CDM: Form for submission of requests for revisions of approved methodologies to the Methodologies Panel (version 01) ***(To be used by project participants, through the DOE/AE, for requesting revisions of approved methodologies)***	
Name of the entity (DOE) submitting this form	-
***Reference number** and **title** of the approved methodologies*	AM0001 – Incineration of HFC23 waste streams
Title/Subject (give a short title or specify the subject of your submission, maximum 200 characters):	Revision to AM0001 to address methodological issues
*Attach proposed **revised approved methodology** (with revisions in track change mode):*	☒ Yes, is attached.
*Attach **draft CDM-PDD** example of project activity:*	☒ Yes, is attached.
Date and signature for the DOE	-
Submitted request for revisions Please use the space below to substantiate the reason for the request for revisions of the approval methodology. If the request for revision is related to a project activity under development or implementation, please describe the context in which they arose. If you are proposing amendments to existing methodologies, please specify the text you want to change or introduce. If necessary, attach files or refer to sources of relevant information.	
If you propose an amendment to an approved methodology, please provide reasons.	

This request aims to address a number of methodological issues in the current version of AM0001. The request proposes to address the following four issues:

1) **Adequacy of the HFC-23/HCFC-22 ratio used for emission reduction calculations.** The current version of the methodology implicitly assumes that the plants would continue to operate during all crediting periods (i.e. up to 2030) at or above a historically observed HFC-23/HCFC-22 ratio. In contrast to more recently approved methodologies, the current version of AM0001 assumes that no autonomous technological improvement in the HFC-23/HCFC-22 ratio would take place over time. However, a detailed evaluation of data from registered projects shows now that this assumption is problematic and that the methodology should be revised in this respect. The data shows that (a) several plants achieved low HFC-23/HCFC-22 ratios without incentives from the CDM; (b) most plants are operated just slightly above the cut-off HFC-23/HCFC-22 ratio established in the PDD; (c) two plants were operated at significantly lower HFC-23/HCFC-22 ratios than the cut-off rate during periods in which no CERs could be claimed, while the HFC-23/HCFC-22 ratio was above the cut-off value during periods when CERs can be generated; and (d) the HFC-23/HCFC-22 ratio decreased over time. Altogether, this provides strong evidence that the plants would – without the incentives from the CDM – likely operate at a lower HFC-23/HCFC-22 ratio than they actually do.
2) **Adequacy of the cap on historical HCFC-22 production.** The current methodology contains a cap on HCFC-22 production eligible for crediting. This cap aims to prevent perverse incentives that, as a result of the incentives from the CDM, more HCFC-22 is produced than would be produced without the CDM. An evaluation of data from registered projects questions whether the cap is effective, for the following reasons: (a) Two plants produced during several years less HFCF-22 than can be credited. These plants could have increased their production just for the purpose of gaining CDM credits. (b) The amount of HCFC-22 produced in a year of the crediting period very frequently just matches or exceeds the amount eligible for crediting. (c) Some plants heavily reduced or even stopped their HCFC-22 production once the amount of HCFC-22 that is eligible for crediting was reached and started production again when the new crediting year started. In addition, the price of HCFC-22 dropped in China, the most important market, to a historical low in 2008. Apparently, the production pattern of HCFC-22 plants is strongly driven by the possibility go gain CERs. This suggests that some plants would likely have produced less HCFC-22 without the economic incentives from the CDM. This shows that the current cap is not effective in preventing perverse incentives that can result from the CDM.
3) **Implications of the new agreement under the Montreal Protocol.** In 2007, Parties to the Montreal Protocol agreed to significantly accelerate the phase out of HCFCs. As a result of this accelerated phase out, demand for HCFC-22 may decline in the future. In this case, the cap on HCFC-22 production introduced in the methodology will not fulfil anymore its objective of avoiding perverse incentives. Therefore, a new approach is required to avoid perverse incentives that more HCFC-22 is produced under the project activity than would have been produced in the baseline.
4) **Lifetime of existing facilities.** The methodology implicitly assumes that the plants can continue to operate without any time limitation. However, it is possible that a HCFC-22 production plant would have been shut down at a certain point in time but that its operation is prolonged due to the possibility of CDM crediting. Given that new plants can so far not be credited under the CDM, the operators would loose a significant amount of revenues if the operation of an existing plant would be stopped. This may result in continued operation of less efficient old plants with potentially higher HFC-23/HCFC-22 ratios, whereas these plants may, in the absence of the CDM, be replaced by new production facilities with potentially lower HFC-23/HCFC-22 ratios.

This request addresses all four issues by introducing a lower cap on the HFC-23/HCFC-22 ratio used to calculate emission reductions. It further includes other improvements to the methodology. Most or all HCFC-22 production plants eligible under AM0001 have been registered by now. However, the methodology would apply to registered projects at their renewal of the crediting period and address these issues for subsequent crediting periods. The detailed rationale of the revision request is provided in the Annex of this document (because it is difficult to put longer text and figures in this form). A draft AM and an example CDM-PDD are attached, as required.

If you have a request for revision, please specify and provide reference to the exact methodology to which it applies.	
Version 5.2 of AM0001	
In case you propose the amendment to the approved methodologies, please provide your draft below, if not included in an annex:	
Revisions are illustrated in the draft revised methodology attached to this request.	
Information to be completed by the secretariat	
Date when the form was received at UNFCCC secretariat	
Date of transmission to the Meth Panel and Executive Board	

Annex

Detailed explanation of the revision request

1) Adequacy of the HFC-23/HCFC-22 ratio used for emission reduction calculations

A key parameter for the calculation of emission reductions is the quantity of HFC-23 that would be generated in the baseline per quantity of HCFC-22 produced (the HFC-23/HCFC-22 ratio). AM0001 requires using the lower value between 3% and the lowest annual HFC-23/HCFC-22 ratio observed in a three year historical period between 2000 and 2004. In the absence of historical data, a default value of 1.5% shall be used.

