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Implications of the establishment of new hydrochlorofluorocarbon-22 (HCFC-22) facilities seeking to obtain certified emission reductions for the destruction of hydrofluorocarbon-23 (HFC-23)

Technical paper

Summary

This document was prepared by the secretariat in response to the conclusions of the Subsidiary Body for Scientific and Technological Advice contained in document FCCC/SBSTA/2010/6, paragraph 81, with a view to enhancing understanding of hydrofluorocarbon-23 (HFC-23) abatement in hydrochlorofluorocarbon-22 (HCFC-22) facilities and to provide an analysis of relevant new developments in other intergovernmental processes. The document provides background information on the matter, summarizes the developments under the Montreal Protocol on Substances that Deplete the Ozone Layer, and highlights a number of options to address the implications of the establishment of new HCFC-22 facilities seeking to obtain certified emission reductions for the destruction of HFC-23.

Contents

I. Background and mandate

1. The Conference of the Parties (COP), by its decision 12/CP.10, requested the Subsidiary Body for Scientific and Technological Advice (SBSTA), in collaboration with the clean development mechanism (CDM) Executive Board, to develop a recommendation to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) at its first session relating to implications of the implementation of project activities under the CDM for the achievement of objectives of other environmental conventions and protocols, in particular the Montreal Protocol on Substances that Deplete the Ozone Layer, and which imply the establishment of new hydrochlorofluorocarbon-22 (HCFC-22) facilities, which seek to obtain certified emission reductions (CERs) for the destruction of hydrofluorocarbon-23 (HFC-23), taking into account the principles established in Article 3, paragraph 1, and the definitions in Article 1, paragraph 5, of the Convention.

2. The SBSTA, at its twenty-second session, invited Parties and admitted observers and relevant intergovernmental organizations to submit their inputs on this issue. Fifteen such submissions were received by the secretariat.[1] The SBSTA took note of these submissions at its twenty-third session and agreed to recommend a draft decision on the implications of the establishment of new HCFC-22 facilities seeking to obtain CERs for the destruction of HFC-23 for adoption by the CMP at its first session.[2]

3. The CMP considered this issue at its first session and adopted decision 8/CMP.1. It decided on a definition of "new HCFC-22 facilities" and recognized that issuing CERs for HFC-23 destruction at new HCFC-22 facilities could lead to higher global production of HCFC-22 and/or HFC-23 than would otherwise occur and that the CDM should not lead to such increases. The CMP further recognized that the destruction of HFC-23 is an important measure to mitigate greenhouse gas (GHG) emissions and encouraged Parties included in Annex I to the Convention (Annex I Parties) and multilateral financial institutions to provide funding from sources other than the CDM for the destruction of HFC-23 in Parties not included in Annex I to the Convention (non-Annex I Parties). It requested the SBSTA to continue deliberating on the implications of the new HCFC-22 facilities seeking to obtain CERs for the destruction of HFC-23, and the means to address such implications, with a view to preparing a draft recommendation with guidance to the Executive Board for adoption by the CMP at its second session.

4. The SBSTA, at its twenty-fourth session, noted the elements of decision 8/CMP.1 referred to in paragraph 3 above. It invited Parties, admitted observers and relevant intergovernmental organizations to submit their inputs elaborating on practical solutions to address the implications of the situation recognized in this decision.[3] Five such submissions were received by the secretariat.[4]

5. The SBSTA considered these submissions at its twenty-fifth session; however, no conclusion could be reached on this issue.[5]

6. The SBSTA, at its twenty-sixth session, stated that it would welcome information, analysis or outcomes from assessment panels, conventions and international organizations that may be relevant to the discussions on the implications of the situation referred to in paragraph 3 above, such as, but not limited to, the assessment being undertaken by the Technology and Economic Assessment Panel (TEAP) of the Montreal Protocol. The SBSTA invited Parties, admitted observers and intergovernmental organizations to submit

[1] The submissions are contained in document FCCC/SBSTA/2005/MISC.10.
[2] FCCC/SBSTA/2005/10, paragraph 57.
[3] FCCC/SBSTA/2006/5, paragraph 100.
[4] The submissions are contained in document FCCC/SBSTA/2006/MISC.11.
[5] FCCC/SBSTA/2006/11, paragraph 116.

to the secretariat their views on any possible approaches, such as the approaches that had been considered in consultations at previous sessions, to address the implications of the situation. Two such submissions were received.[6]

7. At its twenty-seventh session, the SBSTA deliberated on these submissions but did not complete its consideration of the issue. Consultations on this issue at SBSTA 28,[7] SBSTA 29,[8] SBSTA 30[9] and SBSTA 31[10] were also inconclusive.

8. The SBSTA, at its thirty-second session, took note of its previous conclusions on this matter as well as the views expressed by Parties during that session. It recognized the need to improve the understanding of the matter among Parties. The SBSTA requested the secretariat to prepare a technical paper for consideration at its thirty-fourth session, with a view to enhancing understanding of the matter and to providing an analysis of new developments in other intergovernmental processes.[11]

9. This document has been prepared in response to this request and provides background information on this matter, including an analysis of new developments in the intergovernmental process under the Montreal Protocol. The document also highlights potential options to address the implications of the establishment of new HCFC-22 facilities seeking to obtain CERs for the destruction of HFC-23, based on submissions to the secretariat by Parties, international organizations and admitted observer organizations. The document also draws upon the relevant technical literature and information from intergovernmental organizations.

