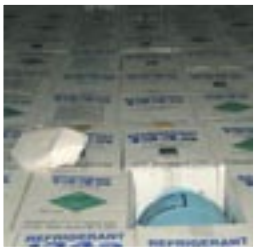

AN EARLY FREEZE TO STOP THE WARMING

THE URGENCY OF AN ACCELERATED PHASE-OUT FOR HCFCS

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ACKNOWLEDGEMENTS

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SUMMARY

The Montreal Protocol faces a unique opportunity on its 20th anniversary to build on its unparalleled record of success. By accelerating the phase out of HCFCs (hydrochlorofluorocarbons), it can solidify its achievements in protecting the ozone layer and make an historic contribution to combating climate change, saving billions of carbon dioxide (CO_2) equivalent tonnes from reaching the atmosphere. This opportunity, however, hangs in the balance and will require determined action at its 20th anniversary meeting in Montreal.

This briefing reviews phase out scenarios under discussion, accompanying measures, and interactions with the Kyoto Protocol and the Clean Development Mechanism. It finds signs of rapid growth of HCFC production coupled with uncertainty over current production levels. It considers the implementation issues associated with this uncertainty and differing phase out schedules. The report concludes that the scenarios under discussion are unnecessarily lax and that a more aggressive phase out scenario will be practical and necessary to achieve maximum benefits for the climate and the ozone layer.

EIA makes the following recommendations to Parties to the Montreal Protocol:

1. **Support a freeze on production and consumption in Article 5 countries beginning in 2008, based on a baseline of 2007 levels, in order to prevent spiralling HCFC production;**
2. **Support a full phase-out of Article 5 HCFC consumption and production by 2025, with appropriate interim steps;**
3. **Commit to substantial funding to the Montreal Protocol's Multilateral Fund to ensure the HCFC phase out;**
4. **Direct the Multilateral Fund to change its provisions to fund the HCFC phase out and support climate-neutral alternatives;**
5. **Support an accelerated phase-out of HCFC consumption and production in non-Article 5 countries;**
6. **Strongly promote new environmentally neutral technologies that eliminate reliance on equipment using HCFCs and similar blends of greenhouse gases in favour of low-impact alternatives;**
7. **Seek to freeze and phase out the production of HCFCs for feedstock uses, which are currently exempt from the Montreal Protocol phase-out;**
8. **Urge governments of countries that manufacture large volumes of HCFCs to enact stricter domestic measures to freeze and phase out HCFC production at the earliest achievable date;**
9. **Improve coordination between the Montreal Protocol and the Kyoto Protocol to eradicate perverse incentives to increase HCFC-22 as a result of the Clean Development Mechanism;**
10. **Urge governments to enact domestic measures to require the destruction of all HFC-23 by-product, regardless of CDM project funding.**

BACKGROUND

The Montreal Protocol on Substances that Deplete the Ozone Layer is widely regarded as the world's most successful multilateral environmental agreement, phasing-out 95% of production of ozone-depleting substances (ODS) worldwide over the past 20 years and placing the ozone layer on a path toward recovery in the second half of this century.

Many ODS are also potent greenhouse gases (GHGs) that are responsible for climate change, some of them thousands of times more powerful than carbon dioxide at warming the planet.[1] As a result, in addition to protecting the ozone layer, the Montreal Protocol has been the world's best climate treaty to date, reducing GHG emissions by an estimated 135 billion tonnes of carbon dioxide-equivalents (CO_2-eq.) from 1990 to 2010 and delaying radiative forcing [2] by an estimated 7-12 years.[3]

Strengthening the Montreal Protocol will result in additional emissions reductions and further mitigate the effects of climate change. This could buy the world some much needed time to develop and negotiate a long-term climate framework to succeed Kyoto and fulfil the key objective of preventing "dangerous anthropogenic interference" set by the UN Framework Convention on Climate Change (UNFCCC).

The most substantive way to strengthen the Montreal Protocol is to accelerate the phase-out of HCFCs, which is currently scheduled for 2040 in Article 5 (developing) countries and 2030 in non-Article 5 (developed) countries. Accelerating the phase-out of HCFCs will ensure the continued success of the Montreal Protocol in protecting the ozone layer and produce significant benefits to the climate.

In March 2007, a record nine Parties proposed adjustments to HCFC control measures.

