive) if there is more robust evidence that is the correct way to proceed.

3.6.1.4 SECTOR SPECIFIC RECOMMENDATIONS

In this section individual sectors have been reviewed and highlight selected Working Group recommendations.

*Refrigeration and Stationary Air Conditioning*

It is strongly recommended that this market sector be part of the Community Directive on Fluorinated Gases to address all containment and monitoring/verification issues. Efforts should be made to promote the use of alternative fluids and NIK systems when they are a practical and economically viable solution. Improved energy efficiency can provide significant levels of CO<sub>2</sub> emission reduction and could be addressed by means of voluntary agreements.

*Mobile Air-Conditioning*

Many issues are similar to the refrigeration and stationary air-conditioning market. Emissions monitoring and containment should be addressed via the recommended Community Directive on Fluorinated Gases. The development of new technologies for mobile air conditioning systems should be supported.

*Technical Aerosols*

An emissions monitoring and verification system should be established via the recommended Community Directive on Fluorinated Gases. The development of not-in-kind technologies to replace HFC propelled technical aerosols should be supported. Restrictions on the use of HFCs in certain “non-critical” product applications could be considered.

*Metered Dosed Inhalers (MDIs)*

Monitoring should be addressed via the recommended Community Directive on Fluorinated Gases. The possibility of a voluntary agreement with MDI manufacturers should be explored, including losses during production and recovery from discarded MDIs.

*Solvents*

Emissions monitoring and containment should be addressed via the recommended Community Directive on Fluorinated Gases.

*Fire-Fighting*

Monitoring and containment should be addressed via the recommended Community Directive on Fluorinated Gases. The possibility of a voluntary agreement with the fire-fighting industry should be explored.

*Use of SF<sub>6</sub> in Windows, Tyres*

Use restrictions for SF<sub>6</sub> in these applications should be issued either on the national or the European level.

*Aluminium Production*

Voluntary action by the aluminium industry has already created a monitoring system. The group recommends an expeditious national implementation of the “Best Available Techniques” according to the BREF notes related to the IPPC-Directive.

*Semiconductor Industry*

Voluntary action by the semiconductor industry has already created a monitoring system. The group recommended that the Commission considers the appropriateness of giving some formal recognition to the joint emission reduction commitment (Memorandum of Agreement) of the European Electronic Component Manufacturers Association (EECA) and the European Semiconductor Industry Association (ESIA).

*By-Product Emissions of HFC 23 from HCFC 22 Manufacture*

An emissions monitoring and verification system should be established via the recommended Community Directive on Fluorinated Gases. Because of the magnitude of emissions from this source, the group strongly recommends accelerated voluntary action by the industry or national legislation by the affected Member States (potentially linked to the IPPC-Directive).

*Magnesium Production and Die Casting*

Emissions monitoring should be addressed via the recommended Community Directive on Fluorinated Gases. For large-scale operations the IPPC Directive could be used to help minimise SF<sub>6</sub> emissions. For smaller operations, particularly those involved in die-casting, the viability of alternative cover gases needs to be explored.

*Production and Use of Gas Insulated Switchgear*

Voluntary action by the switchgear industry has already created a monitoring system and set standards for the handling and recycling of SF<sub>6</sub>. It is recommended that the Commission considers the appropriateness of giving some formal recognition to this voluntary action. Moreover, it should be considered to link the proposed regulatory framework with voluntary action in this sector.

*Rigid Foams (XPS, PU and Phenolics)*

It was agreed that it would be premature to recommend specific policies and measures on the European level in addition to some general use principles and provisions on the monitoring of HFC usage and emissions. A voluntary commitment was proposed by the industry. Most participants welcomed the initiative and recommended a closer evaluation of the proposal and a reflection on ways of linking it to the recommended Community Directive on Fluorinated Gases.

*One Component Foams*

It was agreed that manufacturers should aim to minimise the mean global warming potential of its propellants. Opportunities for a voluntary agreement with this industry should be explored. Additional efforts need to be made to assess safety hazards associated with the use of flammable propellants. Emissions monitoring can be addressed via the recommended Community Directive on Fluorinated Gases.