II. Technical background information

A. Production and use of hydrochlorofluorocarbon-22

10. HCFC-22 is a HCFC which is used as a refrigerant in the air conditioning and refrigeration industry, as a component in foam blowing and as a chemical feedstock in the manufacture of synthetic polymers. HCFC-22 is an ozone-depleting substance with an ozone depletion potential[12] of 0.055. It is also a GHG with global warming potential (GWP) of 1,810 according to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

11. HCFC-22 is an interim replacement for more potent ozone-depleting substances such as chlorofluorocarbons (CFCs); its emissive use is controlled under the Montreal Protocol.

12. At their 19th meeting, in 2007, Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer agreed on an accelerated phase-out of HCFCs (MOP, 2007). Under this agreement, consumption and production of HCFC-22 for emissive uses in developing countries (Parties operating under Article 5, para. 1, of the Montreal Protocol) will be largely phased out by 2030. In 2030, the consumption and production must be reduced by 97.5 per cent compared with the average level in 2009 and 2010. In developed

[6] The submissions are contained in document FCCC/SBSTA/2007/MISC.17.
[7] FCCC/SBSTA/2008/6, paragraph 124.
[8] FCCC/SBSTA/2008/13, paragraph 74.
[9] FCCC/SBSTA/2009/3, paragraph 109.
[10] FCCC/SBSTA/2009/8, paragraph 53
[11] FCCC/SBSTA/2010/6, paragraph 81.
[12] The ozone depletion potential (ODP) of a chemical compound is the relative amount of degradation to the ozone layer it can cause, with trichlorofluoromethane (R-11 or CFC-11) being fixed at an ODP of 1.0.

countries (Parties not operating under Article 5, para. 1, of the Montreal Protocol), the phase-out will be largely completed by 2020 when the consumption and production must be reduced by 99.5 per cent compared with the baseline.[13]

13. When used as a feedstock, HCFC-22 is converted into other chemical compounds, and hence its use does not lead to its release to the atmosphere. For this reason, the Montreal Protocol does not restrict the production and consumption of HCFC-22 for use as a feedstock.

14. The production of HCFC-22 for feedstock use has increased in both developed and developing countries over the past decade. Most of the HCFC-22 production for feedstock use is for producing polytetrafluoroethylene. The production of HCFC-22 for emissive uses has increased in developing countries and decreased in developed countries in the same period. These trends are shown in table 1.

Table 1
Aggregated hydrochlorofluorocarbon-22 consumption in developed and developing countries (metric tonnes)

	Developed countries			*Developing countries*		
Year	*Feedstock use*	*Emissive use*	*Total use*	*Feedstock use*	*Emissive use*	*Total use*
2000	135 229	225 597	360 826	58	116 606	116 664
2005	187 414	161 981	349 396	78 343	272 059	350 403
2009	120 825	74 971	195 796	173 098	384 904	558 002

Source: Ozone Secretariat of the United Nations Environment Programme.

15. Table 2 shows a projection of the global HCFC-22 consumption by 2010 and 2015 (MLF, 2009). According to this projection, the consumption of HCFC-22 for feedstock use is expected to grow further, while the consumption for emissive use is expected to decline.

Table 2
Projected global hydrochlorofluorocarbon-22 consumption (metric tonnes)

Year	*Emissive use*	*Feedstock use*
2010 (based on assumption of accelerated phase-out)	375 000	380 000
2015 (projected)	245 000	495 000

B. Hydrofluorocarbon-23 formation from hydrochlorofluorocarbon-22 production

16. HFC-23 is a HFC formed as an unwanted by-product in the fluorination of chloroform with hydrogen fluoride during the production of HCFC-22. Currently, HFC-23 has no major commercial use. HFC-23 has a very high GWP of 11,700 according to the Second Assessment Report of the IPCC and 14,800 according to the Fourth Assessment Report of the IPCC. HFC-23 is a non-toxic gas.

17. In the absence of regulations or financial incentives to abate HFC-23, it is discharged to the atmosphere commonly in developing countries. Generally, plant owners

[13] The baseline is defined as follows: for consumption as 2.8 per cent of the 1989 CFC consumption plus 100 per cent of 1989 HCFC consumption; for production as 2.8 per cent of 1989 CFC production plus 100 per cent of 1989 HCFC production.

do not have economic incentives to install HFC-23 abatement facilities because such facilities involve capital and operation costs but the abatement does not generate revenues if not registered under the CDM.

18. Various factors influence the quantity of HFC-23 formed as a by-product of HCFC-22, including the technology used and the processing parameters. The IPCC/TEAP special report estimates the HFC-23 waste generation rate (the mass of HFC-23 formed per mass of HCFC-22 produced) as being in the range of 1.4 to 4.0 per cent (IPCC/TEAP, 2005). The HFC-23 waste generation rate in plants registered under the CDM varied between 0.9 and 5.4 per cent according to data reported by the plant operators in project design documents and monitoring reports.

C. Technologies for hydrofluorocarbon-23 abatement

19. Thermal oxidation (incineration) and plasma pyrolysis are the two most widely used technologies for the destruction of HFC-23. Out of the 19 registered CDM projects of this type, 17 plants are using thermal oxidation and two are using plasma pyrolysis technology. In the thermal oxidation process, HFC-23 is decomposed at a high temperature flame in the presence of oxygen (1,200–1,800 °C). Plasma pyrolysis systems use a very high temperature plasma arc (2,500–10,000 °C) without the use of oxygen. Both technologies can achieve a destruction efficiency of more than 99.9 per cent.

