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2014: A YEAR OF ACTION ON HFCs

environmental investigation agency

ABOUT EIA

EIA is an independent campaigning organisation committed to bringing about change that protects the natural world from environmental crime and abuse. As part of our work, we have undertaken groundbreaking investigations into the illegal trade in ozone depleting substances (ODS) and have been closely involved in the international ozone and climate negotiations for well over a decade.

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INTRODUCTION

Climate change is manifesting itself in ever more alarming ways. Devastating bush fires, historic droughts, and recurrent flooding are wreaking havoc on the lives and livelihoods of people around the world. The impacts are most severe in developing countries, where communities already on the brink face a crisis of existential proportions.



COVER IMAGE:
The North Pole is usually covered by sea ice but in recent years, water has been seen at the pole, and many climate scientists think the region could soon be ice-free.

© Sue Flood, from the book "Cold Places"
http://www.sueflood.com/cold-places

The body of scientific evidence supporting the need for drastic action to address the drivers of climate change is now overwhelming.[1] However, the political response has been wholly inadequate. The international community has spent more than two decades constructing an elaborate framework to address climate change which has thus far yielded very limited results. With an ever-widening gap between what is required to limit global temperature rise to below 2°C by 2020 and climate mitigation pledges under the UN Framework Convention on Climate Change (UNFCCC)[2], countries must seize each and every opportunity to curb greenhouse gas (GHG) emissions.

Phasing out the production and consumption of hydrofluorocarbons (HFCs) under the Montreal Protocol presents one such opportunity. Of all the options to tackle climate change in the short term, this is the most tangible prospect for immediate, cost-effective action to achieve significant additional GHG emissions reductions, and one which will help keep the climate system from reaching a truly disastrous tipping point.

Achieving a fair and balanced global deal to eliminate HFCs will require leadership and trust. To create the right conditions for an agreement, donor countries must provide sufficient funding for developing countries to fulfil their existing commitments under the Montreal Protocol. At the same time, developing countries must come to the table and put forward workable solutions to existing barriers to a deal on HFCs. Action on HFCs, which will help to close the 2020 'gigatonne gap', cannot be held hostage by developed or developing countries to the politics of a broader climate agreement under the UNFCCC.

The good news is that some governments and major corporations are already moving ahead with plans to eliminate HFCs. Landmark legislative changes in some of the biggest HFC producing and consuming countries, as well as an historic commitment to adopt climate-friendly refrigeration from the global consumer goods industry mean that the market is ready for change. Alternatives to HFCs are coming to market at an ever-increasing pace.

2014 is the year to turn commitments into real actions. EIA calls on Parties at this week's meeting in Paris to begin substantive negotiations to address HFCs under the Montreal Protocol and make 2014 a year of climate action.

In the quarter-century since its inception, the Montreal Protocol has prevented over 200 billion tonnes (Gt) of CO_2e from reaching the atmosphere through the phase-out of ODS. Conservative estimates put future savings from a phase-down of the consumption and production of HFCs under the Montreal Protocol at 115 to 141 $GtCO_2e$ by 40 years after adoption.[3]



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THE REPLENISHMENT

The Montreal Protocol's Multilateral Fund (MLF) was designed to cover incremental costs incurred by developing countries as a result of the phase-out of their consumption and production of ODS.[4] Since 1990, the MLF has provided Article 5 countries with over US$3 billion to eliminate the production and consumption of chlorofluorocarbons (CFCs), halons and other ODS including hydrochlorofluorocarbons (HCFCs), which are currently being phased out according to an accelerated schedule agreed in 2007.[5] ODS use has plummeted by a staggering 98% compared to historic levels,[6] corresponding to a reduction of over 10 billion tonnes of CO_2-equivalent emissions per year.[7] This impressive feat has been achieved at a level of cost-effectiveness which is unmatched by any other effort to reign in global GHGs.