Since then, at the 27th Open-Ended Working Group in Nairobi in June 2007, the Parties recognised a "clear need to accelerate the timetable for the phase-out of ozone-depleting substances, in particular HCFCs."[4] On June 7th the G8 Summit Declaration added additional support, committing to "accelerating the phase-out of HCFCs in a way that supports energy efficiency and climate change objectives."[5]

The Technology and Economic Assessment Panel (TEAP) of the Montreal Protocol has reported that accelerating the phase-out of HCFCs by 15 years could result in cumulative savings of 468,000 ODP tonnes. With additional practical measures such as end-of-life measures and leakage reduction within the refrigeration sector, emissions could be reduced by nearly 1.25 million ODP tonnes, advancing the recovery of the ozone layer by as much as 7.1 years.[6]

The TEAP and other experts have calculated that an accelerated HCFC phase-out could result in potential emissions reductions of 17.5 to 25.5 billion CO_2-eq. tonnes by 2050, provided that additional measures are taken to replace HCFCs with substitutes and alternatives that have zero or low Global Warming Potentials (GWPs) and to improve the energy efficiency of refrigeration and air conditioning equipment.[7] Low GWP substitutes and alternatives exist, and the Montreal Protocol's history has shown that increasingly stringent regulation has produced innovations in technology that have benefited both the environment and industry.

This report adds to this analysis by updating the phase-out scenarios under discussion and considering an additional 'stronger' scenario with a 2007 baseline, 2008 freeze and a full phase out by 2025.

PHASE OUT SCENARIOS – HOW MUCH, HOW QUICKLY?

Four scenarios were compared for consumption in Article 5 countries, with elements from the various Party adjustment proposals amalgamated to form Scenarios 2 and 3, comparing these with a more aggressive phase-out schedule (Scenario 4). A number of assumptions were made in order to simplify the analysis to allow a clear comparison of the various proposals.[8]

SCENARIO 1: (Business-as-usual under Montreal Protocol phase-out): 2015 base level; consumption freeze in 2016 with 100% phase out in 2040.

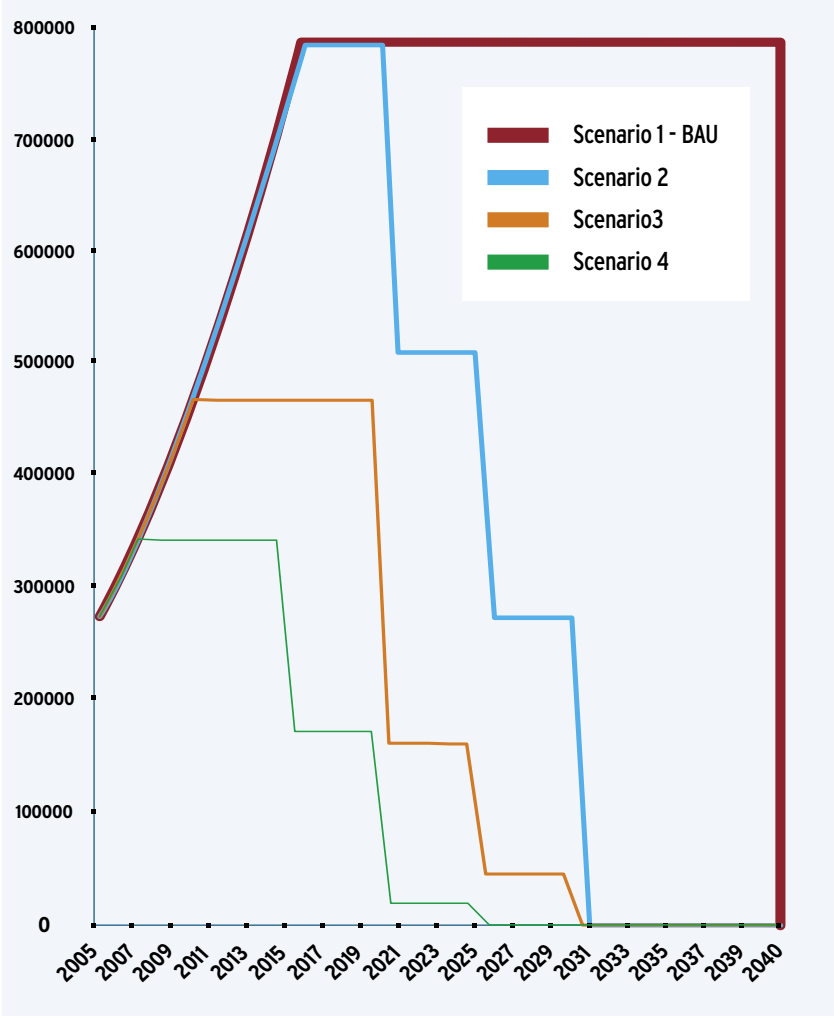
SCENARIO 2: 2015 base level; consumption freeze in 2016; three step reduction (2020 - 35%, 2025 - 65%, 2030 - 99.5%) to 100% phase out in 2040.

SCENARIO 3: 2010 base level; consumption freeze in 2011; two step reduction (2020 - 65%, 2025 - 90%) to 100% phase-out in 2030.