20. According to the IPCC/TEAP special report, the investment costs for an abatement facility are about USD 2–8 million and the operating costs are about USD 189,000–350,000 per year (IPCC/TEAP, 2005). The actual costs depend, inter alia, on the capacity of the destruction units. The GHG abatement costs are estimated in the literature to be about USD 0.20–0.50 per tonne of carbon dioxide equivalent (CO_2 eq) (IPCC/TEAP, 2005; Schneider et al., 2005). The CER revenues can exceed the abatement costs significantly; for example, assuming abatement costs of USD 0.50 per tonne of CO_2 eq and a CER price of USD 16, the CER revenues could be about 30 times the cost of HFC-23 destruction. Under a range of different scenarios, the revenue from CERs could also exceed the revenue from producing HCFC-22 (see table 3). In addition, several publications emphasized that the revenues from CERs could exceed the costs of producing HCFC-22 (Schneider et al., 2005; TEAP, 2007; Wara, 2006).

Table 3
Revenues from certified emission reductions in comparison with revenues from hydrochlorofluorocarbon-22 sale under different price assumptions

Assumed hydrochlorofluorocarbon-22 prices	*Assumed certified emission reduction prices*	
	10 USD/certified emission reduction	20 USD/certified emission reduction
1 USD/kg	3	6
4 USD/kg	0.75	1.5

Note: Assumptions in the data presented in table 3: (i) Waste generation rate (mass of HFC-23 (hydrofluorocarbon-23)/mass of hydrochlorofluorocarbon-22) is 3%; (ii) Certified emission reductions per tonne of HFC-23 destroyed, which can be received by HFC-23 incineration projects after accounting for all transaction costs, are approximately 10,000.

D. Applicability of hydrofluorocarbon-23 projects under the clean development mechanism

21. Under the CDM, projects that abate HFC-23 emissions use the baseline and monitoring methodology AM0001. Nineteen such project activities have been registered under the CDM.[14]

22. The applicability of the methodology is limited to existing HCFC-22 facilities. The crediting was limited to existing facilities to avoid a situation where issuing CERs could lead to a higher global production of HCFC-22 and/or HFC-23 than would otherwise occur (see decision 8/CMP.1, para. 2).

23. The emission reductions are calculated based on the amount of HFC-23 destroyed and emissions associated with the abatement of the HFC-23. To avoid incentives for more HCFC-22 to be produced and/or more HFC-23 to be formed than in the absence of the CDM, the approved baseline and monitoring methodology AM0001 limits the amount of HCFC-22 that is eligible for crediting and the extent of mass of HFC-23 formation per unit mass of HCFC-22 production (also referred to as waste generation rate w), as follows:

(a) The amount of HCFC-22 production that is eligible for crediting is limited to the maximum historical annual HCFC-22 production level during any of the last three years between the beginning of 2000 and the end of 2004, including an HCFC-22 production equivalent to the CFC production at swing plants;

(b) The waste generation rate is capped to the lowest level achieved in the last three operation years up to 2004 and a value of 3.0 per cent.

24. According to estimates by the TEAP, about 67–68 per cent of production volume in 2006 in developing countries is covered under the CDM (TEAP, 2007).

E. Contribution of the clean development mechanism to hydrofluorocarbon-23 abatement

25. HFC-23 destruction projects in existing HCFC-22 facilities have the largest share of CERs issued so far. By 1 April 2011, the 19 projects of this type had issued 277 million CERs, which corresponds to 48 per cent of the total CERs issued as at 1 April 2011.

26. The CDM has played an important role in abating HFC-23 emissions globally. Montzka et al. (2010) analysed the global HFC-23 concentrations in the atmosphere over time and assessed the contributions from various sources. The study concludes that a substantial increase in global HFC-23 emissions occurring during the early 2000s. These increases occurred during a period when Annex I Parties reported decreasing emissions to the secretariat, indicating that HFC-23 emissions from non-Annex 1 Parties increased as they produced more HCFC-22. Although CDM projects destroyed a significant share of HFC-23 emissions from non-Annex 1 Parties in 2007 and 2008, both HCFC-22 production data and the HFC-23 emissions inferred for non-Annex I Parties suggest that a substantial amount of HCFC-22 production and associated HFC-23 emissions from new HCFC-22 facilities continued unabated during these years.

[14] Eleven facilities in China, five in India and one each in Argentina, Mexico and the Republic of Korea. For more information, see <http://cdm.unfccc.int>.

F. Issues related to clean development mechanism projects implemented in existing hydrochlorofluorocarbon-22 facilities

1. Revision of the baseline and monitoring methodology AM0001

27. Following a request from the CDM Executive Board, the Methodologies Panel under the Executive Board prepared, at its 44th meeting, an information note on issues related to the approved CDM methodology AM0001 for HFC-23 destruction in existing HCFC-22 facilities.[15]

28. The Executive Board considered this information note at its 55th meeting and requested the Methodologies Panel, where appropriate by using external expertise and by directly requesting information from the project proponents of the registered CDM HFC-23 project activities, to provide additional information to the Board on different aspects of the methodology.

29. At its 47th meeting, the Methodologies Panel prepared a report to the Executive Board on issues related to the methodology, which was considered by the Board at its 58th meeting. The executive summary of the report is available on the UNFCCC website.[16] At its 58th meeting, the Executive Board requested the Panel to revise the methodology AM0001, based on the shortcomings identified in the report. The Board agreed to put the methodology on hold with immediate effect. This implies that no new project can be registered and that existing projects cannot request a renewal of the crediting period until a new version of the methodology is approved by the Executive Board; however, CERs can continue to be issued for registered projects until the end of their crediting period. At its 49th meeting, the CDM Methodologies Panel agreed to recommend the Board a revision of the methodology. The proposed revision includes, inter alia, a more a stringent cap on the waste generation rate.