The current version of the methodology implicitly assumes that the plants would continue to operate during all crediting periods (i.e. up to 2030) at or above a historically observed HFC-23/HCFC-22 ratio. In contrast to more recently approved methodologies, the current version of AM0001 assumes that no autonomous technological improvement would take place over time. However, a detailed evaluation of data from registered projects shows now that this assumption is problematic and that the methodology should be revised in this respect. Evidence from registered projects and information from literature suggests that the plants would – without the incentives from the CDM – likely operate at a lower HFC-23/HCFC-22 ratio than they actually do. This is explained in detail in the following.

Our quantitative evaluation is based on information reported in PDDs and monitoring reports. The analysis covers 19 registered projects of which 17 have issued CERs by 10 February 2010 and 163 monitoring reports which contained information on HFC-23 generation and HCFC-22 production and for which CERs were issued by 10 February 2010.

Our evaluation revealed the following findings:

a) Some plants achieved already quite low HFC-23/HCFC-22 ratios between 2000 and 2004
b) Most plants are operated exactly at or just above the cut-off HFC-23/HCFC-22 ratio established in the PDD
c) Plants are operated at a significantly lower HFC-23/HCFC-22 ratio during periods when no CERs can be claimed compared to periods when CERs can be generated
d) The HFC-23/HCFC-22 ratio does not seem constant but apparently tends to decrease over time

These findings are illustrated in the following in more detail.

a) Some plants achieved already quite low HFC-23/HCFC-22 ratios between 2002 and 2004

The HFC-23/HCFC-22 ratio varies significantly among plants. 18 out 19 projects document the historical HFC-23/HCFC-22 ratios in their PDDs. The historical values documented in PDDs for the period 2000 to 2004 vary between 1.64% (project 1105 in 2003) and 5.44% (project 0193 in 2003). The weighted average historical HFC-23/HCFC-22 rate for all 18 projects and all years was 3.21%, the mean 3.15%. This shows that the IPCC default value of 3%, which is used in the methodology as a cut-off value,

represents a reasonable average estimate but that the variations among plants are considerable. Apparently, some plants managed to reduce the HFC-23/HCFC-22 significantly without any incentives from the CDM or any forms of regulations. For example:

- the Changshu Haike plant in China (UNFCCC Reference number 1105) operated at a ratio of 1.87% in 2002, 1.64 % in 2003 and 1.84% in 2004;
- the Shandong Dongyue plant in China (UNFCCC Reference number 232) operated at a ratio of 2.59% in 2002, 2.47% in 2003 and 2.37% in 2004;
- the Quimobásicos plant in Mexico (UNFCCC Reference number 151) operated at a ratio of 2.46% in 2002, 2.53% in 2003 and 2.44% in 2004.

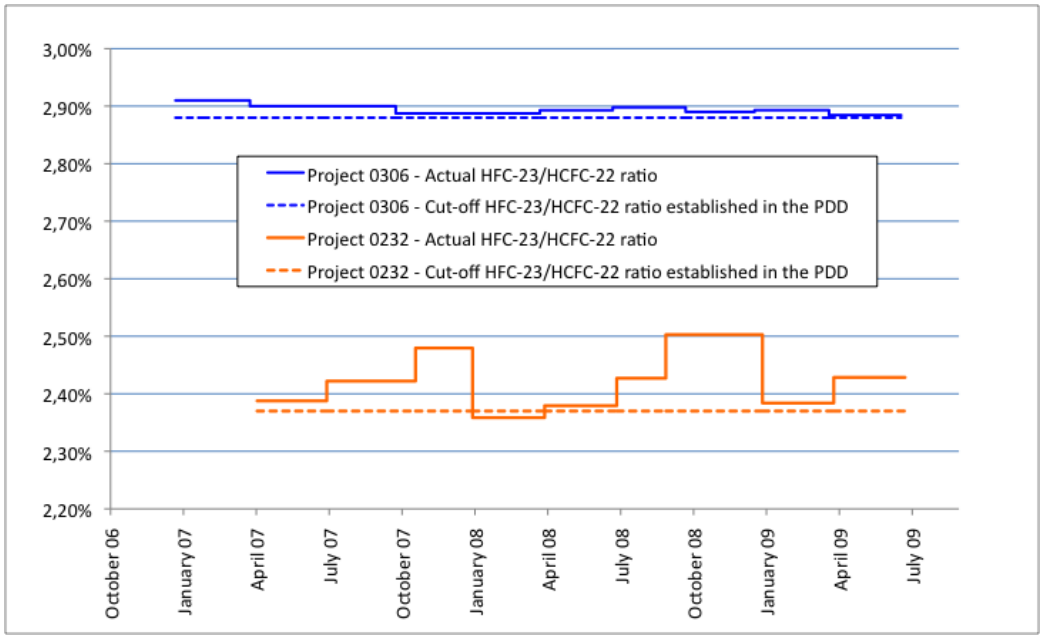
This illustrates that significantly lower HFC-23/HCFC-22 ratios than the default value of 3% have been achieved in the past without any incentives from the CDM. Indeed, McCulloch and Lindley (2007) explain that "significant reduction in HFC-23 formation can be achieved by adjusting process operating conditions". The fact that the HFC-23/HCFC-22 ratio varies considerably among plants and that some plants achieved significantly lower values than others questions to what extent historical data is a reliable proxy for how the plants would be operated in the future, in particular if the historical data is not only used for one crediting period but for three crediting periods.

