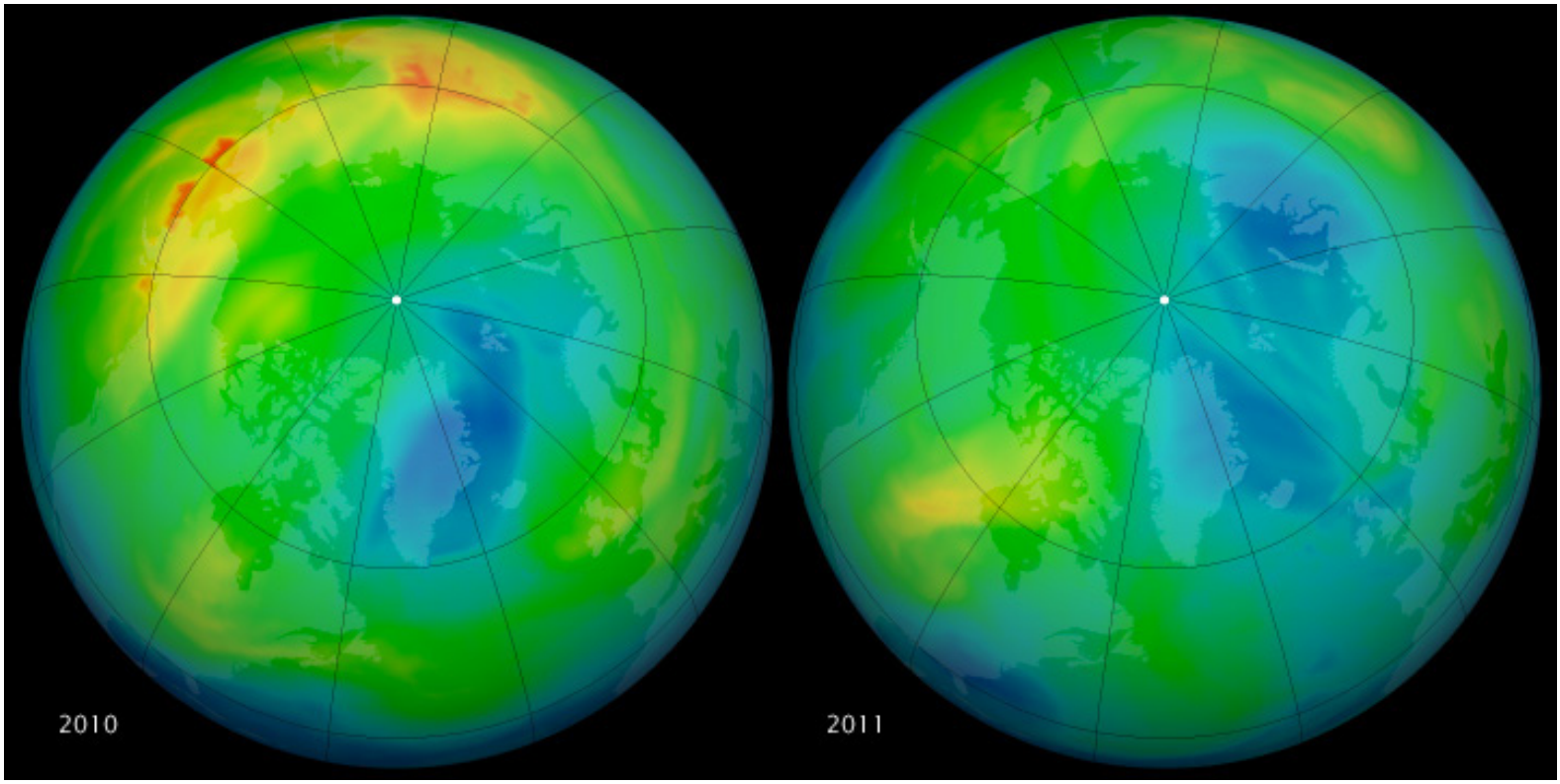
THE MONTREAL PROTOCOL IN 2011

DYNAMIC ACTION FOR OZONE AND CLIMATE PROTECTION

31ST MEETING OF THE OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

AUGUST 1-5, MONTREAL



PREPARED BY THE ENVIRONMENTAL INVESTIGATION AGENCY
LONDON, U.K. • WASHINGTON, DC, U.S.A.

Montreal Protocol on Substances that Deplete the Ozone Layer

31ST MEETING OF THE OPEN-ENDED WORKING GROUP OF THE PARTIES

In the first half of 2011 alone, a number of acute disruptions to seasonal atmospheric and climate norms have occurred, and latest scientific projections indicate the pace of global temperature increase is accelerating. The likelihood of the complete loss of Arctic summer sea ice by 2030, faster melting of the vast Greenland ice sheets, and the rapid and quickening thaw of permafrost regions indicate that the window for arresting climate change before tipping points are reached is rapidly closing.

This year also witnessed a record-setting Arctic ozone hole that many scientists believe may be linked to climate change. Whatever the case, it is clear that little time remains for humanity to avert irreversible climate change with its attendant catastrophic impacts on societies and global ecosystems.

The Montreal Protocol represents the definitive model for agreement and action on global environmental protection thanks to its successful efforts to halt ozone depletion. In doing so, it has also accomplished more to slow the onset of global warming than the UNFCCC and its Kyoto Protocol will manage for at least another decade. And while it is imperative that the UNFCCC achieve an agreement on climate, the only real prospect for avoiding acute climate change in the immediate term is decisive action on short-term climate forcers in all appropriate international, regional and national venues.

The ODS phase-out currently being implemented under the 2007 Accelerated HCFC Phase-Out Agreement, the proposed HFC Amendment and HFC-23 Decision all afford key opportunities for the Montreal Protocol to significantly contribute to mitigating GHG emissions. While fostering direct transitions from HCFCs to low-GWP alternatives, phasing down HFCs and ending the venting of HFC-23 will not by themselves halt climate change, these actions would make a significant contribution and could ultimately make a critical difference in determining the severity and consequences of climate change.

The fact is that acute climate change is already taking place. However, it may yet take years to complete and implement an international climate agreement; years that many scientists assert we cannot afford. The Montreal Protocol is the only international body that is fully operational and competent to take action on climate now. It is the phase-out of ODS, mandated by the Montreal Protocol, that has resulted in the commercialization of HFCs and therefore, the Montreal protocol has a responsibility to act so that its efforts to restore the ozone layer do not come at the expense of the global climate.

We urge Parties to resolve and reach agreement on funding and other issues to ensure we implement the final phase-out of ODS without further phasing in high-GWP HFCs. Whether to offset the responsibility of the fluorocarbon industry for one sixth of all human-induced global warming, to rewrite the legacy of substituting super greenhouse gases for ODS, or to simply supply an inspiring and working example for the world to consider and emulate as it grapples with reaching a global climate accord, the Montreal Protocol has the ability, the power and the obligation to act as rapidly and forcefully as it can.



CONTENTS

3-5 MLF REPLENISHMENT

6 HFC AMENDMENT PROPOSALS

7-9 HFC-23 DECISION PROPOSAL AND DEVELOPMENTS

10-12 LOW-GWP ALTERNATIVES TO ODS AND HFCs

13-14 TIME RUNNING OUT ON ODS BANKS

15 ENDNOTES

MLF REPLENISHMENT

The decision at the November 2011 Meeting of the Parties (MOP) on the appropriate level of the 2012-2014 Multilateral Fund (MLF) Replenishment must send a clear and unequivocal message that funding will be available to deliver the climate benefits promised when the Accelerated HCFC Phase-out was adopted, and meet the spirit of Decisions IXX/6 and XX/9. At the time of the Accelerated Phase-out decision it was estimated that an extra 18+ GtCO2e mitigation would be achieved, dependent on the transition to climate-friendly and energy efficient technologies.[1] To realize this promise, adequate funding must be provided to cover the short-term additional costs required to transition to new low-GWP technologies. The long-term benefits will more than outweigh these investments.