2. Proposed ban on the usage of hydrofluorocarbon-23 certified emission reductions in the European Union emissions trading scheme from May 2013

30. In 2011, the European Union (EU) banned the use of CERs from HFC-23 projects in the EU emissions trading scheme from May 2013. This decision may reduce the market demand for CERs from HFC-23 projects after the first commitment period under the Kyoto Protocol.

G. Progress in the broader UNFCCC negotiations on addressing hydrofluorocarbon emissions

31. At COP 16, the outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) invited submissions from Parties and accredited observer organizations on matters relating to the establishment of one or more non-market-based mechanisms to enhance the cost-effectiveness of, and to promote, mitigation actions.[17] The submission[18] from the EU and its member States supported collaboration with work under the Montreal Protocol in addressing HFCs. The submission by Grenada on behalf of the Alliance of Small Island States presented a view that HFC-23

[15] Annex 2 to the report of the forty-fourth Methodologies Panel meeting, available at <http://cdm.unfccc.int/Panels/meth/meeting/10/044/mp44_an02.pdf>.

[16] <http://cdm.unfccc.int/UserManagement/FileStorage/46PQENJ7RFHY2G5KVIXM0T38DCAS1W>.

[17] FCCC/AWGLCA/2010/L.7, paragraph 86.

[18] FCCC/AWGLCA/2011/MISC.3.

projects should not be allowed under the CDM and that a non-market-based approach should be adopted for dealing with industrial gases such as HFCs.[19]

32. The Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) is currently discussing the coverage of GHGs in the next commitment period, including the addition of new HFCs.[20] The discussions under the AWG-LCA and the AWG-KP on this matter are not specific to crediting HFC-23 destruction in new HCFC-22 facilities; they are of a more general nature on how to deal with industrial gases such as HFCs. In addition, during AWG-LCA 14, Parties agreed that an agenda item on "Cooperative sectoral approaches and sector specific actions, in order to enhance the implementation of Article 4.1.c of the Convention" should be added to the agenda of the session.[21] It is envisaged that Parties will discuss in this context how to address HFCs.

III. Developments in other intergovernmental processes

A. Phase-out of hydrochlorofluorocarbons under the Montreal Protocol

33. The Montreal Protocol was adopted in 1987. It is a protocol to the Vienna Convention for the Protection of the Ozone Layer, which was adopted in 1985. The Vienna Convention and the Montreal Protocol control the consumption and production of ozone-depleting substances, such as CFCs, HCFCs and carbon tetrachloride. The Montreal Protocol and its amendments establish time-bound targets to reduce the consumption and production of these substances in both developed and developing countries.

34. The Multilateral Fund for the Implementation of the Montreal Protocol (MLF) provides financial and technical assistance to Article 5 Parties to assist them in complying with their obligations under the Protocol. The fund provided is replenished on a three-yearly basis by the donors. Pledges for the period 1991 to 2010 amounted to USD 2.7 billion.

35. The action under the Montreal Protocol initially focused on the phase-out of substances with a very high ozone-depleting potential, such as CFCs, which were phased out by 2010. HCFCs have a lower ozone-depleting potential than CFCs and, among their other uses, serve as an interim replacement for CFCs. HCFCs are also potent GHGs. With a view to enhancing efforts to control ozone depletion and to reduce GHG emissions associated with the emissive use of HCFCs, the Parties to the Montreal Protocol agreed in 2007 on an accelerated phase-out of HCFCs (MOP, 2007). The phase-out arrangements under this agreement are illustrated in table 4.

Table 4
Arrangements under the Montreal Protocol for the phase-out of hydrochlorofluorocarbons

	Developing countries (Parties operating under Article 5, para. 1, of the Montreal Protocol)	*Developed countries (Parties not operating under Article 5, para. 1, of the Montreal Protocol)*
Baseline year and amount for production and consumption of HCFCs	Average of 2009 and 2010 (previously 2015)	Consumption: 2.8 per cent of the CFC consumption in 1989 plus 100 per cent of the

[19] FCCC/AWGLCA/2011/MISC.3.
[20] FCCC/KP/AWG/2010/18/Add.1.
[21] <http://unfccc.int/resource/docs/2011/awglca14/eng/l01.pdf>.

	Developing countries (Parties operating under Article 5, para. 1, of the Montreal Protocol)	*Developed countries (Parties not operating under Article 5, para. 1, of the Montreal Protocol)*
		HCFC consumption in 1989 Production: 2.8 per cent of the CFC production in 1989 plus 100 per cent of the HCFC production in 1989
Freeze at the baseline level	2013 (previously 2016)	
Phase-out schedule for the production and consumption of HCFCs with respect to baseline year	(a) 10 per cent by 2015; (b) 35 per cent by 2020; (c) 67.5 per cent by 2025; (d) 100 per cent by 2030, while allowing 2.5 per cent annually for servicing during the period 2030–2040	(a) 75 per cent by 2010; (b) 90 per cent by 2015; (c) 100 per cent by 2020, while allowing 0.5 per cent for servicing during the period 2020–2030

36. The MLF will provide the incremental cost to enable Parties operating under Article 5, paragraph 1, of the Montreal Protocol to comply with the accelerated phase-out schedule.