At OEWG 34, the Parties to the Montreal Protocol will begin negotiating a new triennial Replenishment of the MLF. The timing of this Replenishment is significant, given that it is being negotiated contemporaneously with the negotiation of the HFC amendment proposals. There is a clear need for a robust Replenishment that will allow full implementation of the ongoing phase-out of HCFCs and the associated commitment to maximise climate benefits embodied in Decision XIX/6.[8] Developing countries have already warned that without adequate financial backing, their ability to implement existing commitments under the Montreal Protocol will be severely compromised. Likewise, without adequate funding, precious opportunities to enable Article 5 countries to leapfrog expensive and ultimately dead-end HFC technologies will be squandered. The Replenishment also needs to be sufficient to cover activities that historically have been considered as not required for compliance. In recent years, projects such as development and demonstration projects for low-Global Warming Potential (GWP) alternatives, ODS mapping, ODS destruction and training on illegal trade, have either been postponed, rejected for funding, or received only partial funding. These projects have significant impacts on both the ozone layer and the climate and should be funded by the Parties. The recent approval of $10 million for pilot and demonstration projects by the MLF[9] is welcome. However, additional studies are needed on retrofitting existing HCFC refrigeration and air-conditioning equipment to use low-GWP alternatives.

Volume 6 of the Report of the Montreal Protocol's Technology and Economic Assessment Panel (TEAP), *"Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund for the Period 2015-2017"*[10] contains estimates based on two 'cases'. It is EIA's understanding that Case 1, the "commitment-based phase-out" assumes funding requirements for activities resulting in a further 25% of HCFC reductions in order to meet the 35% reduction step in Stage 2 of the HCFC phase-out, and would require a Replenishment of US$609.5 million for the next triennium. Case 2, the "unfunded phase-out," is based on the fact that the amount of funding received by some Article 5 countries covered activities over and above the required 10% reduction in Stage 1, however additional reductions were not specified in some of the agreements. Case 2 assumes that these reductions above the 10% step will be counted towards Stage 2 commitments. Under this scenario, the funding for the Replenishment is reduced to US$489.7 million.

Article 2 countries have committed to provide Article 5 countries with adequate funding to meet their HCFC phase-out commitments. The difference between the two cases may be linked to whether Article 5 countries which have already received additional funding beyond their 10% commitment will use this to address growth from the baseline or will use it to fund Stage 2 commitments.

The difference between the two sums amounts to $119.8 million and as seen below could be used to fund the majority of transitions to low-GWP alternatives to HFCs over the next two triennia.

BELOW:
Measurements taken from high-altitude balloons, like this one launched by the United States National Oceanic and Atmospheric Administration (NOAA) over the South Pole show that the ozone hole over Antarctica is likely to show signs of recovery within the next decade.



© NOAA



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ABOVE:
Danish company Advansor's transcritical CO_2 systems are being used to replace HFC equipment in supermarkets around the world.

Maximizing Transitions to low-GWP Alternatives to HFCs

Consistent with Decision XXV/8 of the Twenty-Fifth Meeting of the Parties,[11] the TEAP has evaluated the cost of maximizing transitions to low-GWP alternatives during the HCFC phase-out. Volume 6 of the TEAP Report examines the following funding scenarios:

1. Additional resources to support the choice of low-GWP alternatives in foam, refrigeration and air conditioning (AC) conversion projects and servicing in the absence of a binding policy to avoid high-GWP alternatives to ODS;

2. The cost associated with a second conversion from HFCs to low-GWP alternatives in the refrigeration and mobile air conditioning sectors that the MLF funded in the 1990s.

The total additional funding requirement associated with these two scenarios is estimated to be only approximately US$23 million per year over at least two triennia, making a total of around US$138 million. This small additional sum would address annually consumption of roughly 10,000 tonnes of high-GWP alternatives (around 3% of total HFC consumption in Article 5 countries, estimated to be 300,000 tonnes in 2015). Assuming an average GWP for HFCs in use to be approximately 1900, a reduction of 10,000 tonnes of HFCs would result in mitigation of approximately 19 million tonnes of CO_2e at a cost of just over $7 per CO_2e tonne.

