

Q&A for CDM HFC-23 Incineration Projects

In response to a note in the press recently raising concerns regarding HFC-23 incineration/destruction CDM projects and the associated request to revise the existing rules for these projects¹ submitted earlier this year to the CDM Executive Board (EB) and the subsequent request by the EB for the CDM Methodology Panel to provide additional details on the topic, the World Bank has looked carefully at the issues and has conducted an analysis based on its experience in the sector, including two HFC-23 projects in China, and communicated with experts in the field. In this context, the following information offers some perspectives on HFC-23 CDM projects and provides answer to some of the allegations in circulation.

What are HCFC-22 and HFC-23?

HCFC-22 (chlorodifluoromethane or CHClF_2) is an industrial chemical used in the air-conditioning, refrigeration and foam sectors (referred to as 'emissive uses'). HCFC-22 is also used as a feedstock chemical in the production of material such as Poly-Tetra-Fluoro-ethylene (also sometimes referred to by one brand-name, "Teflon"). HCFC-22 production and consumption (excluding feedstock use) are controlled under the Montreal Protocol.

HFC-23 (trifluoromethane or CHF_3) is an inevitable by-product of HCFC-22 production. It is a potent greenhouse gas (GHG) with a 100 year global warming potential (GWP) of approximately 11,700 (IPCC 1995). HFC-23 emissions are controlled under the Kyoto Protocol.

How many HFC-23 incineration projects are registered with the Clean Development Mechanism (CDM)?

There are 19 registered HFC-23 incineration projects, of which 11 are in China, 5 are in India, and the other 3 are in Korea, Mexico and Argentina respectively. These projects destroy HFC-23 by incineration, generating GHG emission reductions, or 'carbon credits'.

What is driving the production of HFC-22?

HCFC-22 production and consumption in developing countries have significantly increased since the last decade for three reasons:

1) The rapid economic development in developing countries, especially at the domestic level, and the associated demand for air conditioning and refrigeration equipment²;

¹ Request for revision of the approved methodology *AM0001-Incineration of HFC23 waste streams (AM REV 0186)* submitted at the 44 meeting of the Meth Panel, http://cdm.unfccc.int/Panels/meth/meeting/10/044/mp44_an02.pdf.

² Diffusion of air conditioning in developing country had increased significantly over the past two decades, e.g. IEA reports that adoption of air conditioners by urban residents had increased from 8% in 1995 to 70% in 2004 (OECD/IEA, Energy efficiency of A/C in developing countries, 2007).

2) The phase-out by 2010 of chlorofluorocarbons (CFCs) as mandated under the **Montreal Protocol on Substances That Deplete the Ozone Layer**. These potent ozone-depleting substances were commonly used as refrigerants until they were phased out. Hydrochlorofluorocarbons (HCFCs) including HCFC-22 are transitional replacement gas to these phased-out gases; and

3) HCFC-22 production for feedstock uses (e.g. Teflon), which is not regulated.

HCFC-22 production has increased by 25% per year for emissive uses in developing countries^{3,4}, while HCFC-22 production associated with feedstock uses has increased by 5% worldwide⁵.

Are there production limits for claiming credits placed on these projects?

Yes, the approved methodology (AM0001) sets a cap on the annual amount of HCFC-22 production that can be credited based on a minimum of three continuous years of production between the beginning of the year 2000 and the end of the year 2004, further limited by the maximum yearly production achieved in that period. For the first crediting period, the 19 registered projects have a total maximum amount of HCFC-22 production set at 265 Kt⁶.

How do we know that CDM revenues from CDM HFC-23 incineration projects are not leading to overproduction of HCFC-22?

As mentioned above, the demand for HCFC-22 has grown significantly in developing countries over the last decade because of the demand in key sectors. Furthermore, there are two explanations that demonstrate that the CDM HFC-23 projects do not lead to HCFC-22 overproduction.

First, we can look at the proportion of the production of HCFC-22 associated with HFC-23 incineration/destruction projects. The 19 CDM projects amount to less than half of the production of HCFC-22 in developing countries⁷, meaning that production must be driven by something other than CDM revenues. If we look at China alone, where the majority of HFC-23 projects are located, the overall national production of HCFC-22 very significantly exceeds that of the CDM project unit. Clearly the CDM is not driving the demand for production.

Second, an overproduction would mean that more HCFC-22 is produced than consumed. If we look at China, the domestic consumption alone (not accounting for exports) would cover the annual HCFC-22

³ Montzka, S., Kuijpers, L., Battle, M.O., Aydin, M., Verhulst, K., Saltzman, E.S., Fahey, January 2010. *Recent increases in global HFC-23 emissions*. Geophysical Research Letters. Vol. 37. pp. 1-3.