b) Most plants are operated exactly at or just above the cut-off HFC-23/HCFC-22 ratio established in the PDD

The monitoring reports of all registered projects were evaluated to assess at which HFC-23/HCFC-22 ratios the plants are operated. This includes 17 projects for which CERs were issued 10 February 2010. The evaluation revealed the following:

Whereas the HFC-23/HCFC-22 ratio varied for many projects significantly in the historical period between 2000 and 2004, many plants operate during the crediting period at relatively constant HFC-23/HCFC-22 ratios. Most plants operate in a manner that the cut-off HFC-23/HCFC-22 ratio established in the PDD is always just met or slightly exceeded. Figure shows this for the two plant (projects 0232 and 0306). A very similar plant operation can be observed in the case of the projects 11, 193, 232, 306, 549, 550, 767, 807, 838, 868 and 1194. A possible explanation is that the plants are intentionally operated in a manner that ensures that the cut-off value established in the PDD is always exceeded. Such a behaviour would be economically rationale, as the CDM provides very strong economic incentives not to lower the HFC-23/HCFC-22 ratio below the cut-off value. This suggests that most plant operators are aware of the strong economic incentives from the CDM to keep the HFC-23/HCFC-22 ratio above the maximum value established in the PDD. It would be statistically very unlikely that all these plants operate by chance at a HFC-23/HCFC-22 ratio just above the cut-off value, given that the variation in the HFC-23/HCFC-22 rate over time was for most plants much larger in the period from 2000 to 2004.

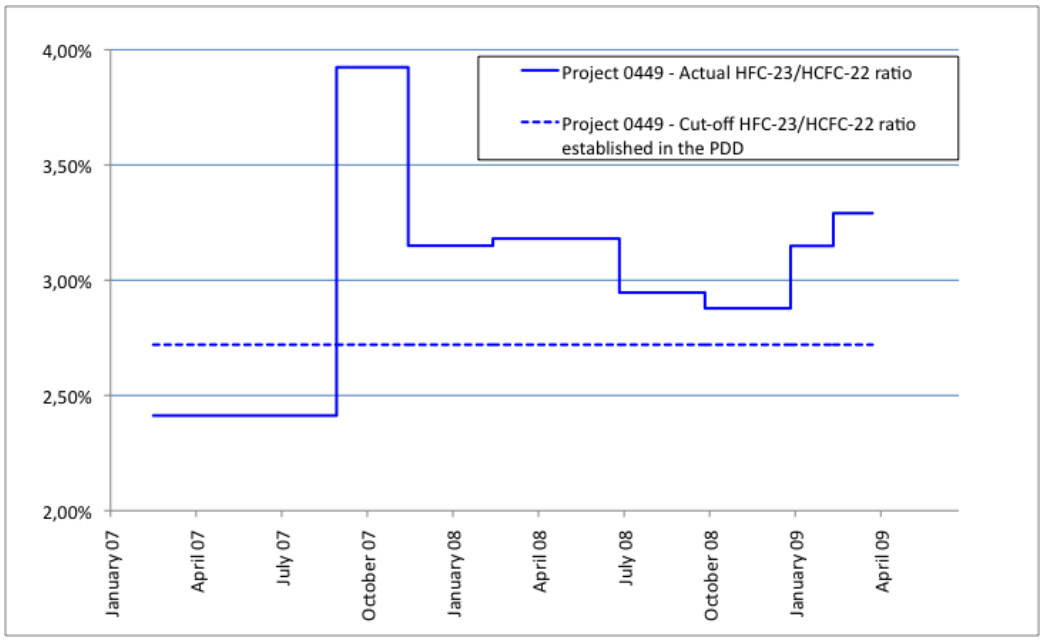
Figure 1: HFC-23/HCFC-22 ratio during the crediting period for projects 0232 and 0306



In the case of few other plants, the HFC-23/HCFC-22 ratio is more variable. For these plants the HFC-23/HCFC-22 ratio is sometimes above and sometimes below the cut-off value established in the PDD. This applies to projects 1, 3 and 115. A possible explanation is that these project participants are not aware of the economic incentives from the CDM to operate the plant at a higher HFC-23/HCFC-22 ratio or that they do not wish to intentionally increase their HFC-23 emissions in order to maximize their CER revenues.

One plant (project 449) operated during its first monitoring report at a lower HFC-23/HCFC-22 ratio than the cut-off value established in the PDD and increased during all subsequent monitoring reports its HFC-23/HCFC-22 ratio above the cut-off value established in the PDD. This is shown in Figure 2. This raises the question whether these project participants initially achieved lower HFC-23/HCFC-22 ratios than established in the PDD but then got aware of the strong economic incentives from the CDM and intentionally increased the HFC-23/HCFC-22 ratio in subsequent monitoring periods.