SCENARIO 4: (recommended proposal): 2007 base level; consumption freeze in 2008; two step reduction (2015 - 50%, 2020 - 95%) to 100% phase out in 2025.

HCFC consumption in Article 5 countries was projected to 2040 using the World Bank data from the TEAP Task Force report of August 2007.[9] Taking the Business-as-Usual Scenario (Scenario 1), consumption grows at a rate of approximately 280% from 2005 to 2015 (10.9% per year), at which point consumption is frozen until it is phased out completely in 2040. Under this scenario, the total HCFC consumption from 2005 to 2040 was calculated at 24.3 million metric tonnes. Scenario 2, with the same baseline and freeze but an earlier phase-out, reduces the total HCFC consumption by almost half (12.6 million metric tonnes). Scenario 3, with an earlier baseline and freeze and earlier phase out reduces the total consumption over BAU by 70% (7.5 million metric tonnes) while Scenario 4 reduces consumption to 4.3 million metric tonnes; a reduction of more than 80% over the BAU scenario.

FIGURE 1 Comparison of phase-out scenarios based on HCFC consumption in metric tonnes.



Assuming a mix of 70% HCFC-22, 25% HCFC-141b and 5% other HCFCs (based on HCFC-123 GWP & ODP), the ODP and GWP weighted consumption savings were calculated and are outlined in Table 1. ODP weighted consumption under BAU from 2005 to 2040 was calculated to be 1.65 million ODP tonnes, while GWP weighted consumption amounted to 34.7 billion CO_2-eq. tonnes.

An accelerated phase-out in HCFC consumption could potentially offer a reduction in HCFC consumption of more than 1.36 million ODP weighted tonnes and 28.6 billion tonnes CO_2-eq. in developing countries.

The Kyoto Protocol aims to reduce the collective emissions of developed country GHGs by around 5% from a 1990 baseline. This amounts to around 0.97 billion tonnes CO_2-eq. each year averaged over a five year period of 2008 to 2012. Given emission increases since the 1990 baseline was set, a more realistic estimate of required reductions would be around two billion tonnes CO_2-eq. per year, amounting to a total of 10 billion tonnes CO_2-eq. over the five-year period.[10] According to EIA's analysis, the Montreal Protocol has the potential to reduce future emissions by almost three times this amount through an accelerated phase-out of HCFCs.

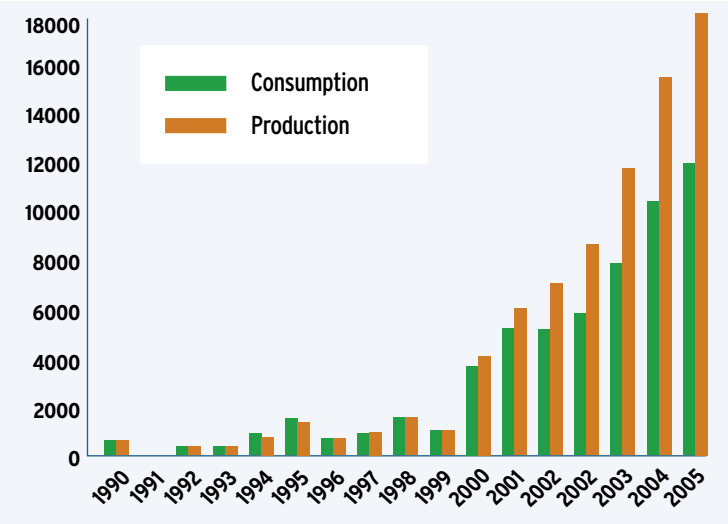


FIGURE 2 Production and consumption of HCFCs in China (ODP Tonnes).

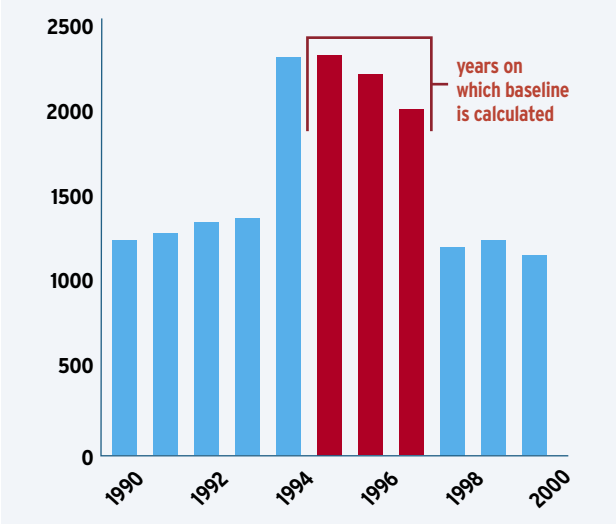


FIGURE 3 CFC consumption in an Article 5 country, showing an increase in consumption just prior to and during the setting of baselines from 1995-1997 (ODP Tonnes).

