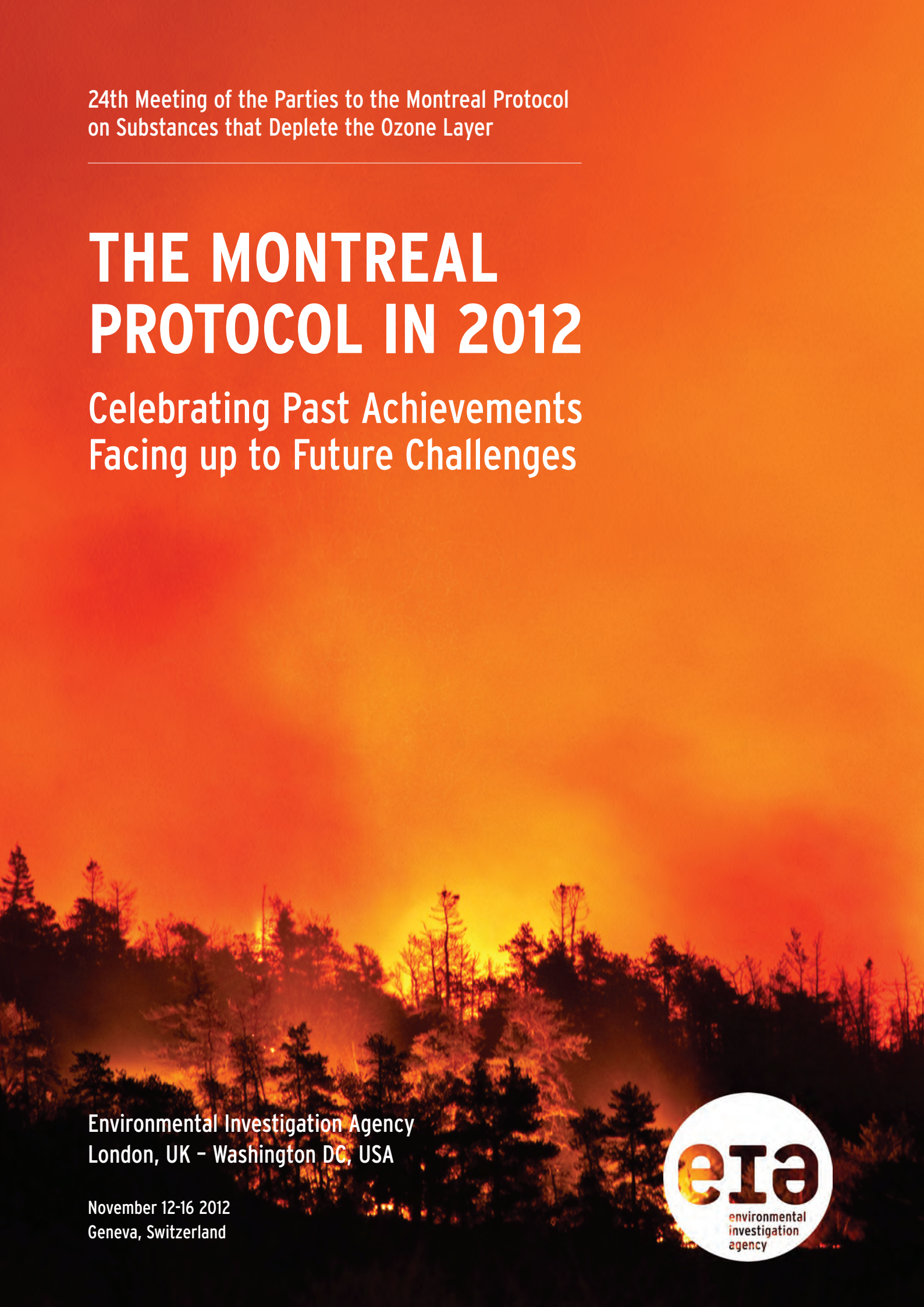
24th Meeting of the Parties to the Montreal Protocol
on Substances that Deplete the Ozone Layer

THE MONTREAL PROTOCOL IN 2012

Celebrating Past Achievements
Facing up to Future Challenges



Environmental Investigation Agency
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I. THE MONTREAL PROTOCOL'S 25TH ANNIVERSARY CELEBRATION: A TIME TO CELEBRATE PAST ACHIEVEMENTS AND FACE UP TO THE CHALLENGES THAT LIE AHEAD.

As we celebrate the 25th Anniversary of the Montreal Protocol and its history of unparalleled success, we owe it to ourselves to reflect not just on our achievements, but also on the challenges ahead, which we are currently failing to address.

A quarter of a century after the signing of the landmark treaty, we have reduced consumption and production of 97 ozone depleting substances (ODS) by some 98%,[1] setting the ozone layer on the path to recovery. And the reduction in greenhouse gas (GHG) emissions resulting from the ODS phase-out far outstrips the mitigation of GHGs achieved so far by the world's climate treaty. Indeed, the Montreal Protocol is not only the best climate treaty we have, it is the only one we are likely to have for at least the next eight years.

But the Protocol has a lot to do if it wishes to retain its title as *"perhaps the single most successful international agreement to date."* [2]

Of all the options to tackle climate change that are currently on the table, hydrofluorocarbons (HFCs) represent the most tangible prospect for immediate global action. Their impending rise is entirely the responsibility of this Protocol, as they have been commercialised as substitutes for the chemicals that this Protocol is phasing out. Under the Vienna Convention, the Montreal Protocol has been tasked with responsibility for controlling ozone depleting substances and dealing with any "adverse effects" arising from their elimination. Without question, the negative impact and contribution to global warming arising from the use of HFCs as alternatives to ODS qualifies as an "adverse effect" that is a direct result of the ODS phase-outs. At the Rio+20 Conference earlier this year, the nations of the world agreed on a final document that states: *"We recognize that the phase-out of ozone depleting substances is resulting in rapid increase in the use and release of high global warming potential hydrofluorocarbons to the environment. We support a gradual phase-down in the consumption and production of hydrofluorocarbons."*

With this clear legal imperative and a strong political signal from the international community, there is no excuse for inaction – we have better technologies, a more comprehensive body of scientific research and arguably a more dramatic environmental crisis on our hands than we did 25 years ago. It is time for the Montreal Protocol to fully embrace its obligations and act decisively to regulate HFCs.