In the spirit of Decision XIX/6 and given the fact that the additional funding request represents approximately 12% of recent Replenishments, this triennium's Replenishment should have a separate line item for funding these conversions.

The TEAP also conducted an analysis of the total cost of gradually phasing down HFCs described as:

"The funding of a gradual phase-down of the consumption of high-GWP substances in Article 5 countries, where the consumption is not associated with a previous conversion from ODS to high-GWP alternatives."

The TEAP estimate annual consumption of HFCs in Article 5 countries to be approximately 300,000 tonnes in 2015. Using cost effectiveness figures based on experience in converting certain manufacturing to low-GWP ODS alternatives they estimate the cost of an HFC phase-down based on the

"The Montreal Protocol can act now to avoid further growth of HFCs at remarkably cost-effective levels."

manufacturing sectors to be between US$1.1 and US$3.2 billion. There are few data to explain what this actually means in terms of an HFC phase-down and the likely climate mitigation impact. The TEAP should explore further how to derive a reliable estimate for an HFC phase-down, based on several different reduction step scenarios.

The TEAP should also explain further why "The Task Force is not able to give further considerations to these amounts within the Multilateral Fund framework of enabling compliance with agreed control schedules".

While much more work needs to be done to give all Parties confidence in this evaluation, these figures should kick start the discussion on financing the amendments.

The TEAP has shown that the Montreal Protocol can act now to avoid the further growth of HFCs at remarkably cost-effective levels. Ignoring these opportunities under the guise of austerity is an ill-judged decision based on short-term politics that will result in unnecessary extra costs and greenhouse gas emissions in the very near future.

The next reduction target of 35% is going to be challenging and A2 Parties need to understand that a higher Replenishment than previous years will be required. However, EIA believes that A5 countries that have received funding for reductions over and above 10% should seek to implement those reductions.

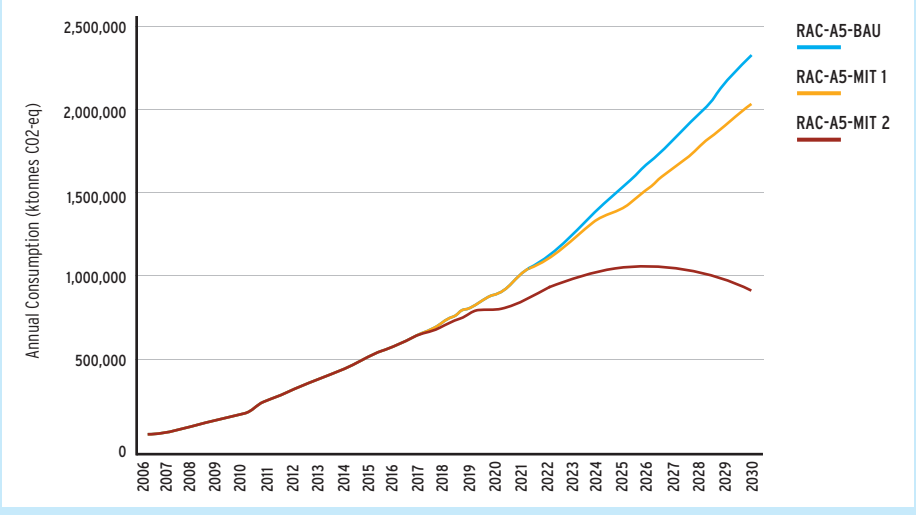
TEAP REPORT ON *"ADDITIONAL INFORMATION ON ALTERNATIVES [TO] ODS"*

Volume 4 of the TEAP's Decision XXV/5 Task Force Report on *"Additional Information on Alternatives [to] ODS"*[12] provides much useful information for the Parties and is a marked improvement over last year's Alternatives Report.