Figure 2: HFC-23/HCFC-22 ratio during the crediting period for project 449

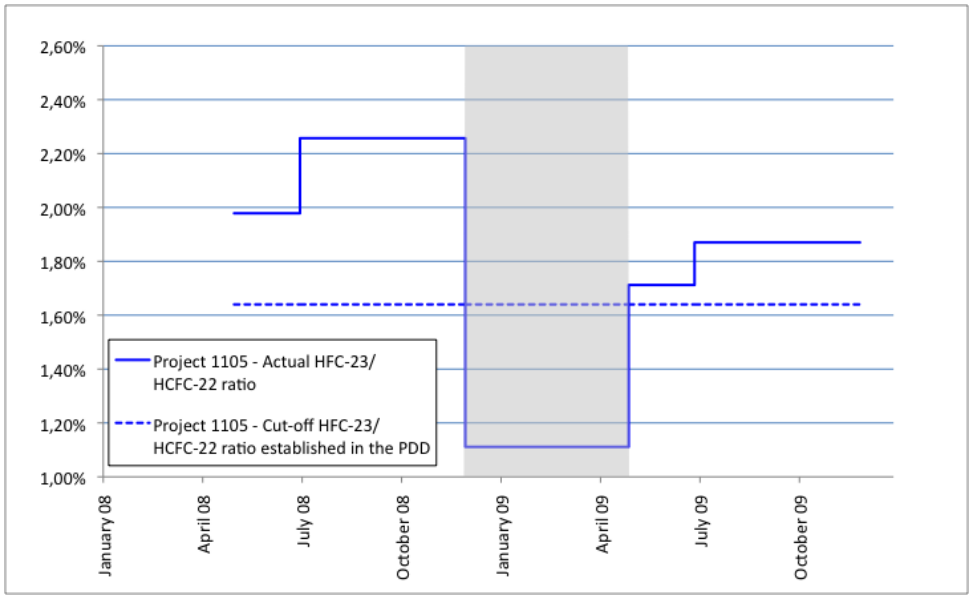


c) Plants are operated at a significantly lower HFC-23/HCFC-22 ratio during periods when no CERs can be claimed compared to periods when CERs can be generated

The most interesting result from the evaluation of data from registered projects is an assessment of the few monitoring periods where project participants could not claim CERs. In the case of two out of 162 monitoring reports no CERs were issued for the entire monitoring period because the maximum eligible amount of HCFC-22 production for that year was already reached by the plant in the previous monitoring period. During these monitoring periods, the project participants could not claim CERs – whatever the HFC-23/HCFC-22 ratio. Thus, during these periods the CDM did not provide any incentives to operate the plant in any particular manner.

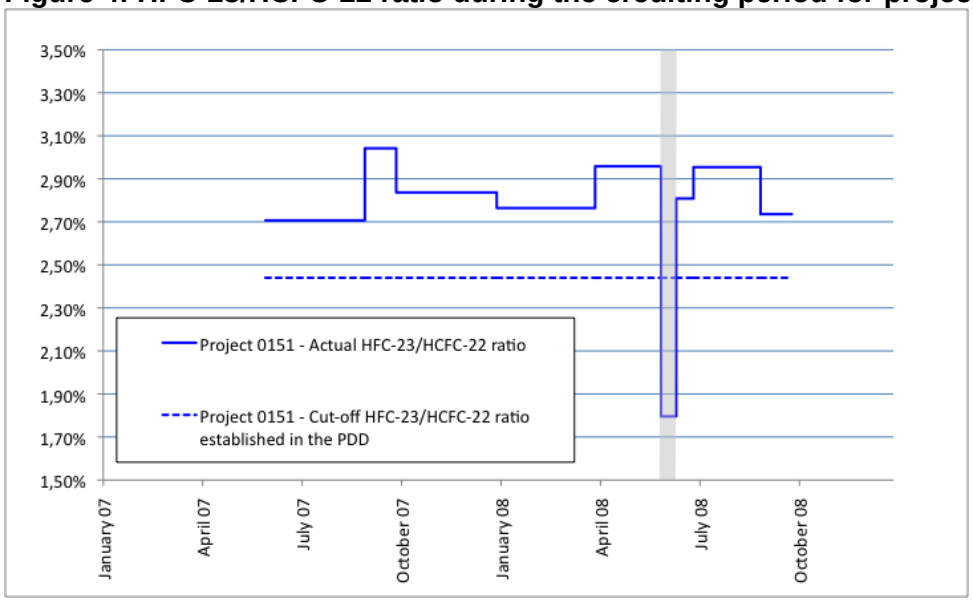
Figure 3 and Figure 4 show the HFC-23/HCFC-22 ratio over time for the two projects which faced this situation (projects 0151 and 1105). The periods in which no CERs could be claimed are marked in grey. The figures show that in both cases the plants were operated during these periods at a significantly lower HFC-23/HCFC-22 ratio than during the periods when CERs could be claimed. In both cases, the HFC-23/HCFC-22 is in the periods in which no CERs could be claimed significantly below the cut-off HFC-23/HCFC-22 ratio established in the PDD. This provides strong evidence that it is likely that the plants would in the absence of the incentives from the CDM be operated at significantly lower HFC-23/HCFC-22 ratios than the cut-off ratio established in the PDD. Apparently, the CDM provides perverse incentives to operate the plants at artificially high HFC-23/HCFC-22 ratios in order to generate more CERs. The fact that most plants operate just at or slightly above the cut-off HFC-23/HCFC-22 ratio established in the PDD, as shown above under b), supports this explanation.

Figure 3: HFC-23/HCFC-22 ratio during the crediting period for project 1105[1]



[1] The last monitoring report has been uploaded at the UNFCCC website but CERs have not yet been issued.