Soaring production of HCFCs for feedstock use, continued and potentially expanding illegal trade in ODS, and emissions of ODS from banks of equipment and other products are three additional issues that the Montreal Protocol has so far failed to tackle in an effective way. They all have impacts on the ability of the ozone layer to recover and they all have huge implications for the climate.

If the Montreal Protocol fails to take on substantive new commitments to protect the ozone layer and the global climate, questions should be raised regarding the need for maintaining the number of institutions and meetings that we have had to date. The accelerated HCFC phase-out is underway, ably administered by the Multilateral Fund's Executive Committee but suffering from a lack of funding that would ensure transitions from HCFCs to climate-friendly alternatives. If the Montreal Protocol cannot formally agree to address the growth in HFCs created through the ODS phase-outs, then consideration should be given to diverting funding from the cost of holding meetings to the Multilateral Fund to maximise transitions to environmentally friendly alternatives.

The recovery of the ozone layer will be a hollow victory indeed if it is eclipsed by the multiple, far-reaching and catastrophic impacts of acute climate change. We call on all Parties to join discussions of the amendments in a formal contact group so that urgently needed progress can be made on some of the technical, scientific and financial aspects of the amendment proposals. Discussion on the availability of alternatives and concerns about costs can begin immediately without this implying a de facto acceptance of the proposals.

Global warming is accelerating beyond our best collective efforts to control it. The time has come for every international body and agency to use its existing capacities to take strong and immediate action to limit greenhouse gas emissions. The central principle in the history of life on Earth has been to evolve or perish. If there was ever a time for the world's most successful environmental treaty to evolve and expand its efforts, that time is now.

ACKNOWLEDGEMENTS

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Aerial view of Greenland
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II. AMENDING THE MONTREAL PROTOCOL TO PHASE OUT HFCS – A GOLDEN OPPORTUNITY FOR THE SILVER ANNIVERSARY

A swift reduction of the production and use of HFCs is easily the most significant, immediate and cost-effective option to achieve rapid global reductions in GHG emissions. If left unchecked, HFC emissions will prove fatal to efforts to arrest and reverse climate change by largely negating anticipated reductions in carbon dioxide (CO_2) and other GHGs.

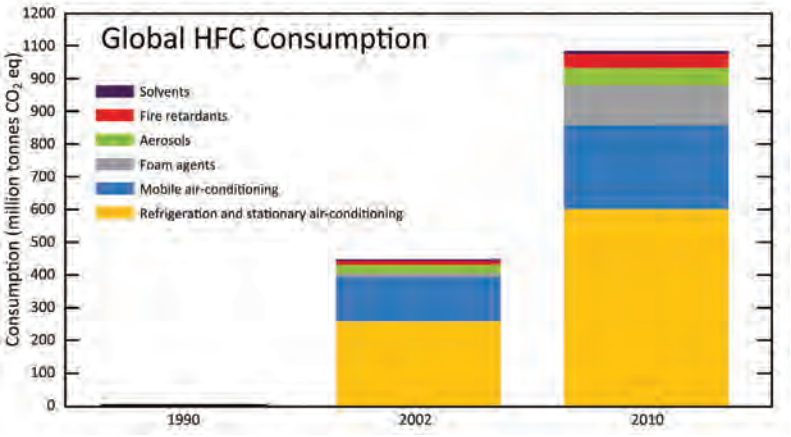
Proposals to amend the Montreal Protocol have been on the table for four years, but formal discussion has been blocked by a small number of countries, largely on the basis that HFCs are not ODS and are regulated by the UNFCCC and Kyoto Protocol. At the same time, questions have been raised regarding the availability of alternatives, costs and legal issues arising from the amendment proposals.

HFC consumption has increased from almost zero in 1990 to 1100 million tonnes CO_2-equivalent (CO_2e) in 2010, and continues to rise. Consequently, atmospheric HFC emissions are the fastest growing source of GHG emissions. The atmospheric abundances of the major HFCs in use have increased 10-15% per year in recent years.[3]

Research and analysis predicts that HFC emissions will reach between 5.5 and 8.8 Gts CO_2e by 2050[4] equivalent to 9–19% of CO_2emissions under a business-as-usual (>550ppm) scenario, representing a radiative forcing equivalent to 6–13 years of CO_2 emissions near 2050.

Consequently, if left unchecked HFC use will prove fatal to efforts to arrest and reverse climate change by largely negating anticipated reductions in CO_2. Moreover, it will negate the positive climate benefit of the ODS phase-out to date, which has resulted in a reduction of ODS emissions equivalent to 8 GtCO_2e per year between 1988 and 2010.[5]

HFCs are different from most other GHGs because they are intentionally produced and not waste products. For nearly all sectors, HFCs can be replaced with alternatives or not-in-kind technologies. The amendment proposals give ample time to develop new alternatives for those few sub-sectors where alternatives are not commercially available. The proposals also specifically state that additional funding will be provided to the Multilateral Fund to pay the incremental costs of the HFC phase-out.



UNEP Synthesis Report, 2011, "HFCs: A Critical Link in Protecting the Climate and Ozone Layer", Figure 1.4. Estimated global consumption of HFCs by various sectors, expressed in millions of CO_2 equivalent tonnes, for 1990, 2002, and 2010.

The Montreal Protocol regulates production and consumption and the UNFCCC regulates emissions, thus a phase-out of HFCs under the Montreal Protocol would not remove HFCs from the basket of GHGs regulated by the UNFCCC and in fact, it would make no change in the obligations of the Parties to the UNFCCC with regard to HFCs. However, practically, it would dramatically reduce the emissions of HFCs through reductions in their production and consumption, giving UNFCCC Parties additional bandwidth to resolve the more pressing issue of global CO_2 and other GHG emissions.

While a phase-out could theoretically be undertaken under the UNFCCC or as a new protocol to the Vienna Convention, under either scenario there would be an unacceptably long delay to draft, approve and ratify the new treaty. The other option would be to include action on HFCs under a global climate agreement, which would effectively delay action until 2020 or later. In order to facilitate the phase-out the new entity would need a range of technical, scientific and economic advice, all of which the Montreal Protocol already has through the Technology and Economic Assessment Panel (TEAP) and its associated Technical Options Committees, the Scientific Assessment Panel and the Environmental Effects Assessment Panel (EEAP). Given action on short-term climate forcers is needed now and considering the global economic crisis, it is highly irresponsible of the global community to not use the available resources of the Montreal Protocol to implement a fast and effective HFC phase-out.