Initial efforts to implement the HCFC Phase-out in Article 5 countries generally demonstrate a real commitment to use low-GWP alternatives where they are readily available. However, premature high-GWP HFC conversions in some sectors threaten to prevent the delivery of the promised climate benefits. Proposed conversions of air-conditioning to HFC-410A in the RAC sector, and foam conversions to HFCs (where Article 5 countries rely on foreign system houses and suppliers for drop-in units and pre-blended polyols) are ill-advised and unnecessary.

The 2012-2014 replenishment must maximize the climate benefits of the 2007 HCFC Phase-out

Under a business as usual (BAU) scenario, 77% of the conversions from HCFCs are projected to convert to HFC technologies using HFC404A, HCF410, HFC134a or HFC245fa. The average GWP of these HFCs as a function of expected use is 1,740. In order to realize the promised level of GHG mitigation, concerted efforts to transition all or nearly all HCFCs to low-GWP alternatives need to be implemented. This has not happened to date, with the MLF recently approving several major HFC projects to replace HCFCs.[2] At the next MOP, Parties must recommit to maximizing the climate benefits of the HCFC phase-out and prevent a massive HFC "phase-in".

Given that the Article 5 HCFC phase-out will primarily occur over the next twenty years, there is sufficient time to bring viable low-GWP alternatives into the market and for each step in the phase-out to focus on sectors with viable low-GWP alternatives. Historically, the Montreal Protocol has always set schedules that inspire technical innovation, and by committing to maximize transitions directly from HCFCs to low-GWP alternatives, the HCFC phase-out should be no different. The schedule for the HCFC phase-out in developing (Article 5) countries is the following:

2009/10 - Baseline;

2013 - Final freeze on use and production;

2015 - 10% reduction;

2020 - 35% reduction;

2025 - 67.5% reduction;

2030 - 97.5% reduction; and

2040 - 100% phase-out

The MLF's decision, in all but exceptional cases, to restrict funding to what is necessary to achieve the 2013 Freeze and the 2015 10% step-down will help prevent countries from converting to high-GWP HFCs as they attempt to expedite their HCFC phase-outs. However, there are other MLF policies and procedures such as calculations for cost effectiveness, and the requirement that HCFC Phase-out Management Plans (HPMP) cover entire phase-out steps, that are forcing countries to choose high-GWP alternatives. Parties need to review these policies and procedures and consider changes that will maximize the ability of the MLF to ensure the climate benefits of the Accelerated phase-out fully materialize.

To realize the 18 Gts of CO2e emission reductions promised at the time of the Accelerated HCFC Phase-out, adequate funding must be provided to cover the short-term additional costs required to transition to new low-GWP technologies.

Maximizing direct transitions from HCFCs to low-GWP alternatives in the sectors where alternatives are available will result in dramatic climate benefits. Conversions to commercially available low-GWP alternatives must be prioritized by the MLF, and conversions in those sectors where low-GWP alternatives are commercially available should be targeted. Implementing agencies should be instructed to prioritize low-GWP alternatives, and the MLF should ensure that conversions to high-GWP HFCs are not carried out where low-GWP alternatives are available, or where other sectors could be converted to low-GWP alternatives.

In response to Decision XXII/3, the Technology and Economic Assessment Panel (TEAP) prepared a report for the Parties to use in determining the appropriate level of funding for the 2012-2014 Replenishment.[3] The TEAP has developed six funding scenarios based on two different sub-sector packages: 1) conversions of 75% from the Foam sector, 15% from the RAC



sector and 10% from servicing; and 2) 90% from the Foam sector and 10% servicing. The TEAP then looked at funding 10%, 15% and 20% reductions from baseline for each of these scenarios. The TEAP assessed a wide range of information on both consumption and production (although data on production was lacking), and concluded that the most likely funding outcome would be between US$390.2 and $477.0 million for the 2012-2014 triennium – essentially stable funding. The TEAP went on to project increases in the next two replenishments to US$572.9-686.6 million for the 2015-2017 triennium and US$611.4-776.1 for the 2018 to 2020 triennium, due to the greater size of subsequent phase-out steps and increased costs of moving into other sectors.

The TEAP looked at the explicit funding policies of the MLF such as cost-effectiveness thresholds and levels of assistance for low-volume consuming (LVC) countries and HPMP funding to date. However,

Maximizing transitions from HCFCs to low-GWP alternatives will result in dramatic climate benefits. Conversions to commercially available low-GWP alternatives must be prioritized by the MLF, and conversions in those sectors where low-GWP alternatives are commercially available should be targeted.

the TEAP did not evaluate whether those policies and the level of funding was causing unnecessary transitions to high-GWP HFCs. The TEAP did note in section 4.2.2. that the initial cost estimate for the first phase of the Accelerated HCFC Phase-out based on experience with the CFC/Halon phase-out was US$1.948 billion – several times the level of projected available funding. The implementing agencies then went through revisions in approach to the phase-out to reduce costs, but the latest cost estimates in the consolidated business plan were still US$231 million above the funding projected to be available for the 2011-2014 period.

The TEAP needs to evaluate whether the MLF funding policies and the pressure on the implementing agencies and Article 5 countries to reduce the costs of the Accelerated HCFC Phase-out are resulting in greater conversions to HFCs. The analysis should also look at what would be deemed "cost-effective" if both ozone restoration and climate protection are factored into the calculation. This assessment might

be used to attract climate funding to maximize the climate benefits of the HCFC Phase-out.

ExCom Decision 54/39(h) encourages Countries and agencies "to explore potential financial incentives and opportunities for additional resources to maximize the environmental benefits from HPMPs pursuant to paragraph 11(b) of Decision XIX/6" of the 19th Meeting of the Parties. The TEAP identified the following barriers in place that limit the possibilities to secure substantial additional resources to maximize the climate benefits to the HCFC Phase-out:

-limited recognition of the link between the ODS phase-out and climate and the huge growth potential of high-GWP HFCs that could be phased-in under the current HCFC phase-out conditions and funding levels;

-little experience in determining the eligibility of ODS phase-out activities as part of climate change projects to secure climate funding; and,

-no incentives for Article 2 countries that are willing to provide additional funds over and their obligations under the Montreal Protocol to specifically fund higher cost transitions to low-GWP alternatives.

The TEAP estimated previously that a 20% reduction in climate emissions could be achieved under normal funding conditions, but that by securing climate funding the reduction in climate emissions caused by the HCFC phase-out could more than be doubled. The Parties need to determine how to facilitate greater low-GWP transitions as a matter of urgency, before massive amounts of high-GWP HFCs are phased-in due to a lack of necessary funding.

RECOMMENDATIONS:

There are several key Decisions that the Parties must adopt to ensure that the MLF is directed to maximize transitions to low-GWP alternatives during the HCFC Phase-out:

Request the TEAP to assess which Article 5 Parties that can transition directly to low-GWP alternatives, identify the sectors where direct transitions can occur, and quantify how many projects are transitioning to HFCs due to a lack of funding;

Request that TEAP evaluate the cost of maximizing direct transitions to low-GWP alternatives during the first step-down to 10% below the Baseline;

Require the MLF to examine HPMPs for opportunities to transition to low-GWP alternatives and to require a consultation with the submitting country, the implementing agency and the MLF to reconsider low-GWP alternatives in submitting a revised HPMP.

Direct the MLF to fund new low-GWP technology pilot projects that will accelerate the commercialization of alternatives to HFCs particularly focusing on the RAC sector;

Direct the MLF to provide sufficient funding, on a case by case basis, to transition entire industrial sectors, if necessary, to low-GWP alternatives in HPMP, even if the transition of the entire sector achieves a greater transition than mandated by the HCFC phase-out schedule, provided the excess is deducted from available funding in the next step-down phase;

Direct the MLF to prioritize HCFC transitions in sectors where low-GWP alternatives have been commercialized.

Direct the MLF to not fund transitions to high-GWP HFCs where low-GWP alternatives have been proven and commercialized;

Request the TEAP/SAP to a) assess the quantities of HCFCs in use that are not eligible for incremental funding under the HCFC phase-out guidelines and, b) assess the potential for transitioning these HCFCs to low-GWP alternatives; c) evaluate the climate benefits of transitioning these HCFCs to low-GWP alternatives, and d) estimate the incremental costs of transitioning these HCFCs to low-GWP alternatives.