⁴ Historical data on HCFCs production and consumption (emissive uses only) are publicly available at:

http://ozone.unep.org/Data_Reporting/Data_Access/index.shtml.

⁵ Montzka, S., Kuijpers, L., Battle, M.O., Aydin, M., Verhulst, K., Saltzman, E.S., Fahey, January 2010. *Recent increases in global HFC-23 emissions*. Geophysical Research Letters. Vol. 37. pp. 1-3.

⁶ Based on the information available in the Project Design Documents of the 19 HFC-23 registered CDM projects (available at www.UNFCCC.int)

⁷ HCFC-22 production in developing countries (excluding production feedstock) was estimated at about 530 Kt in 2008 (Campbell N., Werkema, T., 2009), while HCFC-22 production covered under the 19 HFCs CDM registered projects represents 265 Kt (UNFCCC.int).

production capacity of the 11 Chinese HFC-23 destruction CDM projects⁸. Also, volumes of produced HCFC-22 maintained on site are extremely low (3.7% on average, for the years 2008-2009) showing that the demand is real and there is little surplus.

Data on HCFC-22 production, consumption and volumes of stockpiles have been provided by China's Ministry of Environmental Protection (MEP). The reporting methodology includes verification of sale reports.

Are the HFC-23 facilities covered by CDM projects less efficient than plants not covered by CDM project?

One of the points raised is that the level of HFC-23 emissions per kg of HCFC-22 produced is larger for plants covered by CDM projects when compared to more recently built facilities, not eligible under CDM. This statement is refuted by scientific reports. In any case, under the approved CDM methodology, the quantity of HFC-23 emitted per ton of HCFC-22 produced is capped at a maximum ceiling of **3%**⁹ when calculating emissions, which is within the limit reported by the IPCC jointly with the TEAP¹⁰ and other reputable sources of scientific literature¹¹. (This means that any production over 3% is not eligible for carbon credits, so inefficiencies are not rewarded).

Moreover, the scientific research reports that HCFC-22 plants **not covered by CDM Projects are less efficient** in both developed and developing countries: the average HFC-23/HCFC-22 ratio for non-CDM projects is on average **3.7 ±0.3%**¹². This includes newer facilities in developing countries.

Are the current rules creating perverse incentives such as artificially increasing HCFC-22 production?

No, as presented in the above paragraphs, the current rules set the ratio for HFC-23/HCFC-22 in CDM projects at values consistent with or below the values reported by reputable bodies and scientific literature. HCFC-22 production has been driven by the growth in the air-conditioning and refrigeration sectors in developing countries. The production has increased over the last decade by 25%/year on average in developing countries. The growth has continued in spite of the financial crisis, but at lower pace (e.g., 11% in China in 2008). In spite of the crisis, the demand for HCFC-22 has remained high above the production capacity of the 19 CDM projects.

The analysis conducted by CDM Watch points out that the production of a plant at its HCFC-22 cap (as set under the approved methodology for the crediting period) is suspicious. However, when carefully analyzing and comparing the cap value and technical capacity of plants (as reported in the project design

⁸ Domestic consumption of HCFC-22 was 199.6 Kt in 2008 while the maximum eligible production covered by the domestic CDM projects represents 208 Kt of HCFC-22.

⁹ 0.03 tones of HFC-23 produced per 1 tones of HCFC-22 is the maximum allowed as per the approved methodology AM001 available at UNFCCC.int. In fact, the ratio is sets for the crediting period at the lowest value between 3% or the minimum rate obtained between 2000 and 2004.

¹⁰ IPCC/TEAP. 2005. Special Report: Safeguarding the Ozone Layer and the Global Climate System

¹¹ Montzka, S., Kuijpers, L., Battle, M.O., Aydin, M., Verhulst, K., Saltzman, E.S., Fahey, January 2010. *Recent increases in global HFC-23 emissions*. Geophysical Research Letters. Vol. 37. pp. 1-3.

¹² ibid

documents of registered CDM projects), it is clear that plants have in fact operated closer to their capacity production. The fact that most HFC-23 CDM plants have a HCFC-22 cap set at their technical capacity have not been reported by CDM Watch.

Lack of evidence for perverse incentives of HFC-23 projects: The analysis conducted by CDM Watch¹³ is based on a narrow and simplistic approach drawing from selected parameters extracted from PDD and monitoring reports. Key parameters have been discarded from the analysis, such as operating conditions and technical capacity. There is not sufficient evidence to support the allegations.