37. Next to reducing ozone depletion, the accelerated phase-out has also had a significant positive impact on mitigating climate change. According to a report by the Scientific Assessment Panel of the Montreal Protocol, the accelerated HCFC phase-out is projected to reduce GHG emissions by between 0.4 and 0.6 gigatonnes CO_2 eq per year on average over the period from 2011 to 2050 owing to the phase-out of emissive consumption and production of HCFCs (UNEP, 2010).

38. The use of HCFC-22 as a feedstock in the manufacture of other chemicals is not controlled under the Montreal Protocol. The accelerated phase-out of HCFCs for emissive uses may result in a shift in HCFC-22 consumption for emissive uses to feedstock applications. Hence, HFC-23 from new HCFC-22 facilities may, despite the accelerated phase-out, continue to be generated and vented to the atmosphere in the absence of economic incentives or regulations requiring its abatement. According to a report by the TEAP, HFC-23 emissions could reach 0.45 billion tonnes of CO_2 eq by 2039, which represents around 35 per cent of the total GHG emissions from usage of ozone-depleting substances (TEAP, 2007).

39. To implement the phase out of HCFCs, the Parties operating under Article 5, paragraph 1, of the Montreal Protocol develop HCFC Phase-out Management Plans (HPMPs). The MLF has recommended a staged implementation approach for the development of HPMPs, whereby the first stage should address all policy and institutional strengthening as well as technical and financial assistance measures required to achieve compliance with the freeze of consumption and production by 2013 and the 10 per cent reduction target for 2015 in developing countries. The HPMPs will cover the following aspects (MOP, 2010):

(a) The establishment of a national team and related institutional arrangements;

(b) A review of the existing regulatory and policy framework;

(c) Information dissemination and industry interaction;

(d) Data collection on the baseline in each HCFC-consuming industrial sector;

(e) Data analysis;

(f) Technology selection, taking into account climate change impacts;

(g) Prioritization of sectors for interventions;

(h) Estimation of the incremental costs and associated technical assistance needed;

(i) Stakeholder consultations;

(j) The development of strategies and plans for the phase-out of HCFCs.

40. The development and implementation of the HPMPs in developing countries is funded by the MLF. Various countries have submitted to the MLF proposals to prepare an HPMP. As per the 63rd meeting of the Executive Committee of the MLF, 126 countries have received an approval to prepare their HPMP and 60 HPMPs have been approved to date (MLF, 2011).

B. Developments under the Montreal Protocol regarding hydrofluorocarbons (including hydrofluorocarbon-23)

41. The Montreal Protocol has been successful in protecting the ozone layer by reducing the production and consumption of ozone-depleting substances. The reduction of emissions of ozone-depleting substances has also had benefits for the mitigation of climate change, since most ozone-depleting substances are also potent GHGs. The accelerated phase-out of HCFCs aims to enhance efforts to protect the ozone layer. HFCs have been until now a major replacement for HCFCs in the refrigeration and air-conditioning applications, as shown by the trends in the developed countries. HFCs have been introduced as alternatives to HCFCs in the foam sector in many developed countries. An accelerated phase-out of HCFCs may therefore result in an increase in the use and emissions of HFCs. To preserve climate benefits along with ozone benefits, two proposals to amend the Montreal Protocol to address HFCs were presented at the 30th meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (OEWG): one by the United States of America on behalf of itself, Canada and Mexico (North American Proposal),[22] and another by the Federated States of Micronesia.[23] These proposals, first presented in 2009, seek to control the production and consumption of HFCs under the Montreal Protocol in a phased manner.

42. HFCs are currently not covered under the Montreal Protocol but are addressed by the Convention and its Kyoto Protocol. The proposed amendments referred to in paragraph 41 above suggest that 20 HFCs be included in a new Annex F to the Montreal Protocol, including two substances referred to as hydrofluoroolefins. The production and consumption of the HFCs would then be phased down according to a defined schedule. Under the proposed amendments, the provisions of the Convention and its Kyoto Protocol would still apply to all Parties to the Protocol.

43. HFC-23 emissions are explicitly covered under both proposed amendments. These proposals require each Party to limit the HFC-23 emissions from HCFC-22 facilities by 1 January 2014 according to the North American Proposal and by 1 January 2013 according to the proposal by the Federated States of Micronesia. It is proposed to make MLF funding available to meet the incremental costs of compliance. However, projects covered under the CDM would not receive funding from the MLF.

[22] <http://ozone.unep.org/Meeting_Documents/mop/22mop/MOP-22-5E.pdf>.
[23] <http://ozone.unep.org/Meeting_Documents/mop/22mop/MOP-22-6E.pdf>.

44. Owing to the divergent views among Parties on these proposals, no conclusions have been reached so far. During the 30th meeting of OEWG, the following views were expressed by the Parties (OEWG, 2010).[24]

(a) The representative of the United States said that it was necessary to coordinate and harmonize approaches to dealing with HFCs, preserving and building upon the climate benefits that have arisen from the phase-out of CFCs and HCFCs. It was acknowledged that the phase-out of HCFCs was still in its early stages and that a number of countries had just submitted their HPMPs; timely action on HFCs, however, would avert the additional costs that would accrue if action was delayed, and alternatives with low GWP did exist in many sectors and could feasibly be adopted. The aim of the North American Proposal was not to diminish the responsibility of the Convention for HFCs but rather to work in conjunction with it to phase down the emissions of the substance for which the Montreal Protocol had been partly responsible. The representative of Mexico added that the proposed amendment would assist Parties operating under Article 5, paragraph 1, of the Montreal Protocol to adopt integrated solutions in an area in which the Montreal Protocol had considerable experience, and to receive appropriate financial and technical support in implementing those solutions;