Figure 4: HFC-23/HCFC-22 ratio during the crediting period for project 0151

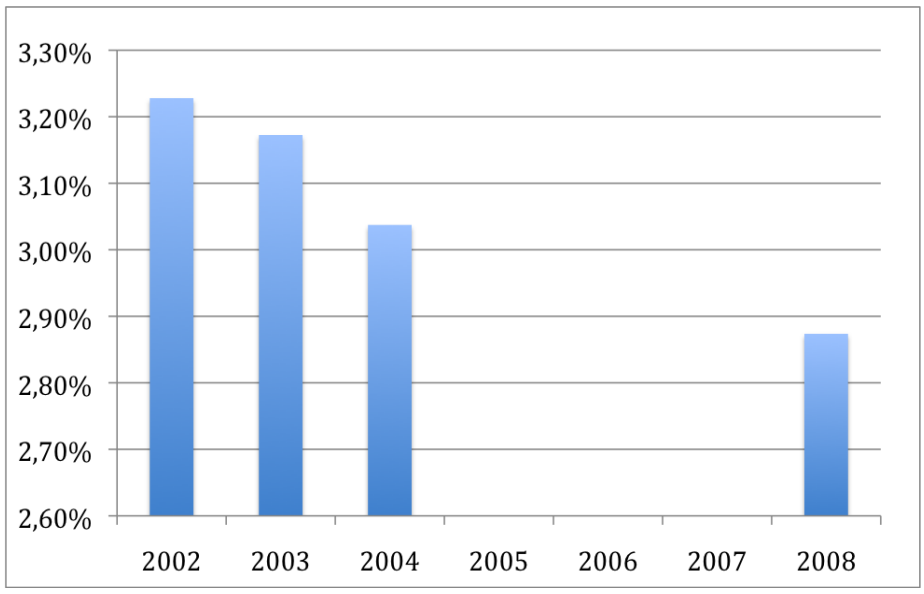


d) The HFC-23/HCFC-22 ratio tends to decrease over time

As highlighted above, the current version of the methodology assumes that the historical HFC-23/HCFC-22 ratio observed in the period 2000 to 2004 would continue for up to 21 years (i.e. up to 2030 for some projects). In contrast to more recently approved methodologies, the current version of AM0001 does not consider autonomous technological improvement in a key parameter to estimate emission reductions.

However, data from registered projects suggests that it is very well possible that the HFC-23/HCFC-22 ratio would in the baseline scenario decrease over time. Figure 5 below shows the weighted average HFC-23/HCFC-22 ratio of all projects that reported historical ratios for the years 2002, 2003 and 2004 and that have issued CERs in the year 2008. This includes 12 out of 19 registered projects. The figure shows that the weighted average HFC-23/HCFC-22 ratio decreased over time.[2]

Figure 5: Average weighted HFC-23/HCFC-22 ratio



[2] The weighted average was weighted by the plant size which was approximated through the eligible amount of HCFC-22 for crediting. Due to the limited number of projects and a strong variation in the HFC-23/HCFC-22 ratio between projects this trend is not as apparent as it may appear in the figure. For example, the *mean* from all projects (instead of the weighted average) shows overall a similar trend which, however, is less pronounced.

Conclusions on the adequacy of the HFC-23/HCFC-22 ratio

An evaluation of data from registered projects shows that the current approach of using a fixed cap on the HFC-23/HCFC-22 ratio based on historical data from 2000 to 2004 is problematic and not conservative. The available data suggests that it is likely that some plants would operate at a lower HFC-23/HCFC-22 ratio in the absence of the CDM. Data from monitoring reports shows that most plants are operated just slightly above the cut-off HFC-23/HCFC-22 ratio established in the PDD. Moreover, two plants were operated at significantly lower HFC-23/HCFC-22 ratios than the cut-off rate during periods in which no CERs could be claimed, while the HFC-23/HCFC-22 ratio was above the cut-off value during periods where CERs can be generated. Finally, the available data indicates that the HFC-23/HCFC-22 ratio decreased over time, whereas the methodology assumes that it would stay constant for all crediting periods. Altogether, this provides strong evidence that the current approach provides perverse incentives to operate plants at an artificially high HFC-23/HCFC-22 ratio in order maximize CER revenues.

To address this issue, a HFC-23/HCFC-22 ratio should be used in the calculation of emission reductions. Given that one plant operated at a HFC-23/HCFC-22 ratio of 1.1% during a period when no CERs could be claimed (while the HFC-23/HCFC-22 ratio was significantly higher during periods when CERs could be generated), the maximum HFC-23/HCFC-22 ratio used in the calculations should not exceed 1%. Potentially, a lower value should be used, given that further improvements in the HFC-23/HCFC-22 may occur in the future. For this reason and for other reasons, explained in the next sections, we propose to use an even lower value.

2) Adequacy of the cap on historical HCFC-22 production

The current version of the methodology introduced a cap on the amount of HCFC-22 production for which HFC-23 destruction can be credited. The cap is based on the maximum historical HCFC-22 production in the most recent three years within the period from 2000 and 2004, including an equivalent amount of CFC production. The cap aims to prevent perverse incentives that, as a result of the incentives from the CDM, more HCFC-22 is produced than would be produced without the CDM. In addressing this objective, the methodology implicitly assumes that HCFC-22 production (including an equivalent CFC production) will in the absence of the CDM stay at historical levels or grow but not drop below historical levels.

The evaluation of data from registered projects questions whether the potential perverse incentives are avoided through the cap. Table 1 illustrates the actual HCFC-22 production during the first years of the crediting period in relation to the maximum eligible amount of HCFC-22 production for which HFC-23 destruction can be credited.