Despite the formal support of 108 countries, representing more than half the Parties to the Montreal Protocol, formation of a formal contact group to even

"If left unchecked, HFC use will prove fatal to efforts to arrest and reverse climate change by largely negating anticipated reductions in CO_2"

discuss the Amendment Proposals has been repeatedly blocked. The need for early action to curtail HFC emissions is critical to reduce the risk of passing tipping points for abrupt and irreversible climate change. Setting a clear HFC phase-out schedule now will also help ensure that developing nations do not invest in unsustainable technologies, requiring far more costly and difficult mitigation efforts in the future.

RECOMMENDATIONS

In order to move the HFC Amendments forward at the 24th Meeting, Parties should:

- Insist on the formation of a formal HFC contact group and advance discussions on the amendment proposals to a point where they can be adopted in 2013.
- Support the request that the TEAP conduct a further, more detailed analysis of the availability of alternatives to HCFCs and HFCs.
- Request the TEAP to conduct an analysis of the feasibility, climate benefits and cost of a phase-down of HFCs under the Montreal Protocol.



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III. THE GIGATONNE GAP – HFCS AT THE UNFCCC

At the 17th Conference of the Parties to the UNFCCC in Durban (CoP 17) in December 2011, Parties to the UNFCCC formally acknowledged that there is a significant ambition gap between current climate mitigation pledges and what science dictates is required to ensure global temperature rise is limited to 2°C above pre-industrial levels. Dubbed the 'gigatonne gap', UNEP estimates the shortfall between now and 2020 to be around six gigatonnes (assuming all pledges are implemented).[6]

Discussions on enhancing pre-2020 ambition, including by addressing HFCs, are currently taking place under the new Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP-2). At the UNFCCC meeting in Bangkok in August-September 2012, Parties proposed three general ways of increasing the level of ambition, including "Recognising additional supplementary actions and initiatives undertaken at sub-national, national and international levels". One of the actions listed under this approach was "Reducing production and use of HFCs under the Montreal Protocol". In Bangkok, numerous Parties gave their strong backing to addressing HFCs under the Montreal Protocol as a catalyst for other actions. Parties also called for a technical paper exploring barriers, incentives, cost-benefit options and a quantification of mitigation potentials of various initiatives identified.

With discussions on near-term ambition at CoP 18 in Doha likely to focus on specific *international cooperative initiatives* (ICIs) which are seen as having the largest mitigation potential, it is clear that phasing out production and consumption of HFCs under the Montreal Protocol is a leading prospect. The Montreal Protocol should take a decision and signal its willingness to take on additional commitments on HFCs.

RECOMMENDATIONS

- Parties to the UNFCCC should give their full support to reducing production and use of HFCs under the Montreal Protocol in the shape of a formal CoP decision.
- Parties to the Montreal Protocol should ensure government officials and ozone officers liaise with their UNFCCC counterparts to provide all necessary input on HFCs and the Montreal Protocol ahead of the CoP 18 climate negotiations.
- Parties to the Montreal Protocol should take a decision and signal their willingness to take on additional commitments on HFCs.

IV. FUNDING TO MAXIMISE THE ENVIRONMENTAL AND CLIMATE BENEFITS OF THE HCFC PHASE-OUT

The Montreal Protocol has been evaluating for several years how to leverage additional funding to promote the climate co-benefits resulting from the phase-out of HCFCs and elimination of ODS banks.

A draft decision for consideration at this Meeting of the Parties proposes to create a fund to provide the Multilateral Fund (MLF) with additional financing to maximise the environmental and climate benefits of the HCFC phase-out. Countries and other entities would make voluntary contributions to this fund with the objective of facilitating transitions from HCFCs directly to low-GWP and energy efficient technologies, in cases where costs cannot be met under the current ODS phase-out guidelines.

The MLF has established guidelines for the incremental costs of the phase-out of HCFCs based on the cost-effectiveness of the proposed transition in terms of the amount of ODS that will be reduced through the transition. This ODS cost-effectiveness calculation was modified by Decision XXI/9, pursuant to which the Executive Committee of the Multilateral Fund has provided a 25% incentive above the guidelines for transitioning directly from HCFCs to low-GWP alternatives. Unfortunately, the up-front cost of transitioning to low-GWP alternatives is often higher than the 25% incentive funding covers.

Since there is currently no mechanism for the Executive Committee to fund more than the guidelines plus the 25% climate incentive, Article 5 countries are often faced with a decision to either convert to high-GWP HFCs, or fund the additional costs for climate-friendly transitions themselves. China's HCFC phase-out management plan (HPMP) dealing with the phase-out of HCFC-141b used in the polyurethane foam sector illustrates why a new source of funding is required. Using solely an ODP analysis, only facilities that used more than 50 tonnes of HCFC-141b would pass the cost-effectiveness test for transitions to hydrocarbon technologies. Despite this, China proposed converting many medium and small foam blowing facilities to hydrocarbons, based on the mature status of the technology and its availability at reasonable prices on the local market based on a combined ODS and GWP cost-effectiveness. However, the proposal was rejected and the companies instead converted to HFC-245fa (GWP 1,020) rather than to hydrocarbons (GWP <20).[7]

HCFC phase-out Stage 2 conversions will focus on the refrigeration and air conditioning sectors, which are considered more difficult to address and will likely increase the disparity in the funds required to effect low-GWP transitions compared to available funds under the MLF. There is therefore an urgent need to establish a funding window to maximise the climate co-benefits of the HCFC phase-out.

According to draft decision XXIV/[I], the Executive Committee would be tasked to assess the feasibility and usefulness of a funding window, and develop terms of reference and procedures for its functioning within the existing framework of the MLF.