Adopt a replenishment that will facilitate the greatest number of transitions to low-GWP alternatives;

Undertake an active campaign to encourage individual countries and/or international climate funding mechanisms to contribute additional funding to the HCFC phase-out as climate mitigation projects;

Request the TEAP to continue monitoring the availability and commercialization of low-GWP alternatives so that HCFC phase-out takes full advantage of anticipated low-GWP alternatives and to assess whether other actions can be taken to increase direct transitions approaching 100% in subsequent step-downs.

HFC AMENDMENT PROPOSALS

For the third year, two Amendments have been proposed for phasing out HFCs. The two Proposals by Micronesia, and by Canada, Mexico and the U.S.A., would merge an HFC phase-out with the existing HCFC phase-out to allow Parties more flexibility in implementing phase-out requirements and effectively eliminate most high-GWP fluorinated compounds by 2050.

An HFC phase-out is the most significant, immediate, cost-effective and rational prospect available for combating climate change, and if adopted by Parties would represent the single greatest action ever taken for mitigating GHG emissions. With the potential to avoid 88 to 140 Gts CO_2e emissions by 2050[4] at a cost of approximately 5-11 billion euros[5], there simply is no other comparable near-term strategy for GHG mitigation or prospect for eliminating an entire class of greenhouse gases.

There are excellent reasons for initiating an HFC phase-out now, but none more prominent than the rise in GHG emissions and their accelerating effect on global warming. With each scientific paper that advances the date for disappearance of Arctic summer sea-ice or melting of the vast Greenland ice sheets and permafrost regions, the time available for averting catastrophic climate change diminishes. Similarly, the impasse and inevitable delays in agreeing to and implementing a global climate accord bode poorly for a timely and adequate response.

Although the need for action on GHGs is clear and undeniable, some Parties have thus far rejected action on HFCs on the basis of legal, political and technical grounds. The objections that Montreal is an ozone convention that is not empowered to act on climate, that the UNFCCC is the only suitable forum for climate action, or that Montreal cannot take action on anything in the Kyoto 'basket of gases', are all specious arguments that should be discarded.

Article 2 of the Vienna Convention clearly states and indeed compels the Montreal Protocol to address "adverse effects" of efforts to protect the ozone layer[6]. As the definition of "adverse effects" specifically includes climate change, the Montreal Protocol is clearly a legal and appropriate forum for phasing out HFCs. Moreover, as all nations are members of the Montreal Protocol, and as Montreal only regulates production and use of GHGs rather than emissions as under the UNFCCC, there is no overlap or conflict between the two.

The position that the technology is not yet available for allowing an HFC phase-out largely ignores the tremendous growth in low-GWP alternatives (see pages 11-13) taking place within virtually all sectors, as well as the history of the Montreal Protocol and the international marketplace. The original commitment to phase out CFCs by 50% was made at a time when no known commercially viable ODS alternatives yet existed. That is not the case with HFCs, and the rapid development of low-GWP alternatives attests that the technology is and will be available for implementing an HFC phase-out.

In October 2010 a preliminary EU study analyzing HFC abatement options was released confirming TEAP findings that low-GWP alternatives are available within all key sectors and that "ambitious controls of HFCs can be carried out at negative or low positive costs"[7]. The study also warned that failure to restrict HFC use will have long-term effects due to servicing requirements that will represent almost 50% of future HFC consumption in 2020 and 2030.

It is critical that Parties reach agreement on initiating a phase-out of HFCs. Velders, et al. 2009, estimated that HFC emissions will reach 5.5-8.8 Gts CO_2e by 2050[8], and more recent research indicates that global HFC consumption will reach or exceed 3 Gts CO_2e by 2030[9]. By 2050, developing country HFC emissions are projected to be as much as 800% greater than developed countries, with global HFC emissions potentially equivalent to 9–19% of projected CO_2e emissions in business-as-usual scenarios and contributing a radiative forcing equivalent to 6–13 years of CO_2 emissions[10]. This increases to 28–45% under a 450-ppm CO_2 stabilization scenario, and could prove fatal to efforts to arrest and reverse global climate change by negating reductions in other GHG emissions.

Clearly the need to curtail HFCs is critical, particularly in Article 5 countries where soaring demand is triggering a prodigious rise in consumption. As HCFCs are phased out, HFCs will become the dominant substitutes and replace over 75% of HCFC consumption unless the Montreal Protocol acts. Agreement now on a schedule to transition directly from ODS (and HFCs) to low-GWP alternatives will ensure that billion are not squandered financing an unnecessary and climate-damaging HFC-phase-in that will require far more costly and difficult mitigation efforts in the future.

With the increasing availability of low-GWP alternatives and the feasibility of converting entire sectors, there are no technical reasons for Parties to delay action to phase-out HFCs. Additionally, the unquestionable and enormous contribution that an HFC phase--out would make toward arresting global warming has become generally accepted within the UNFCCC.

RECOMMENDATION:

Parties should give full support to advancing and adopting passage of an HFC amendment.

HFC-23 DECISION PROPOSAL AND DEVELOPMENTS

Recent estimates indicate that some 200 million mts CO_2e of HFC-23 are being emitted annually, mostly from non-CDM HCFC-22 production facilities, and representing approximately 0.75% of total worldwide annual GHG emissions. Some 89% of this amount is estimated to be vented from plants in China.[11]

HFC-23 is a waste gas produced during the production of HCFC-22, and is one of the most powerful known GHGs with a GWP of 11,700[12] and an atmospheric lifetime of 250 years.[13]

Despite the fact that several billion dollars have been channeled through the UNFCCC's Clean Development Mechanism (CDM) for HFC-23 abatement, HFC-23 emissions from non-CDM facilities in China and elsewhere have caused atmospheric concentrations of HFC-23 to more than double since the 1990s.[14]

There are 19 HFC-23 projects in the CDM - 11 in China, 5 in India and one each in Argentina, Mexico and South Korea. Offsets from these plants represent half of the Certified Emissions Reductions (CERs) generated under the CDM[15] and have recently been the subject of intense controversy.

Although the destruction of HFC-23 can be carried out at a cost of just €0.17 per CO_2e tonne, when this destruction is commoditized and sold as CERs, it can easily command as much as €12, or 70 times more than it costs to destroy the gas.[16] As a result, the value of HFC-23 destruction credits may exceed that of the primary product (HCFC-22),[17] since every tonne of HFC-23 that is destroyed generates 11,700 credits. Production of HFC-23 at non-CDM plants is typically much lower with product to waste ratios approaching 100:1 as opposed to 35:1 at CDM plants.[18]

Some CDM HCFC-22 plants derive greater revenue from selling HFC-23 offsets in the form of CERs to Kyoto Parties than they do from selling the HCFC-22 itself. In their 2007 Annual Report, Gujarat Chemicals in India stated that 88% of their pre-tax profits came from selling carbon credits.[19] This perverse incentive discourages plant operators from optimizing the so-called "waste gas ratio", leading to artificially higher production of HFC-23 by-product and encouraging higher production and use of HCFC-22, itself a potent GHG (GWP 1700) and ODS that is being phased out under the Montreal Protocol.

Following formal submissions to the UNFCCC in early 2010 indicating that plant operators had both manipulated HFC-23 waste ratios to maximize crediting levels and inflated HCFC-22 production, the CDM Executive Board temporarily suspended issuance to HFC-23 projects and put the HFC-23 methodology on hold. Subsequently, in May 2011, the CDM Methodologies Panel issued recommendations for establishing a more conservative limit on the HCFC-22/HFC-23 waste ratio and reducing the amount of HCFC-22 production eligible for crediting.[20]

Although the CDM Executive Board has since had several meetings and opportunities to act on the recommendations of the Methodologies Panel, as yet no agreement has been reached, with China and Japan resisting efforts to reduce the allowable waste ratio for crediting from 3% to between 1% and 1.4%, and requirements to report data on HCFC-22 and HFC-23 for production lines not included in the project boundary but located at the project activity site.