This year's TEAP report examines two HFC mitigation scenarios up to 2030. The first (MIT-1) is described as a "relatively achievable" scenario based on current technology options and potential trends. The second (MIT-2) is a more ambitious scenario highlighting the sizeable mitigation potential associated with early transitions to low-GWP technologies. Apart from the huge climate benefits of an earlier transition to climate-friendly alternatives, which the TEAP puts at 11.5 $GtCO_2e$ by 2030, the report emphasises that leapfrogging high-GWP technologies as part of planned process upgrades will be more cost-effective than conversions that are forced by regulatory measures. This is particularly true for Article 5 countries where HFC demand is currently less entrenched and there is a smaller installed base. In non-Article 5 countries, where HFCs already have a large market share, additional regulatory measures, such as the new EU F-Gas Regulation, will be key to influencing conversions to low-GWP alternatives.

FIGURE 1: IMPACT OF MITIGATION SCENARIOS FOR THE REFRIGERATION AND AIR CONDITIONING SECTOR IN ARTICLE 5 COUNTRIES

Source: 2014 TEAP XXV/8 Task Force (Alternatives to ODS) Report, p.51



Under a business-as-usual (BAU) scenario, i.e. one which does not take into account any policies or measures in the conversion to low-GWP alternatives, the TEAP notes the following with regard to Article 5 countries:

- The demand for HFC-134a in Article 5 countries almost quadruples in 15 years, between 2015 and 2030;
- The BAU scenario shows a growth in demand by a factor of 4-5 for the refrigerants R-404A, R-407C and R-410A mainly due to the external growth factors;
- Total refrigerant demand increases by almost 400% between 2015 and 2030, both in tonnes and $MtCO_2e$
- In non-Article 5 countries, the increase in refrigerant demand expressed in $MtCO_2e$ is a 38% increase between 2015 and 2030.

The enormous climate impact of unconstrained growth in demand for HFCs in Article 5 countries is clear from the Graphs taken from the TEAP report below. Even in non-Article 5 countries, where the BAU scenario takes into account ambitious new regulatory measures in the EU, untrammelled growth elsewhere will lead to a massive increase in consumption at least until 2030.

EIA strongly rejects the TEAP's statement on page 44 of the Report, that *"The hard truth is that an over-ambitious mitigation strategy can actually jeopardise the delivery of climate benefits."*

The example given is the transition to high-GWP alternatives in the PU spray foam sector, 'forced' by the worst first strategy of the MLF (in this case addressing HCFC-141b before HCFC-22 as it has a higher ODP). Clearly, it is not the ambition of the MLF's mitigation strategy which is at fault, but the manner of its implementation in the HPMP. In the cases cited, Article 5 countries chose to convert their PU foam sector to HFCs while they could have transitioned other sectors where low-GWP alternatives were available, leaving the PU Spray Foam sector to be addressed at a later stage.

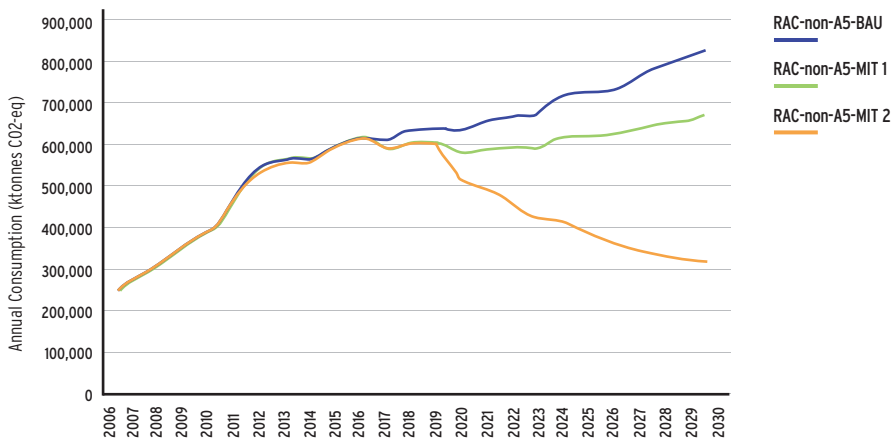
With HFC emissions increasing very rapidly at about 10-15% per year,[13] Parties cannot afford to delay a comprehensive and detailed analysis of the costs of a global phase-down of HFCs any longer.