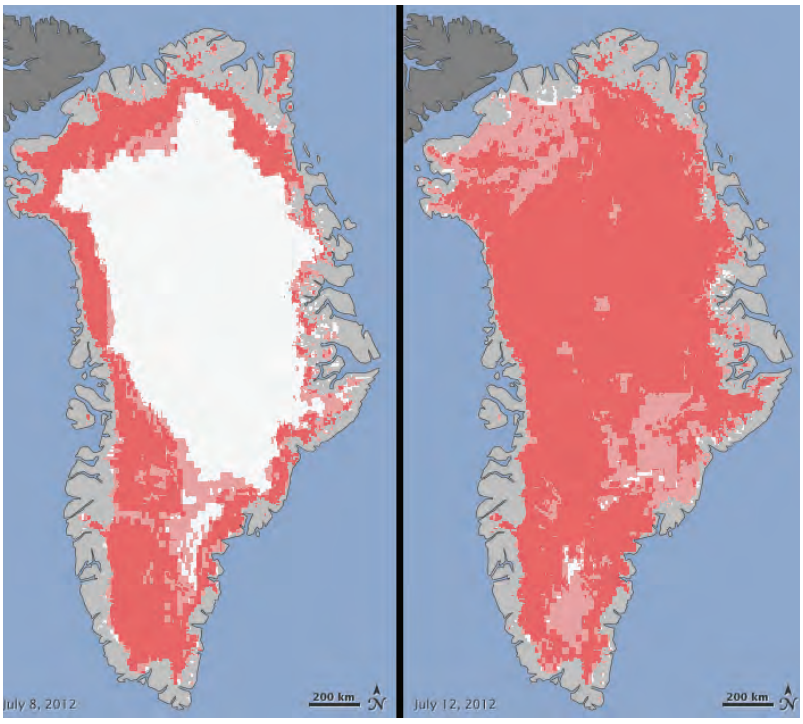
A new source of finance managed by the Multilateral Fund is the easiest, most cost-effective and technologically efficient way to maximise the climate benefit of the HCFC phase-out.

The proposed fund is also an innovative way to encourage and commercialise new alternative low-GWP technologies. Donors to the fund would receive clear reports on how the money is spent and be able to quantify the climate benefits.

RECOMMENDATION

- All Parties should support Decision XXIV/[I] and maximise contributions to the fund so that adequate funding is available in time to maximise low-GWP conversions in Stage 2 HPMPs.

BELOW:
The irrefutable reality of climate change: Nearly the entire ice sheet covering Greenland – from its thin coastal edges to its two-mile-thick center – experienced some degree of melting for several days in July 2012. According to measurements from three satellites and an analysis by NASA and university scientists, an estimated 97 percent of the top layer of the ice sheet had thawed at some point in mid-July, the largest extent of surface melting observed in three decades of satellite observations.



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V. WIDESPREAD AVAILABILITY OF LOW-GWP ALTERNATIVES PAVES THE WAY FOR HFC PHASE-OUT

Fluorinated greenhouse gases, including CFCs, HCFCs and HFCs, have a significant impact on climate change, with recent estimates indicating that they account for about 12% of all radiative forcing caused by increased greenhouse gas (GHG) levels since the beginning of the industrial revolution.[8] Thanks to the phase-out of CFCs under the Montreal Protocol, atmospheric concentrations of CFCs are declining, while fluorinated greenhouse gases used to replace CFCs, HCFCs and HFCs, are rising rapidly.[9]

There are two long-term technical options for eliminating the influence of HFCs on climate change:

1. Using fluorine-free substances with low or zero-GWP. Commercially available examples include:

- Ammonia
- Hydrocarbons such as propane and iso-butane
- Dimethyl ether
- Water
- CO_2
- Other substances used in various types of aerosols, foam products, refrigeration, air conditioning and fire protection systems

2. Alternative methods and processes (termed 'not-in-kind' alternatives): Commercially used examples include fiber insulation materials, dry-powder asthma inhalers, and building designs that avoid the need for air-conditioners.[10]

Low-GWP alternatives to HFCs have already won significant market share in some sectors, with over 90% of new domestic refrigerators/freezers and approximately 25% of new industrial air conditioners in the EU using alternatives. In other sectors however, low-GWP technologies remain minor players, although their share of the market could increase dramatically, and is poised to do so. For example, India and China are about to market hydrocarbon window air conditioners, which will dramatically alter refrigerant use in this sector. Alternative Technologies offer lower direct emissions from the refrigerants used and many also provide additional indirect emissions savings through increased energy efficiency as compared to traditional HCFC and HFC technologies. Low-GWP alternatives have been used for more than 150 years in some applications and comprise significant portions of the refrigerant mix in many sectors.

The proposed HFC Amendments to the Montreal Protocol, the review of the EU F-Gas Regulation, and the growing recognition that both HCFCs and HFCs must be phased out in order to reduce greenhouse gas emissions, have led to a rapid increase in proven and commercialised low-GWP alternatives in new applications and sectors, prompting market growth and creating a multi-billion dollar business opportunity.

There are numerous publications detailing the availability of climate-friendly alternatives, e.g. the regularly updated Greenpeace *Cool Technologies: Working Without HFCs*[11], shecco's *Guide to Natural Refrigerants*[12], the German Federal Environment Agency (UBA) report[13], *Avoiding Fluorinated Greenhouse Gases: Prospects for Phasing Out*, EIA's recent reports on the European and North American supermarket sectors[14] and the

Examples of sectors which already use a substantial percentage of alternatives.
From UNEP, 2011. HFCs: A critical link in protecting climate and the ozone layer. United Nations Environment Programme (UNEP), 2011.

Sector	Examples of Alternatives	Use of Alternatives in Sector		
		Industrialized Countries	Developing Countries	Global Total
Industrial refrigeration systems [a]	Ammonia, CO_2, HC	92%	40%	65%
Industrial refrigeration systems [a]	Ammonia, CO_2, HC	40%	15%	~ 25%
Domestic refrigerators (vapor compression cycle) [b]	HC	51%	22%	36%
Foam in domestic refrigerators [c]	HC	66%	68%	67%
Foam in other appliances [c]	HC	38%	< 1%	28%
Polyurethane foam boards and panels [c]	HC	82%	21%	76%
Fire protection systems [d]	Water, foams, dry chemicals, inert gases	-	-	75%
Asthma medication [e]	Dry powder inhalers	-	-	~ 33%
Solvents [f]	Aqueous, no-clean, alcohols, others	> 90%	> 80%	> 80%

Sources: FTOC 2010; RTOC 2010; TEAP 2009ab; TEAP 2010a.
The percentages in this table refer to: (a) refrigerants used in new installations annually; (b) annual production of new equipment; (c) annual consumption of blowing agents; (d) usage or market; (e) annual medical doses; (f) market penetration in solvent applications.

recent EU Commission funded study carried out by Öko Recherche.[15]

Some barriers to the adoption of alternative technologies exist in certain sub-sectors, for example regulations and standards that inhibit the use of flammable and/or toxic alternatives, insufficient supply of components, increased investment costs, and lack of relevant skills among technicians.[16] However, the current use of alternatives demonstrates that these barriers can be overcome, through revised technical standards, training and technical assistance, infrastructure developments and financial subsidies. The Chinese government has just released a study which established that the real risk from hydrocarbon ignition events in hydrocarbon window air conditioners is 0.005 per million per year, far below the "acceptable risk level" of 100 per million per year.[17] Perhaps most important is the political will to move away from HFCs through legislation, as demonstrated by Denmark, which has banned the use of HFCs in some sectors and imposed a tax on HFC refrigerants.