Determining that even strong action by the CDM Executive Board to revise the HFC-23 Methodology would fail to remedy its inherent flaws, and concerned by the enormous number of cheap credits of questionable or illegitimate value flooding its Emissions Trading System (ETS), the European



Shanghai Aohong Industry Co. is supplied by at least three companies that receive CDM credits for HFC-23 destruction - Jiangsu Meilan Chemical Co., Sinochem Modern Environmental Protection Chemicals (Xi'an) Co., and Daikin Fluorochemicals – thus assuring huge and inexpensive supplies of super greenhouse gases like HCFC-22.

Union (EU) adopted a Regulation in April 2011 banning the use of all industrial gas offsets in the ETS after April 2013.[21] This ban will apply to all HFC-23 credits as well as those from N20 production facilities.

In view of the fact that the ETS ban would only apply to the traded sectors, and that EU governments would still be able to use industrial gas offsets to meet their national compliance targets within the non-traded, or "effort sharing" sectors (e.g. agriculture and transport), Denmark tabled a proposal pledging to forswear use of these credits and has asked other EU members to follow suit. To date, 16 of the 27 EU Member States, including France, Germany and the UK agreed.[22] Italy and Spain are expected to offer the greatest resistance to consensus as their national utilities are heavily invested in HFC-23 projects. Through its Ministry of Finance, the Italian government holds a stake in two World Bank HFC-23 projects, is a 14% stakeholder in the country's largest utility ENEL which in turn has a financial stake in six more HFC-23 projects, and owns 17.36% of the shares of Cassa Depositi e Prestiti (a joint-stock company controlled by the Ministry of Economy and Finance).[23]

The EU ETS ban coincides with the end of the first seven-year crediting period for five HFC-23 projects in China with the majority of HFC-23 projects ending in 2014. EIA believes that there is a compelling case for retiring the HFC-23 methodology and excluding HFC-23 abatement projects from the CDM when their current crediting period expires. Once outside the CDM, there are a number of options for ensuring that these plants continue to capture and destroy any HFC-23 waste streams. A truly comprehensive solution should also address all non-CDM HCFC facilities that are still venting HFC-23 into the atmosphere despite the minimal cost for destruction.

Nations should require their HCFC-22 plants to adhere to standard international industry practice by assuming responsibility for HFC-23 emissions when their current CDM crediting periods expire.

The logical solution would be for China to utilize some of the approximately US$700 million that it has collected from taxing HFC-23 credits at a rate of 65%.[24] These funds have reportedly not yet been spent or allocated and are more than sufficient to pay for the capture and destruction of all HFC-23 from CDM and non-CDM plants alike within China for decades.

Part of the reason for China and Japan's resistance to revising the HFC-23 Methodology may well stem from a common interest in using HFC-23 offsets in a post 2012 Kyoto successor arrangement negotiated bilaterally. Aside from the EU, Japan is the only other significant global market for industrial gas offsets and a number of Japanese firms are invested heavily in existing HFC-23 projects. Canada has never used HFC-23 credits and Australia and New Zealand have indicated that they have no interest in allowing these credits to be a part of their respective national Emissions Trading Systems.[25]

It appears that beyond the 7 or 8 non-CDM plants in China, virtually all other non-CDM HCFC-22 facilities in the world are voluntarily capturing and destroying HFC-23 and absorbing the costs of doing so rather than venting it into the atmosphere. This being the case, there is no reason why China and other nations should not require their facilities to similarly adhere to what has become standard international industry practice by assuming responsibility for HFC-23 emissions when their current CDM crediting periods expire. This is certainly reasonable given the vast sums that have already been paid out and the minimal costs required to prevent the release of HFC-23 into the atmosphere.



Arkema's Changshu Haike facility in Jiangsu, China receives HFC-23 destruction credits through the CDM that effectively subsidize HCFC-22 production.

An alternative way of facilitating HFC-23 capture and destruction at HCFC-22 plants that have are still venting would be for Parties to the Montreal Protocol to adopt draft decision XXIII/M Phase-out of HFC-23 as a by-product of HCFC-22 production, submitted by Mexico, Canada and the U.S.A., which seeks to address these emissions by requesting the Montreal Protocol's Executive Committee to formulate guidelines for implementing destruction projects at HCFC-22 facilities currently not covered by the CDM.

The Draft Decision requests the Executive Committee: to update information on HCFC-22 production facilities in A5 nations; to develop estimates of incremental costs associated with the collection and



destruction of HFC-23; to formulate guidelines for funding projects to collect and destroy HFC-23 by-product; and, to facilitate the development and implementation of HFC-23 destruction projects. In addition, the Decision requests the TEAP in consultation with the SAP to conduct a study of the potential costs and environmental benefits of HFC-23 by-product control measures. Incremental funding for purchase, installation and operation of equipment is estimated at US$2-3 million per unit for equipment and installation, with annual operating costs being much lower and dependant on production levels.

With the exception of Japan, the EU and other Kyoto Parties have made it clear that industrial gas offsets including those from HFC-23 abatement projects 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 on the part of governments, current and ongoing HFC-23 emissions must be addressed through a mechanism outside the CDM. As such, voluntary capture and destruction by producers, supplemented if need be by incremental funding through the HFC-23 Draft Decision for facilities that are still venting, offers a timely and cost-effective way to address these substantial emissions.

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:

Governments should mandate that HCFC-22 manufacturers assume responsibility for destroying the HFC-23 waste gas generated during HCFC-22 production, including the minimal costs for capture and incineration;

If necessary, Parties to the Montreal Protocol should adopt draft decision XXIII/M Phase-out of HFC-23 as a by-product of HCFC-22 production and provide financial assistance for doing so;

The CDM Executive Board should retire the HFC-23 methodology and refrain from renewing projects' crediting period.

CDM & NON-CDM HCFC-22 PRODUCTION FACILITIES IN CHINA

Name	Location Province	City	CDM #	Number of Production Lines	Production Lines	Capacity 2009 (% CDM Total)
Fuxin Hengtong	Liaoning	Fuxin City		??		??
Shangdong Jinan 3F	Shandong	Jinan	idle?	??		??
Shandong Zhongfu	Shandong	Jinan	#1194	2	1	(12,285) - 18,000
Shandong Dongyue	Shandong	Zibo	#0232	5	1	(36,475) - 220,000
Jiangsu Meilan	Jiangsu	Taizhou	#0011	4	2	(23,700) - 110,000
Jiangsu Zhonghao 3F	Jiangsu	Changshu	#0306	2	2	(29,140) - 40,000
ARKEMA (Changshu Haike)	Jiangsu	Changshu	#1105	1	1	(10,000*) - 35,000
Zhejiang Pengyou	Zhejiang	Jinhua		1		10,000
Zhejiang Sanmei	Zhejiang	Wuyi		1		18,000
Zhejiang Yingpeng	Zhejiang	Yongkang	#1947	1	1	(23,269) - 25,000
Zhejiang Yonghe (Xingteng)	Zhejiang	Jinhua		1		12,000
Zhejiang Lanxi Juhua	Zhejiang	Lanxi		1		15,000
Zhejiang Juhua Fluorochemical	Zhejiang	Quzhou	#0193/#0868(2)	5	3	(16,000 +13,709) - 88,000
Zhejiang Linhai Limin	Zhejiang	Linhai	#0550	3	2	(13,634) - 30,000
Zhejiang Yingguang	Zhejiang	Dongyang	#0549	1	1	(10,420) - 18,000
Jiangxi Sanmei	Jiangxi	Xingguo		1		30,000
Sichuan Honghe	Sichuan	Zigong	#0767 ?	2	1	12,000
Sichuan Zhonghao	Sichuan	Chenguang		2		(6000) - 38000

Non-CDM facilities venting HFC-23

Indicates CDM facilities that could be venting HFC-23 from uncovered/uncredited production lines

LOW-GWP ALTERNATIVES TO ODS AND HFCS

Low-GWP alternatives are already available or are in the process of being commercialized, eliminating the need to convert to high-GWP alternatives in most subsectors and sectors.

Rapid and diverse expansion in the availability of low-GWP HFC-free refrigerants and technologies is underway. These climate-friendly alternatives include CO2 (R-744), hydrocarbons (e.g. HC-290) and ammonia, which are already widely used in many sectors and subsectors such as foam blowing, domestic refrigeration, industrial refrigeration, some commercial refrigeration, certain stationary AC and heat pump equipment, as well as fire protection. In addition, low-GWP unsaturated HFCs (HFOs) are rapidly being developed (e.g. HFC-1234yf) as the prospect of an HFC-phase down draws closer and attention is focused on the enormous climate impacts of HFC growth spurred by the HCFC phase-out.