The Need for an Early Baseline and Freeze

In the face of rapid growth in the consumption and production of HCFCs in developing countries and uncertainty over reported data, establishing an early baseline is critical to capturing the best climate and ozone benefits over time and guarding against baseline 'inflation'.

Encouraged by the Montreal Protocol and in response to population and economic growth, HCFC production in developing countries is growing rapidly. Surveys in China, the world's largest producer and consumer of HCFCs, indicate that demand for domestic consumption alone is likely to increase to 300,000 metric tonnes over the next decade.[11] A variety of future demand scenarios have been reviewed by TEAP, with developing country estimates in 2015 ranging from 489,000 to 786,000 metric tonnes.

The urgency for an early baseline and freeze is revealed by a consideration of the likely increased growth rates. For example, using the Scenario 4 'step-down' schedule, the benefit of having a baseline and freeze at 2007 and 2008 respectively compared to just three years later (as in Scenario 3) is calculated in emissions reductions to be 1.1 million metric tonnes of HCFCs - **equivalent to around 74,000 ODP tonnes and more than 1.5 billion tonnes of CO_2-eq.**

At current levels of unrestrained growth, it is clear that complying with the existing phase-out by 2040 would be technologically and economically unfeasible. Converting technology at an early stage before dependency on HCFC technology rapidly increases will reap enormous economic benefits and allow an affordable phase-out. Moreover, an early freeze would begin to reap climate benefits during the Kyoto first commitment period, and set the scene for substantial emissions reductions in the post-Kyoto period.

	SCENARIO 2	SCENARIO 3	SCENARIO 4
ODP weighted savings (ODP tonnes)	799,048	1,143,588	1,360,888
GWP weighted savings (million tonnes CO_2-eq.)	16,781	24,016	28,580

TABLE 1 Savings of HCFC emissions over a BAU scenario of 1.65 million ODP tonnes and 34.7 billion tonnes CO_2-eq. emissions from 2005 to 2040.

An early baseline is also essential to guard against an inflation of the existing growth rate, either in reported or actual production, in anticipation of an approaching baseline date. As some countries' data suggests, this was believed to have occurred before the setting of the CFC baseline, with production estimates showing a conspicuous 'bump' shortly before and during the baseline years (see Figure 3).

Considering the irregularities for HCFC production reporting, the potential for 'inflation' prior to a baseline is particularly acute. Based on the information available, the capacity for production is already as much as double the actual production reported, with current capacity in China alone standing at an estimated 368,000 Mt, more than 2005 global production.[12]

Exemptions

EIA opposes *a-priori*, specific exemptions for certain chemicals under an adjusted phase-out. Experience has shown that regulation can be an effective driving force in helping industry to develop and promote environmentally friendly alternatives. Exemptions, on the other hand, send a mixed message to the market and can potentially hold back the development of environmentally neutral alternatives in the sector to which they apply.

Exemptions also create golden opportunities for illicit smuggling of HCFCs on the global market and inevitably cause complications for resource-constrained national enforcement authorities that are trying to effectively implement national legislation. Illegal trade in ODS is likely to be in the order of 10-20% of legitimate trade and there is recent evidence that HCFCs are being illegally traded.

The problems associated with exemptions underscore the urgent need for the Multilateral Fund and other mechanisms to support the technological development and use of HCFC alternatives which are both ODP- and climate-neutral.

In cases where a phase-out 'bumps into' uses for which there are no alternatives, a mechanism for considering 'essential use' exemptions may be advisable, but it must be accompanied with clear, specific, and legally binding criteria. These should include specific criteria for ODP and climate impact standards and apply only as long as it can be proven that non-HCFC alternatives do not exist.

Overproduction, Artificially Low Prices?

Signs of over-production further support the argument for an urgent freeze and progressive phase out as it drives an artificial dependency on HCFCs in developing countries.

EIA's field work has identified a concern in the global market regarding an artificially low market price for HCFCs and the impact this has. On-the-ground interviews in markets ranging from Latin America to Southeast Asia reveal industry sources complaining of falling HCFC prices and a flooding of the market with HCFC products. HCFC cylinders are found on sale in the Middle East and Latin America for as little as $1 per kg, severely undercutting efforts of alternatives around the globe to gain market share.

TRAPPED BETWEEN TREATIES:
PERVERSE INCENTIVES UNDER THE CDM

An early freeze is particularly crucial in the face of any perverse incentives that may inflate production further. Such perverse incentives, driven by the Kyoto Protocol's Clean Development Mechanism (CDM), are the leading suspect in the observed low HCFC price points.