TEAP DECISION

In many of the Montreal Protocol plenary and informal contact group discussions on the HFC amendment proposals, questions have been repeatedly raised concerning the availability and costs of low-GWP alternatives to HCFCs and HFCs. Decision XXIII/9 was intended to allow the TEAP to provide some of this information to the 24th Meeting of the Parties, however given the unclear mandate and short timeframe the report submitted to the 32nd OEWG[18] does not provide an adequate review of the dramatic progress in the development and commercialization of low-GWP alternatives since the last comprehensive TEAP assessment in 2010.

Draft decision XXIV/[E] proposes a further report, prepared by a task force which includes current TEAP members and additional experts in alternative technologies, which will not only evaluate alternatives with respect to safety, energy and other environmental considerations, but that will assess the potential market penetration of alternatives in future years, assuming appropriate incentives and standards. This information is a fundamental requirement to assess the feasibility of an HFC phase-down, which was the prime intent of the original decision.

Such a study was recently carried out by Öko Recherche as part of the European Comission's review of the F-Gas Regulation.[19] For each sector relying on HFCs or HCFCs, cost-effective and technically feasible abatement solutions were identified and qualitatively and quantitatively compared to the sector-typical conventional HFC technology. The selection of replacement technologies was guided by their safety, energy consumption, maximum reduction potential of CO_2-weighted HFC use and emissions, and cost effectiveness (expressed in abatement cost of €/t CO_2e). In the final analysis which looked at the maximum penetration rate or earliest feasible complete transition to alternatives in new units, only options that showed at least equivalent energy performance to the reference HFC technology were considered.[20]

The concept of penetration rate is an important one in the Öko-Recherche Study. Penetration rate is defined as the "maximum market potential of a technical choice (i.e. abatement option) to replace new products or equipment relying upon HFCs in a particular sector."[21] It incorporates safety constraints and cost considerations while factoring in the availability of materials and components, system complexity and know-how. The report concludes that all key HFC using sectors can ban HFCs in new equipment by 2020 or earlier.[22]

The TEAP report limits its assessment of technology options to 'current' applications, meaning applied at the present time or imminent, and 'longer term' which anticipates availability in 3-5 years. Given the HFC amendments are proposed as phase-downs over decades, the technological options explored should include technologies that are commercialised, proven, or under development and can be expected during the timeframe of the phase-out. Given the need to ascertain feasible step-downs in HFC consumption, the penetration of alternatives in A2 and A5 countries over time needs to be assessed.

As currently drafted, the draft decision requesting a TEAP report on alternatives does not request consideration of the costs of alternatives, which is an important factor in any future agreement to phase out HFCs. EIA believes the TEAP should also indicate capital and running costs for alternatives, indicating where these are expected to reduce over time given economies of scale.

In addition, the TEAP should not exclude alternatives that are technically feasible, but where application is blocked by current safety or other regulations. For example, the use of hydrocarbon refrigerant can be unnecessarily hindered by safety standards, even though in many situations safety considerations can be adequately addressed and the regulatory restrictions on the use of these alternatives can be modified, as was recently demonstrated by the Chinese risk assessment of the use of hydrocarbons in window air conditioners with current safety features.[23]

RECOMMENDATION

- Support Decision XXIV/[E] ensuring it gives the TEAP a clear mandate to consider alternatives to HCFCs and HFCs at regular time intervals up to 2035, and also includes an assessment of cost and energy efficiency of alternatives in addition to information on global-warming potential.

"The TEAP report does not provide an adequate review of the dramatic progress in the development and commercialization of low-GWP alternatives."

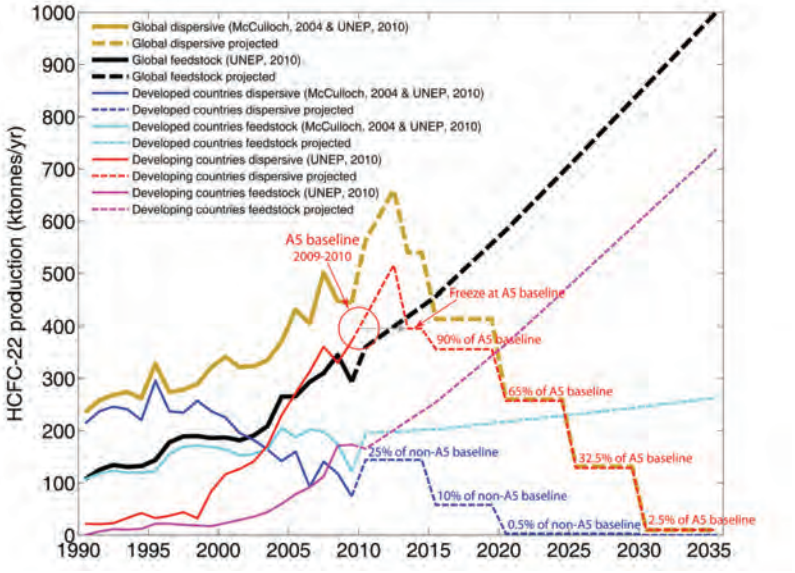
VI. FEEDSTOCKS – A SLEEPING DRAGON ABOUT TO AWAKE?