Concerning the issue of the high revenues associated with HFC-23 incineration projects, it is first important to point out that revenues from CDM do not exceed the revenues associated with HCFC-22 itself¹⁴. Moreover, in China, where the majority of the projects are located, the government has established a Clean Development Mechanism Fund to use the income from the sale of CERs. The government taxes 65 % of the CER revenues and transfers this to the China Clean Development Mechanism Fund¹⁵ for reinvestment in climate change activities.

Are the HFC-23 incineration projects additional?

Yes, HFC-23 incineration projects are additional because there is currently no international agreement, national policies or regulations in developing countries that mandate the destruction of HFC-23. CDM revenues are the only financial resource available to developing countries to cover the incremental costs for the destruction of HFC-23 from HCFC-22 production in facilities.

HFC-23 is an unavoidable by-product of HCFC-22 production, which is released into the atmosphere under the current common practices in developing countries. The 19 plants that have registered CDM projects have implemented high efficiency destruction technology leading to significant GHG emissions avoidance. However, the CDM projects cover only about half of the HCFC-22 production in developing countries and thus scientists report increasing HFC-23 concentrations in the atmosphere¹⁶.

Does the HCFCs phase-out mandated under the Montreal Protocol have an immediate effect on the HCFC-22 production?

No, in developing countries the phase-out will begin in 2015 and will be completed by 2030. More importantly, the Montreal Protocol on substances that erode the Ozone Layer does not restrict HCFC-22 production for feedstock uses, a growing area of consumption due to the increasing demand for products using HCFC-22 (e.g. Teflon).

¹³ Analysis prepare by CDM Watch and presented in the request for review of the approved CDM Methodology, available at : http://cdm.unfccc.int/Panels/meth/meeting/10/044/mp44_an02.pdf

¹⁴ SURVEY REPORT ON HCFCS PRODUCTION IN CHINA (draft). Completed in order to develop phase-out and management strategy for HCFCS productions under the Montreal Protocol. March 2010.

¹⁵ See attached MOU between People's Republic of China and the International Bank for Reconstruction and Development, dated December 19, 2005

¹⁶ Montzka, S., Kuijpers, L., Battle, M.O., Aydin, M., Verhulst, K., Saltzman, E.S., Fahey, January 2010. *Recent increases in global HFC-23 emissions*. Geophysical Research Letters. Vol. 37. pp. 1-3.

Contrarily to the misleading allegation made by CDM Watch, the Montreal Protocol Parties have NOT identified the facilities likely to be targeted for early phase-out as those registered under the CDM for HFC-23 destruction. In fact, the modalities for the phase-out of HCFCs are still being discussed and no agreement has yet been reached by the Parties¹⁷.

Should the HFC-23 incineration methodology be put on hold?

The HFC-23 incineration methodology should not be put on hold because all the 19 registered HFC-23 CDM projects were operating strictly under the CDM modalities and procedures¹⁸. There are no reasons to justify such action.

Also, because of the significant impact of HFC-23 destruction projects on the global effort to reduce greenhouse gases, it is not advisable to put this methodology on hold before an international agreement is reached and a financial mechanism is available for developing countries to cover the additional costs for the destruction of HFC-23. These include capital costs and operational costs associated with the collection and destruction of HFC-23 emissions generated as a by-product in HCFC-22 production.

The regulation of production of hydrofluorocarbons (HFCs) is currently under consideration by the Parties to the Montreal Protocol, but this explicitly excludes CDM projects, which are regulated by the UN Framework Convention on Climate Change.

Should the HFC-23 destruction methodology be revised?

The World Bank encourages technically sound revisions of approved CDM methodologies. Regarding the proposed requests to review the approved methodology, the World Bank has the following remarks:

- 1) To ensure that the proposed revisions take into account sector realities, it is crucial to seek the advice of industry and sector experts on the issues related to the production of HCFC-22, such as the members of the Technology and Economic Assessment Panel (TEAP)¹⁹ which provides technical expertise to the Montreal Protocol Parties. This is also the advice emerging from the Executive Board of the CDM.
- 2) As per paragraphs 45 - 48 of the **Modalities and procedures for a CDM under the Marrakesh Accords** (FCCC/CP/2001/13/Add.2), the revision to the approved methodology would need to consider host country policies, practices and the limitations of the respective technology adopted by the host country.

¹⁷ Refer to paragraph 115 of the report of the 61th Meeting of the Executive Committee for the Implementation of the Montreal Protocol (July 2010).

¹⁸ The verification reports and certification reports, which are listed at the website of <http://cdm.unfccc.int>, provided by the authorized third party verifiers (DEOs).

¹⁹For more information on the TEAP refer to: http://www.unep.ch/ozone/Assessment_Panels/TEAP/index.shtml