The TEAP May 2011 Progress Report states that low-GWP options continue to be commercialised for all applications and that few uses still depend on HCFCs and high-GWP HFCs. The technology is clearly available for transitioning directly from ODS to low-GWP alternatives and avoiding a massive, costly and climate damaging phase-in of HFCs.

It is incumbent on the Parties to the Montreal Protocol to ensure that the start of the HCFC phase-out in developing countries prioritizes sectors and sub-sectors where low-GWP alternatives are established, and moves aggressively to ensure the future availability of additional low-GWP alternatives in other sectors where these technologies have yet to be proven on a commercial scale. The Parties should also instruct the MLF not to pay for transitions to high-GWP alternatives in sectors where low-GWP alternatives have been commercialized.

Foams

Low-GWP alternatives to HCFC-141b in the foam sector are well established, as evidenced by China's HPMP which proposes conversions to hydrocarbons in the refrigerator and freezer sub-sector, cyclopentane in refrigerated trucks and reefers, hydrocarbon-based pre-blended polyols and water-blown technology in small electrical appliances, and hydrocarbon technology in large enterprises in the solar water heater sub-sector.

The technology has and continues to evolve rapidly. Options are already available in most sectors for transitioning directly from ODS to low-GWP alternatives and avoiding a massive, costly and climate damaging phase-in of HFCs.

Hydrocarbons have become the most widely applied technology in the world for polyurethane (PU) foams. Although suitable for large manufacturing facilities, this technology is not yet "cost-effective" to apply in small and medium enterprises (SMEs) if only the ozone reduction benefits are evaluated because of the high equipment conversion cost of ensuring safe use. However, if climate benefits are also factored in, hydrocarbons are "cost-effective" for all but the smallest PU foam production facilities.

An emerging alternative is methyl formate, which has been used in Brazil, North America, Australia and other regions for commercial refrigeration (bottle coolers), discontinuous panels and integral skin foam. This blowing agent is being evaluated in pilot projects supported by the MLF, and in HPMPs submitted to the 64th Meeting of the MLF by Brazil and Mexico. Other nations are planning to convert SMEs in their foam sectors to methyl formate and in some applications to methylal.

Similarly, low-GWP alternatives for polystyrene (XPS) board foams such as CO2 and hydrocarbons are currently used in Europe and Japan, and are being proposed as alternative technologies for China's conversion in this sector, which it estimates will reduce annual CO2e emissions by 20.2 million tonnes. Some 80% of rigid XPS foam materials produced in Germany today are expanded with CO2 or a combination of CO2 and organic blowing agents (approx. 2 to 3% ethanol), which can be applied across the entire product range without any sacrifice in quality.[26]

Commercial Refrigeration

The commercial refrigeration sector, which includes a broad span of applications ranging from simple reach-in coolers (self-contained units) to complex systems used in supermarkets, currently accounts for around 32% of global HFC consumption. Low-GWP alternatives available already include the hydrocarbons isobutane (HC-600a), propane (HC-290) and propylene (R-1270), as well as ammonia (R-717) and carbon dioxide (R-744).

The pace of change in this sector is evidenced by the 2010 pledge of the Consumer Goods Forum (CGF), a body comprising over 650 retailers, manufacturers, service providers and other stakeholders from 70 countries, to not use HFC refrigerants in new equipment starting in 2015.

While hydrocarbon refrigerants have been used successfully in many parts of

the world for more than a decade, the US has failed to keep pace and has built up a large bank of HFCs in refrigeration equipment, even in domestic refrigerators. This is expected to change with the 2010 approval for the use of hydrocarbons in residential and stand-alone refrigeration applications, and multiple additional applications for the use of hydrocarbons pending approval under the US EPA Significant New Alternatives Policy (SNAP) Program.

For stand-alone equipment, including vending machines, ice makers, ice cream freezers, water fountains, and plug-in display cases, hydrocarbons and CO_2 are proven technologies that have been pioneered by major companies such as Coca-Cola and Unilever. Coca-Cola developed a new high-efficiency CO_2 technology for vending machines and announced in 2009 that 100% of their new vending machines and coolers will be HFC-free by 2015. Unilever has placed over 360,000 hydrocarbon-based ice cream freezers globally, including in Latin America and Asia. According to Unilever the technology is around 10% more energy efficient than traditional cabinets.[27]

Condensing units are found in many convenience stores and food specialty stores for cooling small cold rooms and display cases. Condensing units are less energy efficient, compared to a well-designed small-centralised system, but are often chosen for initial cost reasons and ease of installation, particularly in developing countries, and represent one of the biggest challenges in switching to climate-friendly refrigeration. Despite this, the 2010 TEAP report on alternatives to HCFCs estimated 7% market penetration of low-GWP alternatives in developed countries, and highlighted recent designs using ammonia combined with CO_2. The major UK supermarket food retailer, Waitrose, has committed to the use of hydrocarbon-based condensing systems in all new stores. Its simple water-cooled integrated refrigeration and cooling system is delivering a 20% energy reduction against a typical traditional HFC system and delivers up to a 50% equivalent reduction in total carbon footprint. The factory-assembled stand-alone systems are reliable as well as easy to install and maintain, and have potential for countries with warm, humid climates.

Within the broad variety of centralised refrigeration systems, hydrocarbons, CO_2 and ammonia are all utilized. CO_2 is recognised as the best option and more and more supermarkets are switching to CO_2 refrigeration, particularly in Europe.[28] Retail giant Tesco has installed CO_2 systems in Thailand, Korea, Poland, Czech Republic and Hungary, as well as the UK. Tesco is also actively looking at non-HFC systems that will work in tropical climates like Malaysia and Thailand. In South Africa, a GTZ Proklima project funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety has installed CO_2-ammonia cascade systems in two Pick-n-Pay supermarkets in Johannesburg and Cape Town. Energy savings of 19-26% have been recorded after more than one year of monitoring.[29]

EIA's three-year Chilling Facts survey has seen a significant improvement in the number of UK supermarkets using climate-friendly refrigeration. In 2008, the first year of survey, just 14 stores across the UK were using climate-friendly technologies, and as much as one-third of the supermarkets' carbon footprint came from cooling gases. The most recent survey in 2010 revealed 239 stores running on climate-friendly refrigeration and many more preparing for transition. The supermarkets have proven that it is not only technically feasible to eliminate the use of HCFCs and HFCs, but that it is commercially viable and can improve energy efficiency as well.

The Consumer Goods FORUM
The Global Network Serving Shopper & Consumer Needs

In December 2010, the 600+ members of the Consumer Goods Forum including Aeon, Anheuser-Busch, Coco-Cola, Heiniken, Hewlett-Packard, IBM, Microsoft, Nestle, Unileaver, Wal-Mart, and other international retail giants pledged to "begin phasing out hydrofluorocarbon refrigerants as of 2015 and replace them with non-HFC refrigerants."

Domestic Refrigeration and Freezers

Domestic refrigeration accounted for nearly 2% of global HFC consumption in 2010,[30] and one hundred million domestic refrigerators and freezers are produced annually. There are over 400 million hydrocarbon or Greenfreeze refrigerators in the world today, typically using cyclopentane for the foam and isobutane for the refrigerant. All major European, Japanese and Chinese manufacturers now produce Greenfreeze refrigerators. While 63% of new production is still HFC-

134a, 35.5% of new production use hydrocarbons HC-600a or blend with HC-290, therefore, there is simply no reason to continue using HFCs either as a refrigerant or a blowing-agent in domestic refrigeration.

Industrial Refrigeration

The standard refrigerant in the food industry is ammonia although increasingly CO_2 is being used as a low-temperature refrigerant. Ammonia systems are notable for their high cost-effectiveness and high energy efficiency. CO_2/ammonia systems have also demonstrated their cost-effectiveness and are now state of the art. As such, the use of HFCs as refrigerants in the food industry is no longer required.