HFC BANKS: AN EVER-INCREASING CLIMATE THREAT

When the Montreal Protocol entered into force, most of the regulated CFC use occurred in rapid-release applications like spray cans. However, alternatives used in lieu of CFCs have shifted fluorinated gas use to applications such as refrigeration and air conditioning equipment and insulation foams where the gases are contained, or "banked". These banks of fluorinated gases, which persist for years, are already significant and will only increase with continued production of HCFCs and HFCs. Emissions from banks pose a danger to the climate and ozone layer for decades.

FIGURE 2: IMPACT OF MITIGATION SCENARIOS FOR THE REFRIGERATION AND AIR CONDITIONING SECTOR IN THE NON-ARTICLE 5 REGIONS

Source: 2014 TEAP XXV/8 Task Force (Alternatives to ODS) Report, p.59



In a recent study, Velders *et al.*[14] describe HFC banks as a "substantial unseen commitment to further radiative forcing of climate change". They show that an earlier phase-out of HFCs, which prevents the accumulation of HFC banks, would provide significant benefits for climate protection, concluding that if HFC production were phased out in 2020 instead of 2050, an additional 39-64 $GtCO_2$-e of cumulative emissions could be avoided from 2020 to 2050, in addition to the 91–146 $GtCO_2e$ avoided directly.

HCFCs: STILL ON THE RISE

EIA notes with alarm the consistent upward trend of HCFC-22 production and consumption in Article 5 countries, as illustrated in [Table 1] of the TEAP Replenishment Report.[15] A similar, through less marked, trend is observed in the case of HCFC-141b production in Article 5 countries, despite it being prioritised for phase-out in Stage 1 activities. Increasing consumption and production may lead to compliance challenges for Parties in the future. Furthermore, high levels of reported consumption suggest high dependency on HCFCs and the risk of a significant black market trade.

Strong growth in supply and demand for HCFCs is a matter of grave concern. EIA is particularly worried about the illegal trade implications of the rising availability of HCFC-22 at a time when countries are meeting their first reduction target.

FIGURE 3: HCFC-22 NON-ARTICLE 5, ARTICLE 5 AND GLOBAL PRODUCTION AND CONSUMPTION NUMBERS FOR 1995, 2000 AND 2005-2012
(Article 7 reporting, UNEP, February 2014)
Source: 2014 TEAP XXV/8 Task Force (Replenishment) Report, p.63

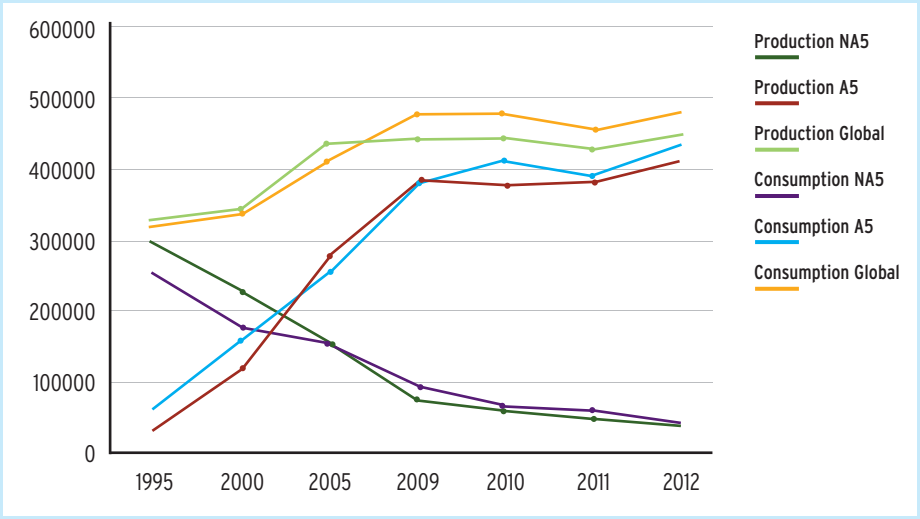


TABLE 1: HCFC-22 NON-ARTICLE 5, ARTICLE 5 AND GLOBAL PRODUCTION AND CONSUMPTION NUMBERS FOR 1995, 2000 AND 2005-2012
(Article 7 reporting, UNEP, February 2014)
Source: 2014 TEAP XXV/8 Task Force (Replenishment) Report, p.63