The CDM allows eligible HCFC-22 facilities that capture and destroy by-product emissions of HFC-23 to earn Certified Emissions Reductions (CERs), or carbon credits, that can be sold at a significant profit on the global carbon market.

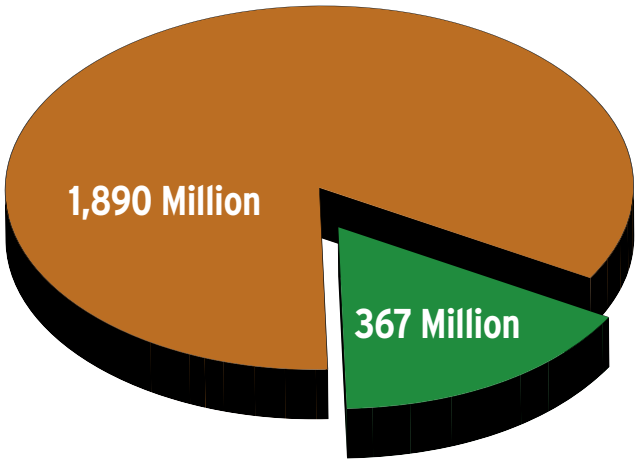


FIGURE 4 Chart showing the proportion of CO_2-eq. emissions in metric tonnes from HCFC-22 production compared to the emissions from the HFC-23 by-product that are destroyed under the CDM.

CO_2-eq Mt from HCFC-22 production

CO_2-eq from HFC-23 by-product

While this has eliminated a portion of emissions of HFC-23, which has a GWP of 11,700, it has created a 'perverse incentive' that has apparently subsidised HCFC-22 production and has helped drive its expanded use.[13] These CDM credits earn up to ten times the cost of capturing and destroying HFC-23 emissions and are exceeding the sales revenue of HCFC-22.[14]

HFC-23 destruction has dominated the CDM, accounting for 52% of all project-based volumes in 2006 (down from 64% in 2005).[15] China currently has the largest stake in the CDM, with more than 70% of CDM volumes from a few large HFC-23 reduction projects in China.[16]

Because HFCs and HCFCs are split between the Kyoto and Montreal protocols respectively, the impact of this perverse incentive is particularly severe.

While the impact of the CDM on HCFC production is now expressly discussed at the Kyoto Protocol, the scale of the problem is underestimated because the direct climate impact of HCFCs is often not addressed. It remains largely unreported, for example, that the global warming impact of the HCFC-22 production (from which the HFCs are a by-product) is five times as high as that of the HFC-23 itself, due to the high volume of HCFC-22 produced. This underscores the importance of an accelerated phase out by the Montreal Protocol to: a) get to the root of the problem, and b) achieve maximum total impact on the climate.

Progressive Phase Out: Good for the CDM

A progressive phase-out with an early freeze date of 2008 at 2007 levels would address the perverse incentive problem by ensuring that excess production does not occur in the near term without threatening existing CDM projects. Figure 5 shows that even Scenario 4 does not affect the first tranche of CDM projects, most of which come to an end around 2012. Currently, CDM rules limit HFC-23 destruction projects to HCFC-22 production facilities in developing countries with an operating history of at least three years between 2000 and 2004, and which have been in operation since the start of project activity. Under these rules, only 67-68% of HCFC-22 facilities in developing countries are eligible for CDM. However, negotiations are underway in the Kyoto process to consider allowing new facilities and production to be covered, potentially creating loopholes and ongoing incentives for increasing production.

HCFC-22 Feedstock Production

HFC-23 emissions from feedstock production of HCFC-22 pose a significant problem, since feedstocks are not subject to control measures under the Montreal Protocol. The TEAP estimated in 2003 that 30-40% of HCFC-22 production was for feedstock