(b) The representative of the Federated States of Micronesia said that the Montreal Protocol had a moral and legal obligation to address the issue of HFC emissions, noting that Article 2, paragraph 2, of the Vienna Convention mandates Parties to adopt appropriate measures with regard to human activities that had adverse effects resulting from the modification of the ozone layer, and that such effects included climate change;

(c) In the ensuing discussion, some representatives expressed opposition to further discussion of HFCs, but many favoured continuing the dialogue on what they said was an important matter. One suggested that there should be a wide-ranging debate at the current meeting, including the consideration of high and low GWP alternatives to HFCs and the development and application of guidelines on how such alternatives were selected;

(d) The Parties engaged in an extended discussion of whether HFCs fell within the mandate of the Montreal Protocol, given that they were covered by the Convention and its Kyoto Protocol. Several representatives said that HFCs did not fall within the scope of the Montreal Protocol because action taken to reduce their emissions would not benefit the ozone layer; they urged that the Montreal Protocol should be limited to matters that lay clearly within its mandate. Others, however, argued that Article 2 of the Vienna Convention allowed the Parties to coordinate their policies in managing the phase-out of HCFCs and the introduction of alternatives, including HFCs, and that action to reduce HFCs was clearly appropriate under the Protocol;

(e) One representative, supported by others, said that under the climate change negotiations the Parties to the Convention were already considering HFCs within the new commitment period of the Kyoto Protocol and that any decision on HFCs under the Montreal Protocol should await the outcomes of that process. Other representatives said that input from the Montreal Protocol had the potential to support rather than hinder those discussions and that linkages between the Kyoto Protocol and the Montreal Protocol on HFCs and other matters should be further explored. One representative quoted previous initiatives dating back to 1998 to demonstrate that the Parties to the Montreal Protocol had been discussing HFCs for some time, including in collaboration with the Convention, and that the Montreal Protocol was the instrument best placed to address the substance from a technical viewpoint. Another suggested that the proposed amendments could not proceed without a joint meeting of the Parties to the relevant conventions, involving extended consultation with all Parties;

[24] <http://ozone.unep.org/Meeting_Documents/mop/22mop/MOP-22-9E.pdf>.

(f) Several representatives from States vulnerable to the effects of climate change stressed the need for urgent action on substances with high GWP. A number of representatives said that the Montreal Protocol had a responsibility to avoid the adoption of such substances as alternatives to ozone-depleting substances. One representative expressed concern at the implications for the long-term stability of industry of introducing alternatives without proper evaluation of their feasibility and impacts;

(g) Others, however, said that the priorities of the Montreal Protocol lay elsewhere. The task of phasing out HCFCs was already stretching the resources of many Parties operating under Article 5, paragraph 1, of the Montreal Protocol and banks of ozone-depleting substances also required urgent attention. Greater clarity was needed on such issues, including in respect of funding;

(h) The issue of common but differentiated responsibilities, and the implications of that principle for resource allocation, figured prominently in the discussion. One representative said that both proposed amendments respected the principle, as they foresaw different timescales for phasing down HFCs for Parties operating under Article 5 , paragraph 1, of the Montreal Protocol and Parties not operating under Article 5, paragraph 1, of the Montreal Protocol. Another representative said that the Montreal Protocol had been one of the first multilateral environmental agreements to implement the principle, in particular in creating the MLF and adopting the worldwide implementation of ozone-depleting substance phase-out schedules. Another representative, however, said that the inclusion of HFCs in the Montreal Protocol would imply the imposition of binding obligations on all Parties to the ozone regime despite the fact that under the climate change regime such obligations applied only to Annex I Parties; consideration of HFCs under the Montreal Protocol would thus entail clear disrespect of the principle of common but differentiated responsibilities. A number of representatives stressed the importance of providing adequate funding and technology transfer in developing and implementing alternatives;

(i) A number of representatives suggested that further study of the issues under discussion was needed, and suggested areas where the TEAP could further evaluate the implications of the proposed amendments;

(j) Two representatives of non-governmental organizations spoke strongly in favour of the proposed amendments and supported immediate action to phase out HFCs under the aegis of the Montreal Protocol;

45. The issue will be further discussed during the 31st meeting of the OEWG in August 2011.

IV. General views of Parties on crediting hydrofluorocarbon-23 destruction in new hydrochlorofluorocarbon-22 facilities

46. This chapter provides an overview of the views expressed by Parties on crediting HFC-23 destruction in new HCFC-22 facilities. The information is based on the submissions of Parties to the secretariat, statements by Parties made at the plenary sessions of the SBSTA and reports by the co-chairs of the SBSTA agenda item, related to crediting of new HCFC-22 facilities under CDM, to the plenary session of the SBSTA. These views are categorized according to specific issues.

A. Impact of the accelerated phase-out

47. Parties have diverse views on the impact of the accelerated HCFC phase-out under the Montreal Protocol on new HCFC-22 facilities seeking CDM benefits. The view of one Party is that the accelerated phase-out of HCFC-22 by 2030 eliminates all the concerns about a potential increase in HCFC-22 production to gain CDM incentives. For this reason, CERs should be issued for HFC-23 destruction in the new HCFC-22 facilities.