Year (tonnes)	1995	2000	2005	2009	2010	2011	2012
PRODUCTION -22							
NA5	295690	225119	160062	74226	63656	49575	39002
A5	32366	116606	272055	371418	379105	379925	411634
Global	328056	341725	432116	445644	442761	429500	450636
CONSUMPTION -22							
NA5	250595	175635	151909	96060	67159	63737	43853
A5	64018	156243	256607	381517	408982	390124	434734
Global	314613	331880	408517	477577	476141	453861	478587

DOMESTIC ACTION ON HFCs

HFC PHASE-DOWN SCHEDULE UNDER THE NEW EU F-GAS REGULATION

YEARS	HFC PHASE-DOWN SCHEDULE
2015	100%
2016-17	93%
2018-20	63%
2021-23	45%
2024-2026	31%
2027-29	24%
2030	21%

On April 16, 2014, the European Union (EU) adopted a new EU F-Gas Regulation aimed at significantly reducing consumption of HFCs in Europe by at least 79% by 2030. The EU F-Gas Regulation contains several new measures to control HFCs, including an HFC phase-down that progressively restricts the supply of HFC chemicals (expressed in CO_2-equivalent) placed on the European market. (see above)

The HFC phase-down is supported by targeted sectoral bans on certain new HFC-based equipment that will enter into effect over the next decade, including domestic refrigerators and freezers, technical aerosols, foams, movable room air-conditioners, stand-alone and large centralised refrigeration systems, single-split and mobile air-conditioning systems. Other measures include provisions requiring HFC-23 by-product destruction, a ban on servicing and maintaining larger refrigeration systems with very high-GWP (more than 2500) HFCs from 2020, and training programmes for natural refrigerants. Taken together, the measures are expected to reduce HFC emissions by 1.5 GT CO_2e by 2030 and 5 GT CO_2e by 2030 over current levels. Several EU Member States are also considering more stringent national measures.

The EU F-gas Regulation also contains provisions to reduce the emission of HFC-23, which has a GWP of 14,800. HFC-23 is produced as a by-product of HCFC-22 production. Certain HFC chemicals, including lower-GWP HFCs, may be using HCFC-22 as a feedstock during their manufacture. To prevent HFC-23 emissions from undermining the climate benefit of the HFC phase-down, the EU included a prohibition on placing any HFC chemicals on the European market — whether from domestic production or imported — unless producers and importers provide evidence that HFC-23 by-product (produced directly or from the production of feedstock used in the production of the HFC chemical) is destroyed.

The United States (US) is also taking regulatory action to address HFCs under the Clean Air Act via its Significant New Alternatives Policy Program (SNAP). The US Environmental Protection Agency (EPA) has promulgated a

BELOW:
The EU has adopted landmark legislation aimed at reducing HFC use by at least 79% by 2030.



© Matt May

"Regulatory developments are sending a clear signal to the market: HFCs are not here to stay."

rulemaking to allow (list) certain natural refrigerants which was signed in June 2014 and will be published in the Federal Register in July 2014. Impacted sectors include consumer aerosols, foams, commercial refrigeration, domestic refrigeration, and mobile air-conditioning. Additionally, the EPA announced a rulemaking that will prohibit (delist as acceptable substitutes) certain higher-GWP HFC alternatives. This rulemaking is undergoing review by the Office of Management and Budget and an inter-agency review and is expected to be promulgated in the early autumn.