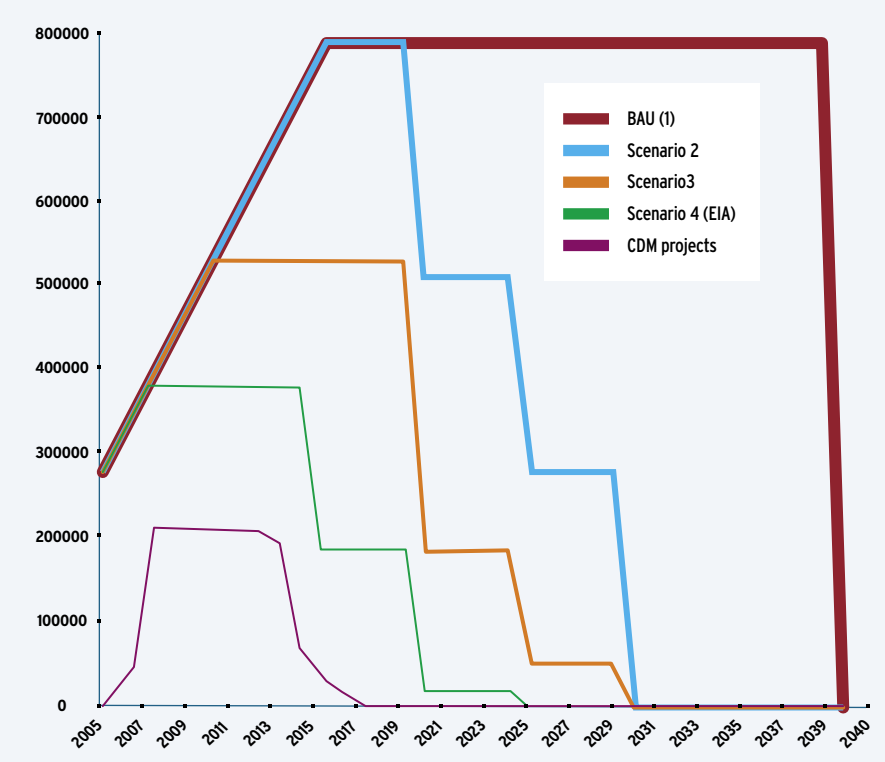


FIGURE 5 Graph showing the production of HCFCs covered by CDM projects related to proposed consumption phase-out scenarios. The purple line represents HCFC production associated with already approved CDM projects. It assumes that the seven year projects are not renewed.

use, primarily for tetrafluoroethylene (TFE), which is a precursor to polytetrafluoroethylene (PTFE, also known by the DuPont brand name as Teflon®).

The TEAP projects that for the baseline scenario, unabated HFC-23 by-product emissions from feedstock production and emissive HCFC-22 could reach 0.45 billion tonnes CO_2-eq. by 2039, representing around 35% of all ODS-related GHG emissions. Currently, the majority of feedstock production of HCFC-22 occurs in developed countries. However it could shift to developing countries where it can be assumed that greater incentives to destroy the HFC-23 will be required.

How can we ensure that all HFC-23 is destroyed? First, governments and companies, especially those receiving significant funding from CDM projects, need to take domestic measures to require and fund HFC destruction for any HCFC plants not yet covered. Larger companies in developed countries are already destroying HFC-23 emissions voluntarily.

Second, mechanisms currently under consideration at the Kyoto Protocol may offer ways to finance future destruction without maintaining a perverse incentive. Credits could be granted for the marginal cost of installing destruction capacity only, for example. Alternatively, companies could use some of the windfall profits gained from CDM funding to destroy the HFC-23 on a voluntary basis.

The potential for extensions of existing projects beyond the first seven year tranche as well as the need to capture and destroy HFCs from new HCFC production and feedstocks underscore the need for greater coordination between the Kyoto Protocol and Montreal Protocol to prevent any hindrance to the phase-out of HCFCs.

Climate Neutral Alternatives

The availability of climate-neutral alternatives supports a progressive phase-out scenario and illustrates the potential benefit of decisive market signals in their support. A variety of alternatives are either ready or near-ready to replace HCFCs.

A set of 'natural refrigerants' offer particular hope in establishing long-term technological solutions. Hydrocarbons (HCs) are refrigerants that are generally energy efficient and low in cost. Isobutane is widely used in domestic refrigerators and commercial units and some hydrocarbons have been used as substitutes for HCFC-22, mostly in systems with indirect cooling.[17] The use of ammonia (NH_3) as a refrigerant is growing; in addition to large units in cold stores and industry, development has spread to small commercial units.[18]

In July 2006, the European Union's F-Gas regulation banned the use of refrigerants in Mobile Air Conditioning (MACs) with a GWP over 150 in new model cars by 2011. Within weeks, major chemical manufacturers announced they had developed low GWP substitutes for HFC-134a.[19] Chemical manufacturers are looking to adapt these low GWP substitutes into other applications.[20]

Recent technological advances have increased the promise of carbon dioxide (CO_2) as a successful climate neutral refrigerant. In August 2007 the global conglomerate, Coca-Cola, introduced policies which favour CO_2 over HFCs when purchasing new refrigeration equipment.[21] The same month also witnessed the German car industry turning its back on HFC-134a in favour of CO_2.[22] Both ammonia and CO_2 cascade systems in supermarkets are now widespread within Europe.

It is imperative that the Parties take all possible steps under the Montreal Protocol and pledge to take additional measures at international and domestic levels outside the Montreal Protocol, to send clear regulatory signals that HCFCs should be replaced with zero or low GWP substitutes. Additional standards for energy efficiency should also be put into place, since the indirect emissions via energy use in air conditioning and refrigeration equipment far exceed the climate impacts of direct refrigerant emissions.[23]

Although there are clearly still issues to resolve, recent developments send a strong signal that technology in this sector can respond to the right regulatory signals. It is crucial at this stage that such regulations address not only the ODP but the GWP of the gas, as well as its energy efficiency.