Table 1: Actual HCFC-22 production during the crediting period in relation to the maximum eligible amount of HCFC-22 production

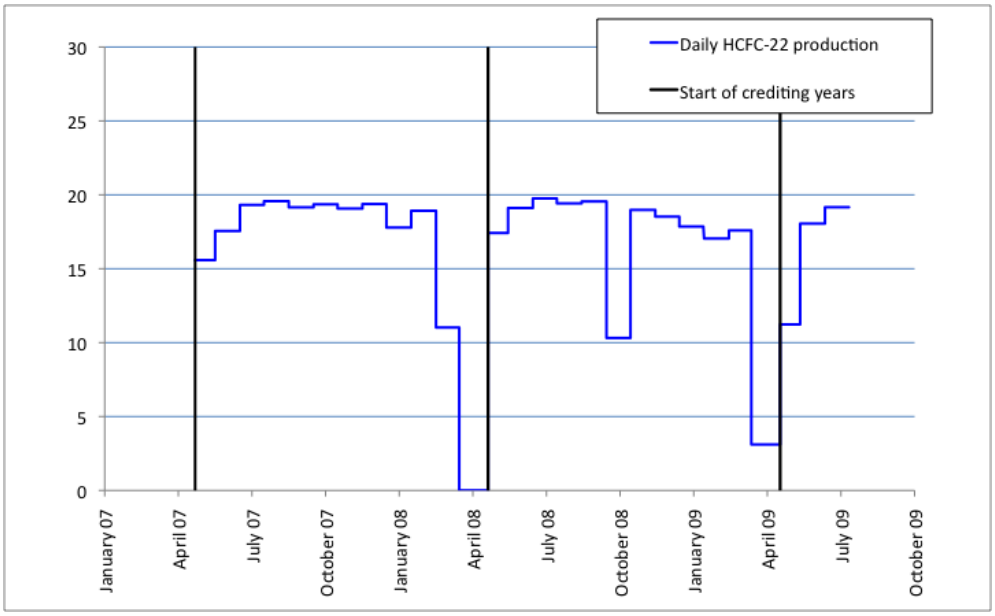
Project	Year 1	Year 2	Year 3	Year 4	Year 5
11	109%	110%	106%		
115	72%	94%	96%	100%	101%
151	100%	101%	107%		
193	105%	102%	104%		
232	102%	101%	101%		
306	125%	120%			
499	101%	99%			
549	101%	113%	159%		
550	100%	109%	119%		
767	101%	101%			
807	69%	94%			
838	101%	103%			
868	105%	109%			
1105	148%				
1194	100%	101%			

Source: Project Design Documents (PDDs) and monitoring reports published at the UNFCCC website

The data shows the following:

1. Two plants (projects 115 and 807) produced during several years less HFCF-22 than can be credited. This means that the implicit assumption that production of HCFC-22 will always be above historical levels appears not adequate. These project participants could have increased their production, if technically feasible, to the eligible amount (100%) and could have even vented the HCFC-22, given that CER revenues are usually higher than HCFC-22 production costs. These project participants may not have wished to intentionally increase their HCFC-22 production in order to maximize their profit or they may not have been aware of the strong economic incentives from the CDM to do so. However, they could have done so – the cap would not have been effective in preventing this.
2. The amount of HCFC-22 produced in a year of the crediting period very frequently just matches or exceeds the amount eligible for crediting (the number is 100% or few percentages above 100%). This shows that a number of plants are constantly producing each year the amount of HCFC-22 which is eligible for crediting. It is very unlikely that such behaviour could be observed by chance. Apparently, the amount of HCFC-22 produced is in the case of several plants determined by the CDM rules and not by other factors, such as market demand.
3. Some plants heavily reduced or even stopped their HCFC-22 production once the amount of HCFC-22 that is eligible for crediting was reached and started production again when the new crediting year started. This is illustrated for the project 767 in Figure 6 below. The plant had a relatively constant HCFC-22 production of about 15-20 tons per day until the HCFC-22 amount eligible for crediting was reached. From that point onwards, the production was reduced or the plant was even shut down (in April 2008). Production was then taken up again with the first day of the next year of the crediting period (1 May of each year). Apparently, the plant operators had no incentives to produce HCFC-22 during times where no CERs could be gained from generating and destroying HFC-23. This questions whether all of the HCFC-22 produced by the plant is produced for the market or whether a lower amount of HCFC-22 would have been produced in the absence of the CDM.

Figure 6: Daily HCFC-22 production during the crediting period for project 767 (tons per day)



The development of the price for HCFC-22 in China, the most important market for HCFC-22, is another indicator that the production of HCFC-22 could be driven by CDM rules. According to the CHEAA appliance magazine (2009), the price dropped in 2008 from 15,000 RMB/ton to 8000 RMB/ton, the lowest price in history. Apparently, this price drop can only partly be explained through normal market effects, such as seasonal variations. The magazine reports that the prices for raw materials, such as chloroform and hydrogen fluoride increased which increased the production costs. According to the magazine, two

factories stated that the production was not profitable at all with the low prices. Although market prices are driven by many factors, this information suggests that the CDM may have been an important factor for the prices of HCFC-22.

In conclusion, the evaluation of data from registered projects suggests that the production pattern of HCFC-22 plants is strongly driven by the possibility go gain CERs. Several plants produced over several years an amount of HCFC-22 which just meets or very slightly exceeds the amount of HCFC-22 for which HFC-23 destruction can be credited. The production patterns suggest that some plants would likely have produced less HCFC-22 without the economic incentives from the CDM. This shows that the current cap is not effective in preventing perverse incentives that can result from the CDM.