In addition, the California Air Resources Board (CARB) recently adopted its Scoping Plan Update under the Global Warming Solutions Act of 2006, outlining new strategies and recommendations to reduce HFC emissions that build upon actions being taken by the US EPA and the EU.

These countries are not alone. Action is also being taken by China and Japan, among others. At the end of May this year, China announced a new target to eliminate emissions of 280 million tonnes CO_2-equivalent of HFCs under the Twelfth Five-Year Plan.[16] This comes after an MLF decision in April 2013 to approve up to US$385 million for China's production sector phase-out of HCFCs.[17] This landmark agreement was significant in that China also agreed to coordinate with stakeholders and make best efforts to manage HCFC production and associated by-product production in HCFC plants in accordance with best practices to minimize associated climate impacts. China, the largest emitter of HFC-23, has announced that it intends to implement a regulation concerning HFC-23 destruction by HCFC-22 manufacturers in the coming months.

In Japan, the new 'Act for Rationalised Use and Proper Management of Fluorocarbons' will enter into effect on 1st April 2015. This will require reporting of consumption of "high-GWP" F-gases in all sectors. In addition to this, companies will be asked to submit and negotiate phase-down plans with the authorities. Refrigerant handlers and end-users will also have an obligation to report charging and recovery activities.[18]

These regulatory developments are sending a clear signal to the market: HFCs are not here to stay.

BELOW:
There is growing momentum towards the introduction of climate-friendly refrigerants in commercial refrigeration.



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COMMERCIAL REFRIGERATION: TOWARDS A GLOBAL COOLING REVOLUTION

There is growing momentum towards the introduction of climate-friendly refrigerants in commercial refrigeration, where technologically viable and feasible alternatives to HFCs are available now. There is strong evidence of this in Europe, where the number of HFC-free supermarkets has more than doubled in the last two years alone. Around the world, the number of HFC-free supermarkets is also increasing rapidly as retailers look to take advantage of the significant climate benefits and energy efficiency gains available when switching to HFC-free cooling.

The Consumer Goods Forum (CGF) – an industry body comprising more than 400 retailers, manufacturers, service providers and stakeholders from 70 countries – first announced its intention to move away from HFCs at the Cancún Climate Conference in November 2010, attracting global plaudits. In June this year, the CGF Board renewed its commitment to begin phasing out HFCs in new refrigeration installations as of 2015, while also calling on global leaders to secure an ambitious and legally binding global climate deal.[19]



CONCLUSION

The climate system is fast approaching the point of no return. Without swift and decisive action to reign in greenhouse gas emissions, the average global surface temperature will continue to rise, communities around the world will suffer unprecedented loss of human life, habitats will be ruined, food security will be in jeopardy, and countless species will die out.

There is an alternative. If world Governments act now, the worst impacts of climate change can still be averted. To do so will require vision and an ability to lead, qualities which have in the past made the Montreal Protocol a unique success in the environmental policy space.

EIA calls on global leaders to start serious negotiations at this week's OEWG meeting, with a view to agreeing a global deal on HFCs in November, making 2014 a year of climate action.

KEY RECOMMENDATIONS:

- Countries must put the high-level statements of 2013 to work, and begin concrete negotiations to address HFCs under the Montreal Protocol at OEWG 34, with the objective of reaching a global agreement at the 26th Meeting of the Parties (MOP 26).
- Parties must avoid engaging in political short-termism and work towards achieving a fair and balanced outcome on the Replenishment negotiations. The provision of sufficient finance will support timely compliance with the accelerated phase-out of HCFCs and create the right conditions for a global deal on HFCs.
- The Replenishment must be set at a level enabling additional resources to support the choice of HFC-free alternatives in foam, refrigeration and air conditioning conversion projects.
- Finally, Parties should continue to push for high-level statements in other fora that support a global phase down of HFCs under the Montreal Protocol. The UN Secretary-General's extraordinary climate change summit in September 2014 will offer a platform for world leaders to call for the Montreal Protocol to agree a global phase-down of HFCs at MOP 26.

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