CONCLUSIONS

An earlier freeze and faster phase out of HCFCs will:

- Maximize ozone layer and climate benefits from the elimination of HCFC production;
- Inhibit opportunities and economic incentives to circumvent controls and stimulate illegal trade in HCFCs;
- Create a level playing field for new ozone and climate neutral technologies to compete commercially with technologies still relying on greenhouse gases;
- Be economically more cost effective and technically more achievable against the backdrop of rapidly increasing demand and consumption of HCFCs;
- Mitigate impacts created by the rapid expansion of demand and production of goods such as air conditioners and refrigerators due to changing economic conditions in many countries.

EIA urges the Parties to the Montreal Protocol to:

- Accelerate the phase-out of HCFCs, with the most aggressive base year and freeze date feasible;
- Replenish the Multilateral Fund to support this phase out, developing a mechanism within the Fund to maximise the climate benefits of the phase out by valuing benefits to the climate as well as to the ozone layer. This should ensure that the substitution of HCFCs by HFCs is minimised, and instead encourage substitution by alternatives with zero or low GWPs and high energy efficiency;
- Ensure that HFC-23 by-product of HCFC-22 production is destroyed. The Montreal Protocol should actively coordinate with the Kyoto process regarding HFC-23 destruction, in order to ensure that the CDM does not hinder an accelerated phase-out of HCFC-22.

EIA urges individual Parties to:

- Voluntarily freeze HCFC production now;
- Achieve 100% HFC-23 destruction as a matter of national policy, which can be funded by profits and taxes on existing HFC-23 projects. Policy signals need to be sent to the private sector as early as possible.