48. The view of some other Parties is that there is a possibility that the CDM offers perverse incentives for increasing the production of HCFC-22 (or not reducing production as per phase-out plans). Moreover, the HCFC-22 produced for feedstock purposes is not controlled under the Montreal Protocol and therefore the production of HCFC-22 for feedstock purposes can be increased for the purpose of gaining CERs.

B. Accelerated shift of hydrochlorofluorocarbon-22 production from Annex I Parties to non-Annex I Parties leading to increased emissions of greenhouse gases

49. The revenue from the sale of CERs from HFC-23 destruction could make HCFC-22 production at new plants in non-Annex I Parties more profitable than at existing plants in Annex I Parties, leading to the decommissioning of existing plants in Annex I Parties and construction of new plants in non-Annex I Parties. Views on the potential magnitude of this effect differ. Several submissions state that a shift of HCFC-22 production to non-Annex I Parties could lead to larger quantities of waste HFC-23 for the same global HCFC-22 production because the average HFC-23 generation rate in non-Annex I Parties is about 3 per cent compared with 2 per cent in Annex I Parties, where plants often adhere to better operating practices and voluntary or mandatory HFC-23 destruction. Allowing new plants to earn CERs for HFC-23 destruction would permit increased GHG emissions due to the larger quantity of waste HFC-23.

C. Possible operation of new hydrochlorofluorocarbon-22 plants to maximize hydro-fluorocarbon-23 generation leading to increased emissions of greenhouse gases and ozone-depleting substances

50. It is possible that the revenue from the sale of CERs generated by the destruction of waste HFC-23 could exceed the revenue from the sale of the HCFC-22 produced. Then a new HCFC-22 plant might be operated to maximize the quantity of HFC-23 generated and hence maximize the quantity of CERs generated. The amount of HFC-23 generated could be increased by:

(a) Operating the plant to maximize the amount of HFC-23 generated rather than to minimize the amount of HFC-23 generated per unit of HCFC-22 produced;

(b) Producing more HCFC-22 than is needed to satisfy the market demand and venting the surplus to the atmosphere.

51. Any HCFC-22 vented would increase emissions of ozone-depleting substances and (non-Kyoto) GHGs. Any increase in the amount of HFC-23 generated per unit of HCFC-22 produced would lead to higher GHG emissions even if the HFC-23 is destroyed. Thus incentives for new HFC-23 destruction may result in higher HCFC-22 production, leading to a negative impact on the objectives of the Montreal Protocol.

D. Reduced contribution to sustainable development in non-Annex I Parties

52. One of the objectives of CDM project activities is to contribute to the sustainable development of the host country. Whether or not a proposed project activity meets this requirement is determined by the host country government. Some submissions claim that HFC-23 destruction projects make a smaller contribution to sustainable development than that made by other types of CDM projects. Allowing new HCFC-22 plants in non-Annex I Parties to earn CERs for HFC-23 destruction would increase the supply of low-cost CERs from such project activities. Allowing new HCFC-22 plants in non-Annex I Parties to earn CERs for HFC-23 destruction would reduce the scope for other types of CDM project activities that might make a larger contribution to the sustainable development of non-Annex I Parties.

E. Impact on the functioning of the clean development mechanism

53. One Party mentioned that the impact of new HFC-23 destruction projects on the overall functioning and effectiveness of the CDM is a concern which deserves further reflection.

F. Inequitable geographical distribution of clean development mechanism project activities

54. The CDM modalities and procedures stipulate that the CMP is to review the regional and subregional distribution of CDM project activities with a view to identifying systematic or systemic barriers to their equitable distribution and take appropriate decisions. The existing HCFC-22 production capacity in non-Annex I Parties is concentrated in a small number of countries. Expansion of existing plants and/or the construction of new HCFC-22 plants would probably be limited to a relatively small number of non-Annex I Parties, thus inhibiting an equitable regional distribution of project activities.

G. Transfer of environmentally sound technology

55. The transfer of environmentally sound technologies to developing countries is a fundamental element of the Kyoto Protocol. Enabling new HCFC-22 plants in non-Annex I Parties to earn CERs for HFC-23 destruction would not contribute to the transfer of environmentally sound technologies to developing countries.

H. Abuse of rights

56. One submission states that rights and entitlements have to be implemented following good faith principles. According to this submission, the use of a pseudo-legitimate right beyond normal limits or in a way that affects third parties would be an abuse of good faith. Indiscriminate use of the CDM for HFC-23 destruction project activities at new HCFC-22 plants could be considered an abuse of good faith and an abuse of rights.

V. Options to address the implications of the establishment of new hydrochlorofluorocarbon-22 facilities seeking to obtain certified emission reductions for the destruction of hydrofluorocarbon-23

57. This chapter highlights options to address the implications of the establishment of new HCFC-22 facilities seeking to obtain CERs for the destruction of HFC-23. These options were proposed in submissions from Parties or admitted observer organizations. The following options are discussed:

(a) Making new HCFC-22 facilities ineligible under the CDM;

(b) Establishment of provisions to ensure that HCFC-22 production serves real demand;

(c) Discounting of CERs;

(d) Introducing an emissions benchmark;

(e) Issuing CERs to entities other than the operator of the new HCFC-22 facility;

(f) Introducing a tax on CERs;

(g) Restricting the use of the CDM to HCFC-22 production for feedstock applications.