Stationary Air Conditioning

Hydrocarbons have been used in some low charge applications, including low capacity portable room units and split system air conditioners, primarily in Europe, Asia and Australia. Propane and isobutane are good alternatives especially in chillers placed outside in warm countries like India and countries with very hot climate. CO_2 is now being installed in a number of applications and shows promise for cool to moderately warm climates.

On 14 July 2011, Chinese air conditioner manufacturer Gree Electric Appliances Inc announced the official opening of the production line for room air-conditioners running with natural refrigerant propane (R290). The production line will manufacture approximately 100,000 units of hydrocarbon room air conditioners per year. With China holding a market share of about 75% of the world production of air-conditioners, the completion of the production line will enable hydrocarbon technology to diffuse into the region but also worldwide and give an impulse to other air-conditioning manufacturers and markets to select sustainable hydrocarbon technology.[31]

The growing availability of low-GWP technologies for the unitary air-conditioner subsector highlights the need to carefully prioritise sectors to be converted for the HCFC phase-out. If low-GWP conversions cannot be made now, countries should be encouraged to delay their air-conditioning sector conversion to a later date. Conversions to high-GWP HFCs such as R410A should not be funded by the MLF.

RECOMMENDATIONS:

Article 2 Countries should review low-GWP alternatives and mandate the adoption of low-GWP technologies to the widest extent possible.

Parties to the Montreal Protocol should explore ways to encourage the commercialization of low-GWP alternatives to HCFCs and the dissemination of up-to-date information on the development and availability of new technologies.

Time for Article 2 Countries to Review Low-GWP Alternatives and Mandate the Adoption of Low-GWP Alternatives to the Widest Extent Possible

Under the Montreal Protocol Article 2 and Article 5 countries are supposed to have common but differentiated responsibilities. Historically this has meant that Article 2 countries would lead by example in phasing down their ODS use and developing alternatives years before the Article 5 phase-out. This happened with HCFCs, but Article 2 countries chose to convert 77% of their HCFCs to high-GWP HFCs using primarily HFC404A, HCF410, HFC134a and HFC245fa. Because of the focus on the climate impacts of HFCs both at the Montreal Protocol and the UNFCCC, at the very end of the Article 2 phase-out a plethora of low-GWP alternatives were and are being developed, a number of which, as discussed above, have been commercialized or are on their way to being proven in virtually all sectors and subsectors. As a result, Article 5 countries are incorporating alternatives into the HPMPs that were not available when Article 2 countries conducted their HCFC phase-out.

The TEAP has suggested that with proper funding 40% or more of all transitions from HCFCs in the Accelerated HCFC Phase-out could be achieved with the use of low-GWP alternatives. By extension, this means that many of the conversions made in Article 2 countries could likewise now transition to low-GWP alternatives. Article 2 countries could accomplish significant climate benefits by educating their industries on the available low-GWP alternatives and mandating conversion to those low-GWP alternatives that have been commercially proven. As Article 2 countries are supposed to lead by example, EIA challenges each Article 2 country to embrace the widest possible adoption of low-GWP alternatives on an expedited basis to provide even more data to be used by Article 5 Parties when developing their HPMPs and hasten the elimination of high GWP fluorinated compounds.

TIME RUNNING OUT ON ODS BANKS



ODS have accumulated in equipment, chemical stockpiles, foams, and other products ("Banks") for the last fifty years. Recovery, recycling and/or destroying the ODS Banks is the responsibility of the Montreal Protocol. Historically, the Montreal Protocol has only controlled the production and consumption of ODS—not emissions[32]. As a result, ODS that were legally placed onto the market in products and equipment, but have not yet been emitted to the atmosphere, have accumulated in Banks[33].

The amount of ODS in Banks will continue to increase as the HCFC Phase-out proceeds. While the Montreal Protocol effectively dealt with the phase-out of production and consumption of ODS, it has only recently begun to explore the management of ODS Banks to destruction[34]. Because of the massive size of Banks and the need for substantial short-term funding, actions to control Banks emissions have been limited to a few pilot projects, the results of which will take years to emerge. An evaluation of possible sources of additional funding is urgently required, all the more so as Banks continues to be studied, substantial emissions of ODS from Banks are occurring on an ongoing basis.

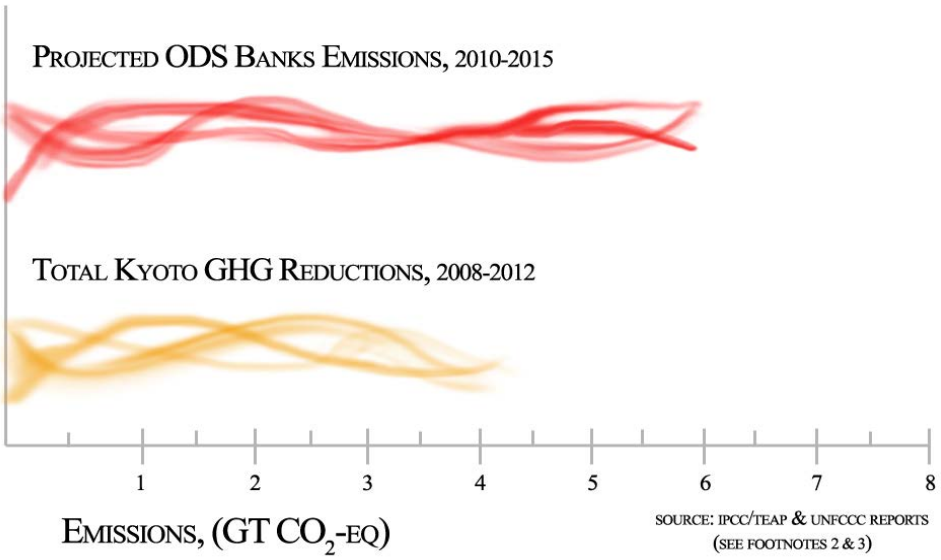
When the TEAP first assessed the amount of ODS in Banks in 2002, it estimated that there were approximately 21 Gt CO_2e in ODS Banks. In the 2010 TEAP assessment the amount of ODS in Banks was estimated at 16-17 Gt CO_2e of ODS. As active recovery has not been undertaken, the difference in estimates is primarily due to the release of these super greenhouse gases into the environment. According to the IPCC and TEAP, ODS Banks in 2010 consisted of 12 Gt CO_2e of CFCs and 4-5 Gt CO_2e of HCFCs. Actions to recover and destroy CFCs and HCFCs in refrigeration and air conditioning Banks represent the most cost-effective climate mitigation opportunities. However, the window of opportunity to reap this double dividend on ozone and climate protection by recovering and destroying these Banks is rapidly closing:

•Developed Countries/Non-Article 5 Parties: TEAP estimates that approximately 72% of CFC Banks and 40% of HCFC Banks in refrigeration and air conditioning will be emitted during the period from 2010 to 2015. These emissions will release 0.7 Gt CO_2e of CFCs and 0.6 Gt CO_2e of HCFCs.

•Developing Countries/Article 5 Parties: TEAP estimates that over 65% of the CFCs in refrigeration and air conditioning, constituting 1.7 Gt CO_2e will be emitted during the 2010-2015 period. In addition, HCFC consumption in Article 5 Parties will continue to rise through 2012. TEAP estimates that HCFC refrigeration and air-conditioning Banks in Article 5 Parties will increase by 11% over the 2010-2015 period, to approximately 2.36 Gt CO_2e in 2015. All of these Banks will need to be recovered and destroyed. [The estimate of the increase in HCFC Banks appears to be low based upon the 8-15% (or higher) annual growth of HCFC use documented in the HPMPs considered by the Multilateral Fund.] After 2015, ODS foam insulation in buildings will represent the largest remaining Banks. ODS Banks of insulating foams will be emitted to the atmosphere gradually over decades. The cost of recovering these Banks at present is drastically higher than recovering ODS from the RAC sector.