3) Implications of the new agreement under the Montreal Protocol

In September 2007, Parties under the Montreal Protocol agreed to accelerate the phase-out of HCFCs in both developed and developing countries. The new phase-out schedule for developing countries is illustrated in the Table below. For developing countries, the base year is now the average of 2009 and 2010, whereas previously the base year was 2015. A freeze is already envisaged by 2013 and a 10% decrease below the base year level is required by 2015. By 2025, the production for emissive uses will have been reduced by about two thirds below 2009 / 2010 levels.

Table 1: Time schedule for phasing out HCFCs in developing countries under the Montreal Protocol

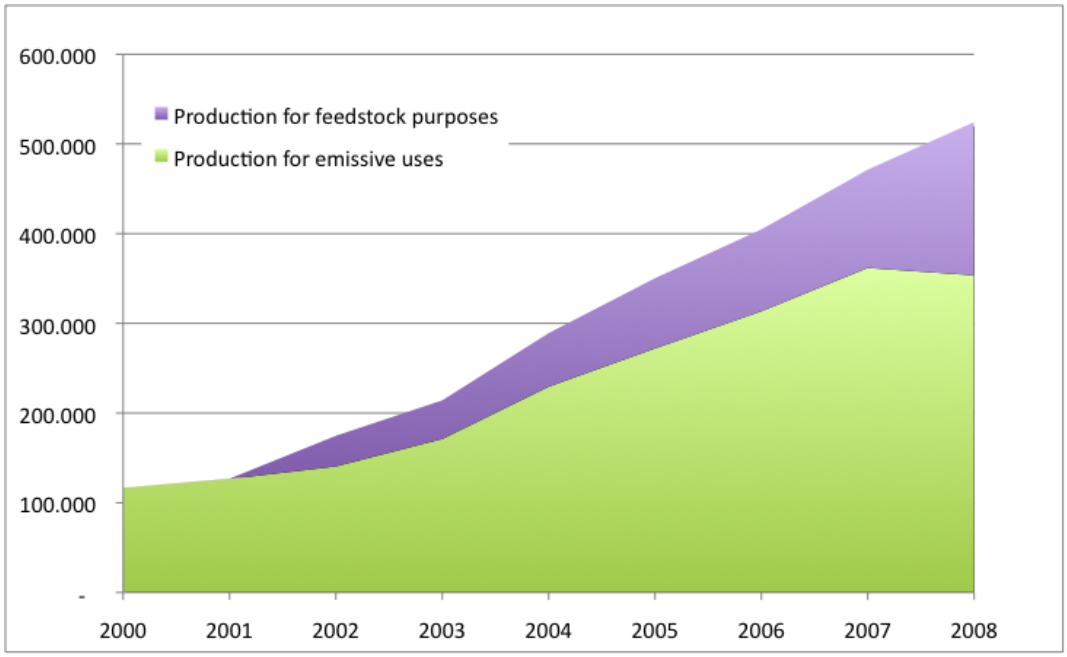
	Current agreement	Previous agreement
Base year	2009 / 2010	2015
Freeze	2013	2016
10% reduction	2015	-
35% reduction	2020	-
67.5% reduction	2025	-
97.5% reduction	2030	-
100% reduction	2040	2040

Historic trends of HCFC-22 production

Over the past decade, the production of HCFC-22 has grown rapidly in developing countries due to various factors, including high economic growth in China and production shifts from Annex I to non-Annex I countries. With the new agreement under the Montreal Protocol, these growth rates are expected to slow down and will reverse. Parties to the Montreal Protocol may start early to implement policies and measures to facilitate the implementation of the earlier phase out and significant funding will be provided for this purpose under the Multilateral Fund.

Figure 7 below shows the HCFC-22 production for emissive uses in developing countries from 2000 to 2008. The figure shows a strong increase in production from 2000 to 2007. The production then peaked in 2007 and decreased from 2007 to 2008, although the new agreement requires stabilization only by 2013. The strong increase is mainly driven by the replacement of CFCs by HCFCs and economic growth. The reduction after 2007 can be explained with two reasons: firstly, some countries, such as China, already completed to a large extent the phase out of CFCs in 2007 and secondly several manufacturers already started to switch from HFCFs to HFCs. This development is partly driven by the ban on imports of HCFC-22 refrigeration appliances in the US from 1 January 2010.

Figure 7: HCFC-22 production in developing countries (tons)



Source: UNEP Ozone Secretariat

In contrast to production for emissive uses, production for feedstock purposes is not regulated under the Montreal Protocol and thus not limited. The figure shows that production has grown significantly, with an extraordinary growth from 2007 to 2008 which compensated the reduction in production for emissive uses.

Future HCFC-22 production

The development of future HCFC-22 production in developing countries is uncertain. Several aspects have to be taken into account:

- The recent ban on the import of HCFC-22 appliances in the US will impact the production of HCFC-22 in China in the years 2009 and 2010 – the base years for the accelerated phase out under the Montreal Protocol. It is possible that the production for emissive uses will further decrease in 2009 and 2010.
- Similarly, the financial crisis could have significant implications for the HCFC-22 production in 2009 and 2010 and thus impact the future phase-out path.
- In the past, agreed phase-out schedules under the Montreal Protocol were often implemented earlier than required. For example, several developing countries phased out CFCs earlier than required under the Montreal Protocol. It is possible that the phase-out of HCFC-22 production would occur faster than required under the Protocol – if CDM incentives do not prevent this development.
- The strong growth in production in feedstock purposes in recent years can not be easily explained. Demand for feedstock applications is expected to grow. However, generally lower growth rates were expected. McCulloch and Lindley (2007) report that HCFC-22 demand for feedstock purposes in China was 20.3 kt in 2001. They further state that a linear growth rate of 4.1 kt was observed over six years and that “there is every reason to expect that this demand will continue to grow and there is no evidence to predict a change in the growth rate”. The enormous growth from 2007 to 2008 is difficult to explain. This grows falls in the period where most CDM projects started to receive CERs. Although speculative, this questions whether some of this production would not have occurred without the CDM, given the evidence provided in section II that the cap on HCFC-22 may not be effective and that HCFC-22 production is in practice strongly determined by CDM rules rather than by other factors.