SEPTEMBER, 2007

REFERENCES

1. http://www.epa.gov/ozone/ods.html accessed 12 September, 07.
2. Radiative forcing is (loosely) defined as the difference between the incoming radiation energy and the outgoing radiation energy in a given climate system. A positive forcing (more incoming energy) tends to warm the system, while a negative forcing (more outgoing energy) tends to cool it. The IPCC express this in Watts per square meter.
3. Guus J. M. Velders, *et al.*, *The Importance of the Montreal Protocol in Protecting Climate*, 104 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 4814 (2007) (reporting emissions reductions of 11 $GtCO_2$-eq. yr-1, which in aggregate translates to about 135 $GtCO_2$-eq.).
4. UNEP, *Report of the Twenty-Seventh Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol*, UNEP/OZL.Pro.WG.1/27/9 (18 June 2007), at 25.
5. G8 Summit in Heiligendamm, Germany, *Growth and Responsibility in the World Economy, Summit Declaration* (7 June 2007), at paragraph 59 ("We will also endeavour under the Montreal Protocol to ensure the recovery of the ozone layer by accelerating the phase-out of HCFCs in a way that supports energy efficiency and climate change objectives. In working together toward our shared goal of speeding ozone recovery, we recognize that the Clean Development Mechanism impacts emissions of ozone-depleting substances.")
6. UNEP, TEAP (2007) Report of the Task Force Response to Decision XVIII/12, August 2007.
7. UNEP, TEAP (2007) ibid; ICF International, 2007. Changes in HCFC consumption and emissions from the US proposed adjustments for accelerating the HCFC phase out. Prepared for the US EPA by ICF International, August 2007.
8. Assumptions for the analysis: a. the BAU scenario assumes that production / consumption will match the maximum permitted under the Montreal Protocol; b. the analysis does not include the global warming impact of HFC-23 by-product of HCFC-22 production; c. ODP conversion factors – HCFC22:0.055; HCFC141:0.11; Others:0.04 / GWP conversion factors – HCFC22:1780; HCFC141:713; Others:76 d. HCFCs in developing countries are calculated on the basis of 70% HCFC-22, 25% HCFC141b and 5% others (modelled on HCFC-123 ODP & GWP); e. the analysis assumes that production and consumption are equal, but only looks at consumption data; f. emission to consumption ratios are not used; g. the analysis assumes that industry will convert to climate-impact free alternatives; h. In the CDM calculations the HFC-23 by-product is calculated at a rate based on the maximum permitted rate for each individual project.
9. UNEP, TEAP 2007 ibid, p25.
10. Velders *et al.* 2007, ibid.
11. College of Environmental Sciences, Peking University, 2007. Study on the strategy for the long term management of HCFCs in China. CPR/REF/43/TAS/414 funded under the German bilateral contribution to the Multilateral Fund of the Montreal Protocol, submitted to the 51st meeting of the Executive Committee of the Multilateral fund, 8th February 2007.
12. College of Environmental Sciences, 2007, ibid.; UNEP, TEAP 2007, ibid.
13. UNEP, *Supplement to the IPCC/TEAP Report* (Nov. 2005), at 7. See *also* Env't Investigation Agency, *Turning Up the Heat: Linkages Between Ozone Layer Depletion and Climate Change: The Urgent Case of HCFCs and HFCs* (Aug. 2006).
14. UNEP, TEAP 2007, ibid, at 6. ("Monies flowing from the sale of Certified Emission Reductions (CERs) could be up to 10 times higher than the costs of mitigation and, under expected future carbon prices, will exceed the sales revenue for the HCFC-22 itself."). Michael Wara, *Is the Global Carbon Market Working?*, NATURE (8 Feb. 2007), at 595-96 ("HFC-23 emitters can earn almost twice as much from CDM credits as they can from selling refrigerant gases – by any measure a major distortion of the market."). IPCC/TEAP Supplement, *supra* note 24, at 7 ("Although mitigation of HFC-23 release is technically possible and economically attractive under the UNFCCC Clean Development Mechanism (CDM), the availability of funds through the sale of CDM credits obtained from the reduction of HFC-23 emissions could provide a perverse incentive for the continuation or expansion of HCFC-22 production in Article 5(1) countries in order to generate such credits."). See *Turning Up the Heat, supra* note 24, at 9 ("The cost of destroying the HFC-23, however, is very low (around $0.20 per mt), allowing for extremely high profits.")
15. *States and Trends of the Global Carbon Market 2006 (Update: January 1 – September 30, 2006*, WORLD BANK (2006) at 11.
16. Carbon 2006. ("China is largest CDM seller. More than 70% of CDM volumes came from a few large HFC-23 reduction projects in China. There are also several projects in India and Brazil.")
17. http://www.nrfund.org/eng/CO_2.html, accessed 9 September 2007.
18. http://www.aboutammoniarefrigeration.com/aaranswers_history.cfm#7 accessed 9 September 2007.
19. UNEP, 2006 Report of the Refrigeration, *Air Conditioning and Heat Pumps Technical Options Committee*, 2006 Assessment, at 3, 12 ("Since the recently adopted EU F-Gas Regulation will ban HFC-134a and other refrigerants with GWPs exceeding 150 in new vehicle models by 2011, the industry will be forced to make a second refrigerant change in mobile air conditioning. Several candidates continue to be evaluated, including CO_2 and R-152a as well as new low-GWP refrigerants, some of which may have low ODPs. Development of these low-GWP refrigerants also may have future consequences for the refrigerant choices in other applications... In early 2006, several chemical companies (others will likely follow) have each announced a new refrigerant blend to replace HFC-134a in Europe. One is an azeotropic blend of CF3I and 1,1,1,2-tetrafluoropropene. Two other formulations have not been publicly released. Since then, due to safety and cost issues of R-744 and R-152a, German car makers have collectively asked for, and formally organised, a co-operative effort to assess the new candidates with a focus on selecting a replacement for HFC-134a during the second half of 2007. The SAE and Japanese Automobile Manufacturers Association are assisting this effort.")
20. McFarland Testimony, at May 23 Congressgional hearing. ("Today DuPont and others are developing the next generation of high performance non-ozone depleting compounds with low global warming potentials (GWPs)... In February of 2006 we announced that we had identified low GWP, non-ozone depleting alternatives for HFC-134a used in mobile air conditioning. The leading candidates have GWPs on the order of only 3% that of HFC-134a and can meet the requirements of the European Union fluorinated gases directive that will phase out the use of HFC-134a in new car models beginning in 2011. It is our intent to leverage these non-ozone depleting, low GWP technologies to other applications that currently rely on higher GWP products, including other refrigerant applications and foam expansion agents for insulating materials. Our goal is to provide ever more environmentally sound practices to the market. ... [W]here other low GWP refrigerants can be used safely, efficiently and in compliance with local regulations they should be chosen. In this regard DuPont intends to extend our innovative low GWP technologies under development to other applications currently using HFCs, including other refrigerant applications and foam expansion agents for insulating materials.")
21. Coca Cola keeps up progress on CO_2 cooling http://www.r744.com/news/news_ida165.php accessed 12 September 2007.
22. Car makers end research on chemicals, VDA confirms http://www.r744.com/news/news_ida168.php accessed 12 September 2007.
23. UNEP, *The Implications to the Montreal Protocol of the Inclusion of HFCs and PFCs in the Kyoto Protocol*, HFC and PFC Task Force of the Technology and Economic Assessment Panel (Oct. 1999), at 36-38 ("When the use of a specific technology creates an incremental energy saving, the reduction in CO_2 emissions from the energy use can far outweigh the direct emissions over the expected life of the product.")