At present, in non-Article 5 Parties, there are 3.8 Gt CO_2e in ODS Banks that can be recovered and destroyed with low or medium effort. In Article 5 Parties, there is an additional 5 Gt

Easily recoverable Banks emissions rival reductions achieved under the first commitment period of the Kyoto Protocol and can be obtained at lower CO_2e expense



CO2e of similar ODS Banks, primarily in refrigeration and air conditioning. Without destruction, these Banks will emit approximately 3 Gt CO2e by 2015[35], offsetting the majority of the 5 Gt CO2e emission reductions expected to result during the first commitment period of the Kyoto Protocol[36].

In Article 5 Parties, HCFC production and consumption will increase through 2012, and these Banks will continue to be replenished with HCFCs for decades to come. In all Parties, Banks of high-GWP HFCs will continue to grow as HFCs replace ODS as the preferred substitute as a result of the CFC and HCFC phase-outs. Conservative estimates project that HFCs in all Banks worldwide will be approximately 4.7-5 Gt CO2e by 2015, more than 5.7 Gt CO2e in 2020, and grow significantly thereafter[37]. These Banks will need to be managed using the same infrastructure, training, and governance institutions required to manage ODS Banks. Investing in the recovery and destruction of cost-effective ODS Banks in the near-term will pay a double dividend for ozone and climate protection in the mid- and long-term because this same infrastructure will be available for use in disposing of HFCs.

The TEAP reports that "[e]nd-of-life measures [across all sectors] are consistent and significant contributors to savings in terms of ... climate, with cumulative savings of around ... 6 [Gt] CO2-eq."[38] TEAP estimates that early retirement of equipment will mitigate an additional 3.5-4 Gt CO2e emissions over the 2011–2050 period, not accounting for further CO2e savings from increased energy efficiency.

In discussing the climate benefits of ODS Banks destruction, it is often forgotten that these chemicals also deplete the ozone layer. Therefore, promoting Banks destruction will also have significant ozone benefits. According to TEAP, end-of-life measures across all sectors have potential cumulative savings of around 300,000 ozone depletion potential (ODP) tonnes[39]. It was reported that simply destroying the most cost-effective Banks in refrigeration and air conditioning at end-of-life, could have accelerated the return of the ozone layer by up to two years[40]. These ozone benefits must be accounted for when considering the cost of managing ODS Banks to destruction as they will save tens to hundreds of billions of dollars worldwide in health-care costs associated with skin cancer, eye cataracts, and other ozone-related ailments.

Immediate action is needed to avoid missing these opportunities. At present, ODS Banks are leaking into the atmosphere and will continue to do so until a comprehensive global program to manage ODS Banks to destruction is established. Further, the majority of ODS in the most cost-effective Banks will be emitted by 2015 unless destruction activities begin immediately. In other words, funding the destruction of refrigeration and air conditioning Banks now will achieve more climate and ozone benefits per dollar than future funding and should be considered a one-time down-payment for substantial climate mitigation.

All Article 2 countries to review their own ODS collection programs and strengthen them to minimize ODS releases to the environment. Likewise, the Parties to the Montreal Protocol need to act on obtaining funding to prevent this massive release of super greenhouse gases rather than continuing to study this problem until all of the easily recoverable Banks are gone.

RECOMMENDATIONS:

All Article 2 countries should review their ODS collection programs and strengthen them to minimize ODS releases to the environment.

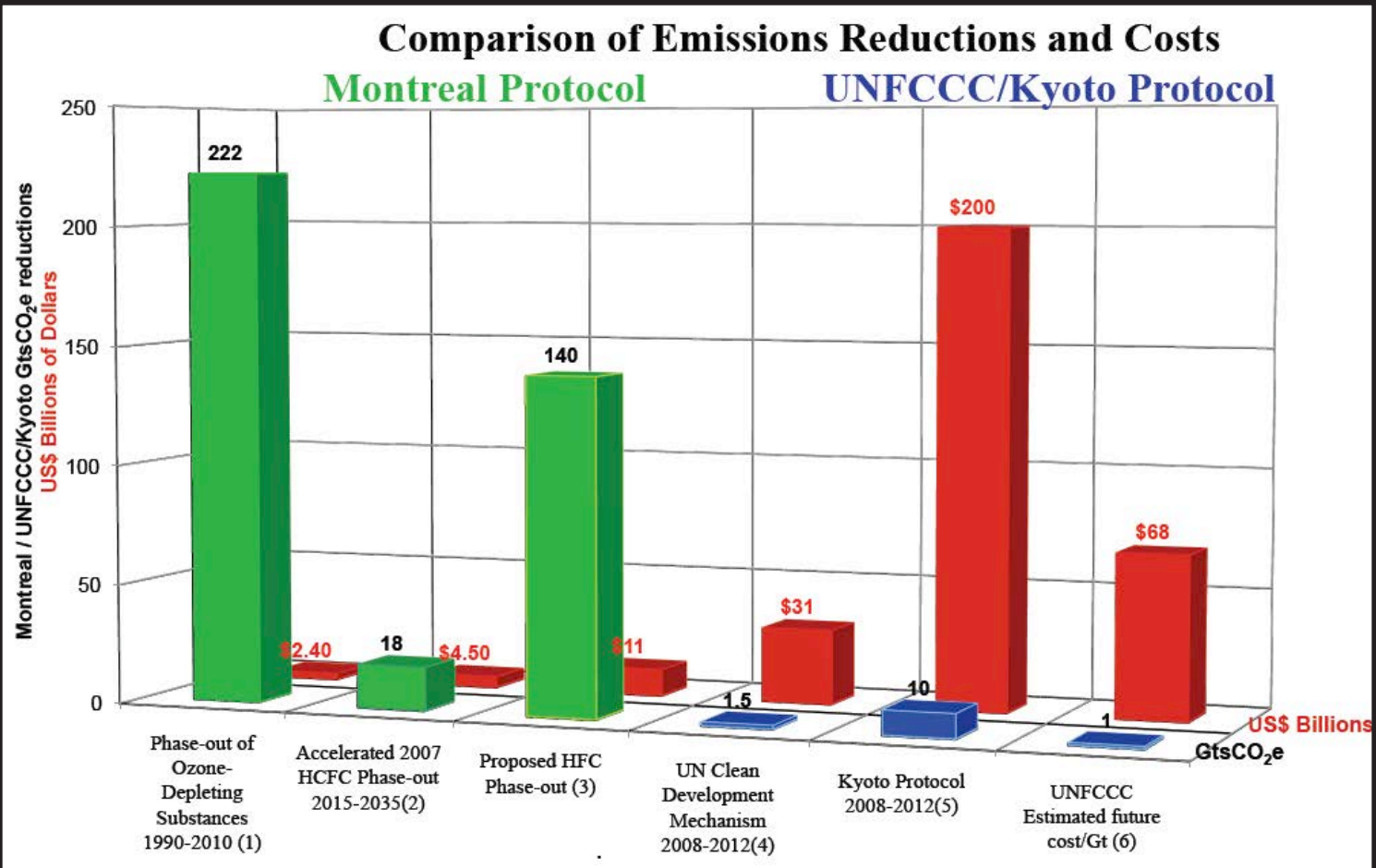
All Parties to the Montreal Protocol must act to obtain funding to prevent this massive release of super greenhouse gases rather than continue to study it until all of the easily recoverable Banks are gone.