While the Montreal Protocol regulates ODS for emissive uses, their use as feedstock and process agents is not controlled. Specifically, feedstock production and use is to continue unabated *"until either the products derived from these feedstocks are no longer needed or when alternative economically attractive synthetic technologies are commercialised."*[24] The theory underlying this exemption is that the ODS is completely consumed in the chemical process. However, as the production of ODS for feedstock now exceeds one million metric tons annually, this assumption should be re-evaluated. This exemption creates real and tangible environmental threats: most notably, the creation and release of by-products during transformation and production (HFC-23, CTC, and others), releases of the ODS itself during production, transport and use, and illegal smuggling of feedstock ODS for emissive uses. Given that alternatives are available, it is time for the Montreal Protocol to investigate and address these issues fully.

Many industries use CFCs and HCFCs as feedstock for producing pharmaceuticals, agricultural products, and, of particular note, fluoropolymers like polytetrafluorethylene (PTFE or Teflon®) and polyvinylidene fluoride (PVDF). Moving to alternatives is possible. Nearly two decades ago, during the initial phase out of CFC emissions, many industries sought out alternative feedstocks. DuPont changed its process for producing Tyvek® and Hypalon®, while Toyo Kasai Kyogo found a CTC-free route to creating polypropylene.[25] The expected cost increase of CFC feedstocks drove these research efforts.

HCFC-22 production data & projections 1990-2035

Miller & Kuijpers, 2011



Unfortunately, such economic incentives appear to be lacking with respect to HCFCs used in the manufacture of fluoropolymers, as the demand for use as feedstock is outstripping the demand for emissive production and as a result, there is massive production capacity solely for the production of feedstock which is likely to keep costs low.

The use of HCFC-22 as a feedstock for producing tetrafluorethylene (TFE), in turn used to produce fluoropolymers like PTFE, causes special concern. While the feedstock use of HCFC-22 rose from 30% to 40% of the market during the last decade, estimates suggest that percentage will reach 67% as early as 2015, with total global consumption reaching nearly 745,000 metric tonnes.[26] Currently, the synthesis of TFE for industrial use requires the pyrolysis of HCFC-22. Besides the inevitable leaking of some HCFC-22, each metric tonne of PTFE produced creates 80kg of HFC-23 waste and 0.33MT of CTC waste.[27] While relatively low-cost (€0.17/tCO_2-eq.) technology exists to destroy approximately 99% of HFC-23 waste, currently around half of all HFC-23 production in Article 5 countries is vented directly into the atmosphere.[28]

There have been advances in alternatives to PTFE in end uses, which should be taken into account when addressing feedstocks. For example, non-stick cookware historically contained PTFE. Now, many often-superior non-PTFE alternatives are already available. Thermolon® and Neoflam's Ecolon® produce non-stick cookware using silica-based polymers.[29] These polymers do not release ODS during production and can be used to produce non-PTFE alternatives for numerous industrial applications.

Additionally, alternatives to ODS-feedstock based fluoropolymers exist for a variety of industrial applications. Polyolefin insulation and flooring can often serve as suitable substitutes for fluoropolymer-based products like PVDF. Bartec makes a self-limiting MSB heating cable that surpasses PTFE-based products, and Victrex offers a variety of polyetherketones thermoplastics under their PEEK® branded products for use as valves, bearings, insulation, and other demanding applications.[30] Besides not using ODS, these products also offer numerous performance advantages to similar fluoropolymer-based products. Chevron delivers chemical and thermal resistant filter fabrics, polyphenylene sulfide (PPS), under the Ryton® brand, for use in appliances, automotive technology, electronics and other industrial applications like boilers, insulation, pumps, and valves. Heresite also produces ODS-free phenolic coatings for intensive industrial use. These alternatives show the

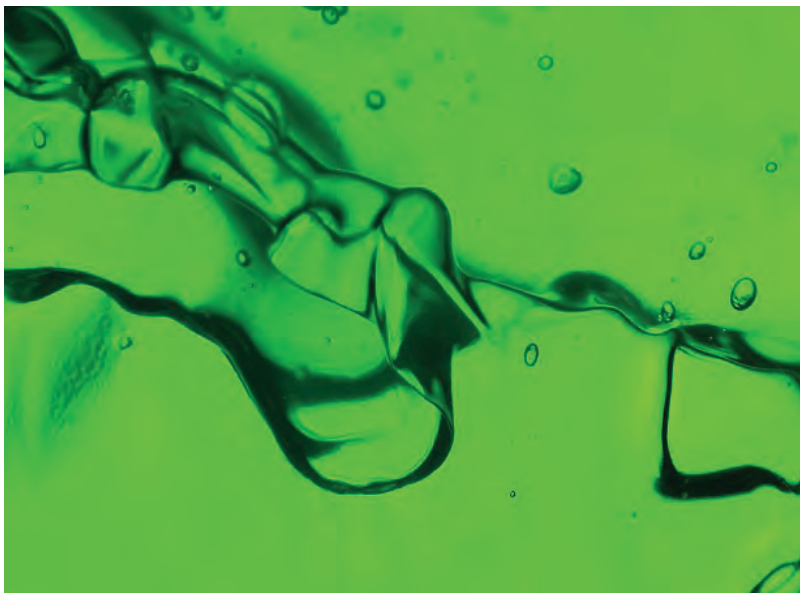
potential to move away from the use of ODS as feedstocks.

An international movement towards finding alternatives to ODS and toxic feedstocks called the Green Chemistry movement is slowly changing customary approaches to chemical operations.[31] The US EPA describes Green Chemistry as applying "across the life cycle of a chemical product, including its design, manufacture, and use," which benefit industry and the environment by eliminating costly end-of-pipe treatments through reductions in waste, safer products, reduced use of energy and resources, and improved competitiveness for chemical manufacturers and their customers.[32]

Repeated attempts have been made to estimate emissions from the use of ODS as feedstock. Although Parties to the Montreal Protocol are required to report ODS production for feedstock uses under Article 7, this obligation is not being met uniformly by the Parties and as a result, estimates are based on anecdotal evidence or proprietary unpublished market data aggregated for competitive reasons.[33] There are no commonly accepted guidelines for estimating feedstock emissions from storage facilities, or fugitive losses during transfers and transportation.[34] HCFC-22 production for feedstock is expected to soar over the coming decades. According to Miller & Kuijpers, global HCFC-22 production for feedstock is projected to overtake production for emissive purposes by 2015, reaching one million tonnes by 2035.[35] Most of this growth will come from developing (A5) countries, which are on course to triple HCFC-22 feedstock production between 2010-2035.