58. Some Parties proposed that combinations of these measures be implemented.

A. Eligibility of new hydrochlorofluorocarbon-22 facilities under the clean development mechanism

59. Some Parties were of the view that the destruction of HFC-23 in new HCFC-22 facilities should not be eligible under the CDM and that the HFC-23 emissions may be abated through other incentives, including funding through channels other than the CDM. One way of funding could be the MLF, if Parties to the Montreal Protocol agree to address HFC emissions under the Protocol.

B. Establishment of provisions to ensure that hydrochlorofluorocarbon-22 production serves real demand

60. To ensure that new HCFC-22 plants are meeting real demand and do not produce HCFC-22 for the purpose of generating CERs from the destruction of HFC-23, the following provisions could be included in a baseline and monitoring methodology for new HCFC-22 facilities:

(a) Crediting may start only after a certain minimum number of years of operation by the new HCFC-22 facilities. Some Parties proposed that there should be a minimum of three years operation history for a new HCFC-22 facility to be eligible for crediting;

(b) The end-use of the HCFC-22 produced by new facilities may be monitored to ensure that the HCFC-22 is consumed and not released to the atmosphere.

C. Discounting of certified emission reductions

61. As highlighted in chapter II.C, the revenues from CERs could exceed the costs of producing HCFC-22 and abating HFC-23. This could result in more HCFC-22 being produced and/or more HFC-23 being generated than in the absence of the CDM. One option to address this situation could be issuing fewer CERs than the emission reductions that were achieved by the plants, with a view to reducing the revenues from the destruction of HFC-23 under the CDM. This may be achieved in the following ways:

(a) The number of CERs issued could be limited in such a way that the HCFC-22 production costs are reduced to a limited extent;

(b) The number of CERs issued could be limited in such a way that only the incremental costs of installing and operating the HFC-23 destruction unit are covered.

62. A methodological approach could be developed to determine an appropriate discount factor.

D. Introducing an emissions benchmark

63. Similar to the discounting of CERs, the revenues from abating HFC-23 under the CDM could be reduced by introducing a low emissions benchmark to calculate the baseline emissions. The benchmark could be expressed as the mass of HFC-23 generated per mass of HCFC-22 produced, also referred to as waste generation rate w in the approved methodology AM0001. In submissions from Parties, emissions benchmarks were proposed in the range between 0.05 per cent and 3.0 per cent mass of HFC-23 per unit mass of HCFC-22.

E. Issuing certified emission reductions to entities other than the operator of a new hydrochlorofluorocarbon-22 facility

64. To avoid any incentives for the operators of a new HCFC-22 facility to produce more HCFC-22 and/or generate more HFC-23 than they would do in the absence of the CDM, the CERs could be issued to an entity other than the operator of the new HCFC-22 facility. The operator could then be compensated by this third party entity for the costs of installing and operating the HFC-23 destruction facility. In addition, the operator may also receive some additional incentives for undertaking the abatement. The third party entity may be the host country government, an institution within the host country or an international institution.

F. Introducing a tax on certified emission reductions

65. The host country government may introduce a tax on the CERs issued to the CDM project with a view to limiting the revenues from the destruction of HFC-23 under the CDM. The revenues from the tax could be utilized to fund other GHG emission reduction projects. One Party proposed that the tax should be at least 50 per cent of the revenues from CERs.

G. Restricting the use of the clean development mechanism to hydrochlorofluorocarbon-22 production for feedstock applications

66. The CDM could be restricted to new production facilities that produce HCFC-22 only for feedstock applications. The use of HCFC-22 as feedstock does not result in HCFC-22 emissions. Furthermore, it is not subject to phase-out under the Montreal Protocol.

Annex

List of references

IPCC (Intergovernmental Panel on Climate Change)/TEAP (Technology and Economic Assessment Panel). 2005. *Safeguarding the Ozone Layer and the Global Climate System: Special Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press. pp.81, 382.

MLF (Executive Committee of the Multi-lateral Fund for the Implementation of the Montreal Protocol). 2009. *Report of the Fifty-seventh Meeting of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol.* Decision 56/64(a) and (b): further elaboration and analysis of issues pertaining to the phase-out of HCFC production sector): pp.8–11.

MLF. 2011. *Report of the Sixty-third Meeting of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol.*

Montzka SA, Kuijpers L, Battle MO, Aydin M, Verhulst KR, Saltzman ES and Fahey DW. 2010. *Recent increases in global HFC-23 emissions. Geophysical Research Letters.* 37.

MOP (Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer). 2007. *Report of the Nineteenth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*. Decision XIX/6: Adjustments to the Montreal Protocol with regard to Annex C, Group I, substances (hydrochlorofluorocarbons).

MOP. 2010. *Report of the Nineteenth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*: pp.7–8.

OEWG (Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer). 2010. *Report of the thirtieth Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*: pp. 9–13.

Schneider L, Graichen J and Matz N. 2005. *Implications of the Clean Development Mechanism under the Kyoto Protocol on other Conventions: the Case of HFC-23 Destruction. elni Review*. 1: pp.41–52.

TEAP. 2007. *Report of the Task Force on HCFC Issues (with Particular Focus on the Impact of the Clean Development Mechanism) and Emission Reduction Benefits Arising from Earlier HCFC Phase-out and Other Practical Measures*. Response to decision XVIII/12. pp. 49–89, 111.

UNEP (United Nations Environment Programme). 2010. *Report of the Scientific Assessment Panel*. Executive Summary: Scientific Assessment of Ozone Depletion: 2010.

Wara M. 2006. *Measuring the Clean Development Mechanism's Performance and Potential*. Stanford: Program on Energy and Sustainable Development at the Center for Environmental Science and Policy, Stanford University.