ENDNOTES

1. E.g. UNEP/TEAP (2007) Response to Decision XVIII/12: Report of the Task Force on HCFC Issues and Emissions Reduction Benefits Arising from Earlier HCFC Phase-out and other Practical Measures (August 2007). http://ozone.unep.org/teap/Reports/TEAP_Reports/TEAP-TaskForce-HCFC-Aug2007.pdf
2. For examples, https://www.zawya.com/Story.cfm/sidZAWYA20100503041358/Jordan%20receives%20grant%20to%20phase%20out%20ozone-depleting%20chemicals/
3. TEAP (2011) Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund for the Period 2012-2014. (May 2011) http://ozone.unep.org/Assessment_Panels/TEAP/Reports/TEAP_Reports/teap-replenishment-task-force-report-for-2012-2014-May2011.pdf
4. US EPA, April 2010, HFC Phase-down Proposal; and Velders, G. et al., (2009). The large contribution of projected HFC emissions to future climate forcing, Proceedings of the National Academy of Sciences, 106, June 2009.
5. Oko Recherche (2010), Preparatory study for the Review of Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases. Working Document 1.
6. Velders et al. (2009), ibid
7. Oko Recherche (2010), ibid,
8. Velders, et al., (2009), ibid
9. Oko Recherche (2010). ibid.
10. Velders, et al., (2009), ibid
11. Montzka,et al. (2010), Recent increases in global HFC-23 emissions, Geophys,. Research Lett., 37, L02808, doi:10.1029/2009GL041195
12. UNFCCC (2009), GHG emissions data, http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php, UNFCCC, Bonn, Germany
13. Forster, p., et al. (2007), Changes in Atmospheric Constituents and in Radiative forcing, in Climate Change 2007: the Physical Science Basis. Contribution of Working group to the Fourth Assessment Report of the IPCC, pp. 129–234, Cambridge Univ. Press
14. Montzka et al. (2010), ibid.
15. UNEP Risoe CDM/JI Pipeline Analysis and Database, October 1st 2010 www.uneprisoe.org
16. IPCC/TEAP (2005) Special report on safeguarding the ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons, also TEAP (2009) "Task Force Decision xx/8 Report" data derived from Annex 5 table a5-5), ibid., and TEAP Decision xx/7 Interim Report.
17. Executive Committee of the MLFI. Further Elaboration and Analysis of Issues Pertaining to the Phase-out of HCFC Production Sector. Unep/ozL.pro/exCom/57/61 27 February 2009. http://www.multilateralfund.org/files/57/5761.pdf
18. http://www.unep.ch/ozone/assessment_Panels/TEAP/ Reports/TEAP_Reports/teap-supplement-ippc-teap-report- nov2005.pdf
19. http://www.gfl.co.in/news%20clipping%20-%20dalal%20street%20journal%20-%20analysis%20-%20cdm%20business%20-%20july%2023-aug%205,%2007%20-%2025072007.pdf / http://www.gfl.co.in/Annual%20Reports/GFL%20Annual%20Report%202007-08.pdf
20. Draft revision to the approved baseline and monitoring methodology AM0001 "Incineration of fluoroform (HFC-23) waste streams" https://cdm.unfccc.int/Panels/meth/meeting/11/049/mp49_an03.pdf
21. Commission Regulation (EU) No 550/2011 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:149:0001:0003:EN:PDF
22. http://www.ens.dk/da-DK/KlimaOgCO2/forside/nyheder/Documents/Newsletter_July_2011.pdf
23. Enel's report states "According to the entries in Enel's stock register, the reports made to the CONSOB, and the information at the Company's disposal, as of March 2010 no shareholder – with the exception of the Ministry for the Economy and Finance of the Italian Republic, which owns 13.88% of the share capital, Cassa Depositi e Prestiti (a joint-stock company controlled by the aforesaid Ministry), which owns 17.36% of the share capital, and the group controlled by Blackrock Inc., which owns 3.02% of the share capital as asset management – owns more than 2% of the Company's share capital, nor, to the Company's knowledge, do any shareholders' agreements indicated in the Unified Financial Act regarding Enel's shares exist. The Company is therefore subject to the de facto control of the Ministry for the Economy and Finance, which has sufficient votes to exercise a dominant influence at Ordinary Shareholders' Meetings of Enel." http://www.enel.com/en-GB/doc/investor/consolidato_2009_ing.pdf page 291
24. http://www.rsc.org/chemistryworld/Issues/2007/April/CleaningUpCarbonMarket.asp
25. S. LaBudde personal communication with UNFCCC delegates Bonn, June 2011
26. Bibro (2008) in: Becken, K. et al. 2011. Avoiding Fluorinated Greenhouse gases – prospects for phasing out. German Federal Environment Agency (Umweltbundesamt). http://www.uba.de/uba-info-medien-e/3977.html p 114.
27. 27. http://www.refrigerantsnaturally.com/28. http://www.r744.com/articles/144020110718.php
28. Chilling Facts, 2011
29. http://www.gtz.de/de/dokumente/giz2011-en-proklima-projectsheet-southafrica.pdf
30. US EPA. Transitioning to Low-GWP Alternatives in Domestic Refrigeration. http://www.epa.gov/ozone/downloads/EPA_HFC_DomRef.pdf
31. http://www.hydrocarbons21.com/content/articles/116620110725.php
32. Fifteenth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, Nariobi, Kenya, Nov. 10-14, 2003, Report of the Fifteenth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, at Decision XV/9, UNEP/OzL.Pro.15/ 9 (Nov. 11, 2003)
33. IPCC/TEAP 2005 Special Report, at 9 (giving estimates of CFC and HCFC banks from 2002-2015); see also TEAP Decision XX/8 Report, at 10; TEAP Decision XX/7 Interim Report, at 21-25.
34. IPCC/TEAP 2005 Special Report, at 9 (providing an estimate of CFC and HCFC banks from 2002-2015).
35. Compare TEAP Decision XX/7 Interim Report, at 22-23 with TEAP Response.
36. The Kyoto Protocol is expected to reduce CO_2-eq. emissions by 5 Gt over its first commitment period from 2008-2012. See Guus J.M. Velders, et al., The importance of the Montreal Protocol in protecting climate, 104 Proc. Nat'l. Acad. Sci. 4814, 4814-19, (2007) [hereinafter Velders et al. 2007], available at http://www.pnas.org/content/104/12/4814.full.pdf.
37. TEAP Decision XX/8 Report, at 10.
38. TEAP Response, at 12.
39. TEAP, Response to Decision XVIII/12, Report of the Task Force on HCFC Issues (with Particular Focus on the Impact of the Clean Development Mechanism) and Emissions Reductions Benefits Arising from Earlier HCFC Phase-Out and Other Practical Measures (2007) at 12 [hereinafter TEAP Response].
40. UNEP, Technology and Economic Assessment Panel, Supplement to the IPCC/TEAP Report at x (2005), available at http://ozone.unep.org/teap/Reports/TEAP_Reports/teap-supplement-ippc-teap-report-nov2005.pdf [hereinafter TEAP Supplement].



The Jiangsu Meilan Chemical CO. Ltd, co. HCFC-22 plant is one of two World Bank CDM projects for HFC-23 destruction.



Sources: Emissions reductions; and, costs

(1) Velders, et al., Proceedings National Academy of Sciences, 104, 4814, 2007; and, total MLF allocations, ref: http:// www.multilateralfund.org

(2) Velders, et al., The Montreal Protocol, Celebrating 20 Years of Environmental Progress, 2007; and, http://siteresources.worldbank.org/INTMP/1114786-1212782394642/21795297/FinancialAssistanceHCFCPhaseout.pdf

(3) Velders, et al., Proceedings National Academy of Sciences, 106, 10949. 2009; and, OKO Recherche (2010) "Preparatory Study for the Review of Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases"

(4) UNE Riso, November 2009; and, based on projected total volume and average cost of CERs over first Kyoto commitment period

(5) Velders, et al., Proceedings National Academy of Sciences, 104, 4814, 2007; and, low-end for estimated costs of Kyoto compliance

(6) UNEP/IPCC, Kyoto Protocol- average cost per Gt of emissions reductions with full Annex trading of carbon emissions rights permitted, http://maps.grida.no/go/graphic/kyoto_protocol_cost_of_implementation

EIA 2011

EIA — WASHINGTON, DC

PO Box 53343, Washington, DC 20009, USA
TEL + 1 202 483 6621
FAX + 1 202 986 8626
EMAIL info@eia-global.org

WWW.EIA-GLOBAL.ORG

EIA — LONDON

62/63 Upper Street, London N1 0NY, UK
TEL + 44 (0) 20 7354 7960
FAX + 44 (0) 20 7354 7961
EMAIL ukinfo@eia-international.org

WWW.EIA-INTERNATIONAL.ORG

© Environmental Investigation Agency 2011

No part of this publication may be reproduced in any form or by any means without permission in writing from the Environmental Investigation Agency, Inc.

This report was produced by the Washington, D.C. and London offices of the Environmental Investigation Agency (EIA). EIA is solely and entirely responsible for the contents of this report.

ACKNOWLEDGMENTS

Front cover imagery courtesy of NASA

EIA's Atmospheric Campaign is made possible by support from: Rockefeller Brothers Fund.