Given the massive increase in feedstock and process agent use, the TEAP should be charged with assessing the direct emissions from ODS feedstock and process agent production and use, and the byproduct emissions that occur during production and use to assess the continued validity of the assumption that feedstock and process agent processes are benign.

A draft decision submitted by the European Union and Croatia on feedstock estimates that annual emissions from quantities of feedstock currently reported could equate to 12 million tonnes of CO_2e. It further notes that there may be quantities of ODS used for feedstock which are not reported, increasing the potential for illegal trade, and that there is insufficient information available on possible alternatives. The draft decision calls on Parties to respect existing Article 7 reporting requirements, take measures to minimize emissions, and provide information on alternatives to the Ozone Secretariat. The decision also requests that the TEAP's 2013 progress report identify alternatives to ODS for feedstock uses and assess the technical and economic feasibility of measures to reduce or eliminate such uses and emissions, as called for in decision XXI/8.



© Pike Research

ABOVE:
The Green Chemistry movement is slowly changing customary approaches to chemical operations.

RECOMMENDATIONS

- Support Decision XXIV/[D] on feedstock uses
- Require reporting of all ODS feedstock production and trade by Parties;
- Require reporting of all ODS and environmentally harmful byproducts emitted during production and use of feedstock;

VII. HFC-23 AND THE CDM: END IN SIGHT FOR THE WORLD'S GREATEST CARBON SCAM

Billions of dollars for HFC-23 destruction have been channelled through the Clean Development Mechanism (CDM) since the mid-2000s. Nevertheless, atmospheric concentrations of this super greenhouse gas (14,800 GWP, atmospheric lifetime 270 years[36]) have continued to rise.

Indeed, as scientific studies indicate, over 90% of annual HFC-23 emissions (approximately 8.6 Gg –127 million tonnes CO_2e) originate from non-CDM HCFC-22 production facilities in China.[37] Meanwhile, project developers in India and China have made staggering windfall profits by monetizing beyond all proportion an abatement process that costs less than US $0.20 or €0.17/$CO_2e$ tonne.[38]

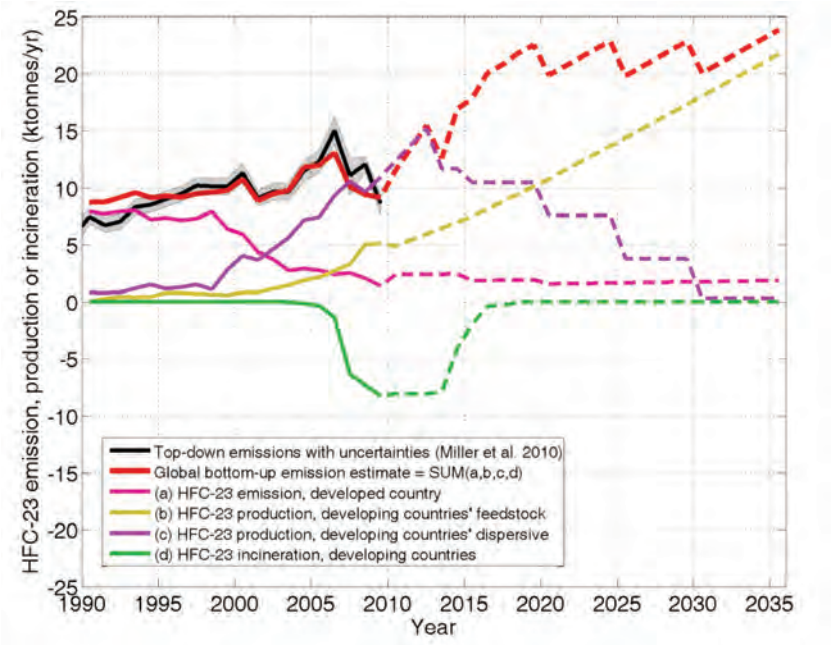
In a nutshell, the CDM has at best only partially addressed HFC-23 emissions whilst subsidizing and encouraging over-production of HCFC-22, an ODS that is currently being phased out by the Montreal Protocol.

HFC-23 PROJECTS DISCREDITED

In response to evidence that HCFC-22 and HFC-23 waste production levels were being maximised by CDM project developers in order to gain more carbon credits, the European Union banned HFC-23 credits along with other industrial gas credits from the world's largest carbon market, the European Emissions Trading Scheme as of April 2013. A somewhat weaker response came from the CDM Executive Board, which has changed the methodology for HFC-23 abatement projects hosted by the CDM by bringing the permissible waste ratio down from three to one percent.

HFC-23 emissions, production and incineration data and projections 1990-2035

Miller & Kuijpers, 2011



CDM POLICY DIALOGUE RECOMMENDATION 2.4:



"Stop registering new projects involving gases with comparatively low marginal costs of abatement (e.g. projects that reduce HFC-23 and projects that reduce N2O from adipic acid plants), which have matured to the point of being ready to graduate from the CDM. Regulation may be needed to ensure the phase-out of these industrial gases."

This means that the maximum emission reductions that can be claimed by project developers is one tonne of HFC-23 for every 100 tonnes of HCFC-22. Under the old methodology, developers were able to claim three tonnes of HFC-23 for every 100 tonnes of HCFC-22 produced.[39] In reality, the new methodology will have little impact however since it only applies to projects when they are renewed, not existing projects.

Unsatisfactory as this is, the CDM EB's attempts to fine tune the HFC-23 methodology could soon be rendered irrelevant. In a further blow to the world's greatest carbon scam, the CDM Policy Dialogue, an independent high-level panel established to take stock of the CDM this year published a report concluding that *"For projects that reduce emissions of certain industrial gases, the main aims of the CDM in these areas have now been achieved."*[40] The authors of the report recommended in no uncertain terms that the Executive Board should *"Stop registering new projects involving gases with comparatively low marginal costs of abatement (e.g. projects that reduce HFC-23 and projects that reduce N2O from adipic acid plants) [...]."*[41]

With the exception of Japan, all Kyoto Parties, as well as the CDM's own advisory board, have made it clear that HFC-23 offsets have no place in the future of international carbon markets. With little or no interest in the development of new CDM HFC-23 projects or renewal of existing projects, current and ongoing HFC-23 emissions must be addressed outside the CDM. Voluntary capture and destruction by producers, or mandated by governments, supplemented if need be by incremental funding through the Montreal Protocol, offers a cost-effective solution. HFC-23 is a by-product of an ODS substance being phased out and under direct regulatory control of the Montreal Protocol, and it is therefore the responsibility of Parties to address and resolve this issue without delay.

RECOMMENDATIONS

- Parties to the Montreal Protocol should mandate that HCFC-22 manufacturers assume responsibility for destroying HFC-23
- Parties to the Montreal Protocol should adopt draft decision XXIV/[H]: Clean production of hydrochlorofluorocarbon 22 through by-product emission control
- Parties to the Montreal Protocol should instruct the MLF to establish the eligibility guidelines mandated in Decision XIX/6 to compel capture and destruction of all HFC- 23 in order to qualify for closure or transition funding under the HCFC phase-out.

VIII. ARTICLE 2 COUNTRIES MUST LEAD THE WAY IN PROVING AND COMMERCIALISING LOW-GWP ALTERNATIVES TO HCFCS

Article 2 countries under the principle of Common but Differentiated Responsibilities, have a responsibility to be leaders in the phase-out of HCFCs and the development of appropriate alternatives.[42] Under Article 10A of the Montreal Protocol, Article 2 countries are required to transfer "best available, environmentally safe substitutes and related technologies" to Article 5 nations at "fair and most favorable trade conditions."[43] This commitment to facilitate access to relevant scientific information, data, training, and technology was reasserted in the Helsinki Declaration adopted at the First Meeting of the Parties in 1989.[44]

Unfortunately, when Article 2 countries began phasing-out HCFCs in 1996, climate co-benefits were not a condition or aspiration of the phase-out, and by 2009, when 65% of HCFCs had been phased-out, 77% of the conversions were to high-GWP HFCs.[45] These conversions from HCFCs resulted in HFCs becoming the fastest growing source of greenhouse gas emissions in most Article 2 countries. If this same replacement pattern is replicated in Article 5 countries, HFCs will represent 9-19% of anticipated CO_2 emissions by 2050 under a business-as-usual (BAU) scenario.[46]

In contrast to the Article 2 phase-out, Decisions XIX/6 and XXI/9 have instructed the Executive Committee of the MLF to consider and incentivize climate benefits in the selection of alternatives to HCFCs in Article 5 countries. As a result, there have been dramatic conversions in Article 5 countries' HCFC phase-out management plans (HPMPs) directly to low-GWP substitutes, causing Article 5 countries to commercialise low-GWP alternatives before these technologies are available or legal to use in Article 2 countries (e.g. methyl formate). This is the reverse of the concept of common but differentiated responsibilities.

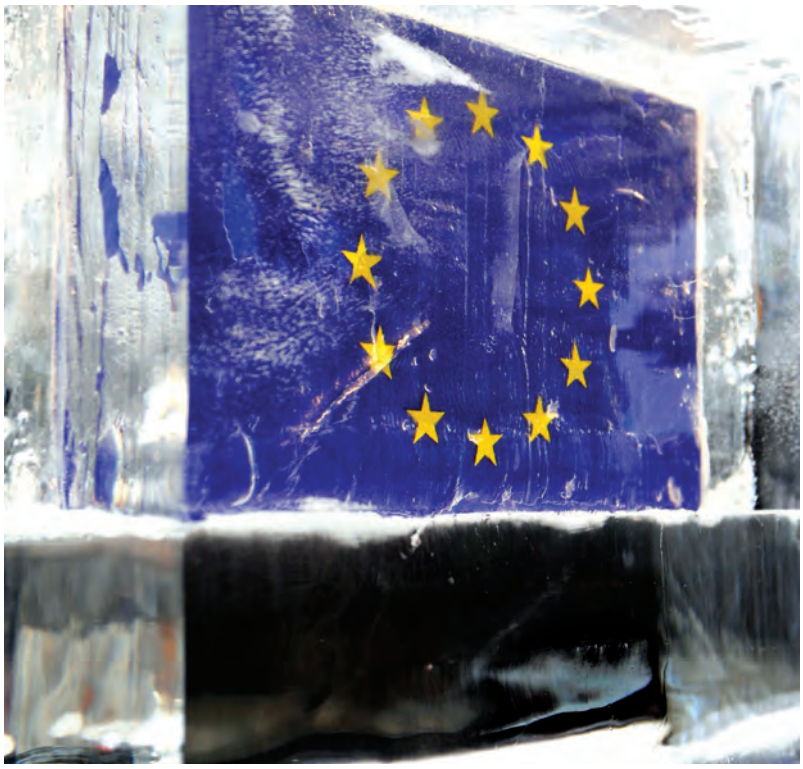
Article 2 countries are beginning to acknowledge the impact of past transitions to HFCs. In this spirit, the European Union is currently considering a revision of its F-gas Regulation. Several studies commissioned against the backdrop of the review show that technically feasible, cost-effective and energy efficient alternatives to HFCs are available in almost all subsectors by 2020 – and in many cases earlier. Based on these findings, a coalition of NGOs, including Greenpeace, WWF, the European Environmental Bureau and EIA have called for widespread bans on the placing on the market of HFC technologies and products in the European Union.

A number of Article 2 countries have formed, along with some Article 5 countries, the Climate and Clean Air Coalition to Reduce Short Lived Climate Pollutants (CCAC).[47] This Coalition recognizes "that mitigation of the impacts of short lived climate pollutants is critical in the near term for addressing climate change and that there are many cost effective options available," and aims to raise awareness of the available mitigation strategies while helping to develop new national and regional actions to deal with short lived climate pollutants, including HFCs.[48]

Although these steps by Article 2 countries are commendable, decisive action on low-GWP alternatives needs to occur now. Article 2 countries must revisit their domestic policies with a view to promoting policies and measures aimed at avoiding the selection of HFCs as alternatives to HCFCs and reversing prior conversions. By promoting the development and commercialisation of low-GWP alternatives, Article 2 countries will increase the availability of these alternatives worldwide, which will ensure effective technology transfer to Article 5 countries. Simultaneous action by Article 2 and Article 5 countries to eliminate the use of HFCs will achieve the greatest climate benefits possible from the HCFC phase-out.

"Article 2 countries must revisit their domestic policies with a view to avoiding the selection of HFCs as alternatives to HCFCs and reversing prior conversions."

BELOW:
The European Union is currently revising its F-gas Regulation.



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