In summary, due to the accelerated phase-out under the Montreal Protocol, HCFC-22 production for emissive uses will be phased-out until 2030. The speed of the phase-out will depend on the production level in the base years 2009 and 2010 and on how quickly the agreement will be implemented by the host

countries. The development of feedstock production is more uncertain; however, it is unlikely to fully compensate the decrease in production for emissive uses. In this regard, overall production in developing countries is likely to decline over time. Moreover, some countries do not have any production for feedstock purposes and in many cases HCFC-22 production for feedstock purposes is integrated with plants that use the HCFC-22.

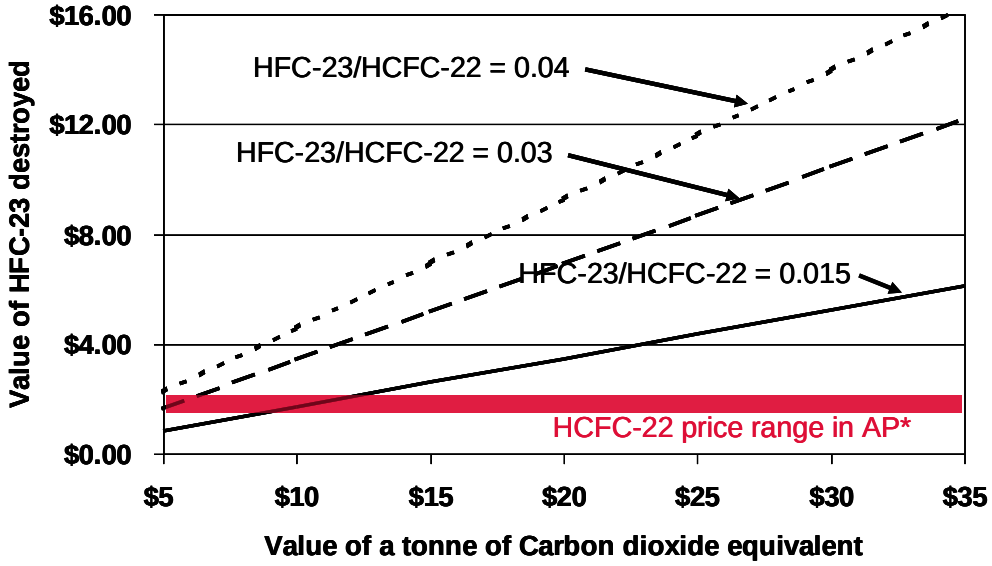
Implications of a potentially declining HCFC-22 production

If the future demand for HCFC-22 declines, the cap established in AM0001 may not fulfil anymore its purpose. In establishing the cap, a key implicit assumption was that HCFC-22 demand will continue to grow. This may have been a reasonable assumption when the cap was established; however, it is not anymore a reasonable assumption with the accelerated phase-out under the Montreal Protocol.

As soon as the HCFC-22 demand drops below the quantity of HCFC-22 that is eligible for crediting, the current cap in AM0001 will definitely not be effective anymore in avoiding perverse incentives: operators would have strong economic incentives to continue HCFC-22 production even if the market demand drops. Data from UNFCCC (2005), the TEAP (2007) and other publications (Schneider et al. 2005) suggest that the economic incentives are considerable. The TEAP (2007, page 57) concludes that "the net revenue per year for HFC-23 destruction could easily exceed the revenue from HCFC-22 sales". Schneider et al. (2005) have estimated the impact of CER revenues on HCFC-22 production costs for a range of possible assumptions (see figure below). In a "high impact" scenario, the revenues from CERs exceed the HCFC-22 production costs by a factor of 4-5. In the worst case, this could result in that HCFC-22 is produced which is not consumed but released to the atmosphere. In other cases, it could delay or exacerbate the achievements of the accelerated phase-out of HCFCs under the Montreal Protocol, with severe consequences for emissions of both greenhouse gases and ozone depleting substances.

Similar conclusions have been drawn by the TEAP. The figure below (TEAP 2007, page 6) illustrates the relation of CER revenues to HCFC-22 production costs for different CER prices and HFC-23/HCFC-22 ratios. The figure illustrates that CER revenues can easily exceed HCFC-22 production costs.

Figure 8: Comparison of CER revenues and HCFC-22 prices



Source: TEAP (2007, page 6)

In conclusion, the future HCFC-22 demand in developing countries may drop below the cap established in AM0001 at some point in the future, mainly as a result of the new agreement under the Montreal Protocol. From that point onwards, the CDM would provide perverse incentives to continue producing HCFC-22 while the production would decline without the CDM. The current approach therefore requires revision to avoid perverse incentives.

4) Lifetime of the existing facilities

The methodology also implicitly assumes that the plants can continue to operate without any time limitation. However, industrial facilities have usually a limited technical lifetime and are replaced after some time. This has been acknowledged in general guidance by the EB (EB8 and EB22) but not in the current methodology. It is possible that a HCFC-22 production plant would have been shut down at a certain point in time but that its operation is prolonged due to the possibility of CDM crediting. Given that new plants can so far not be credited under the CDM, the operators would loose a significant amount of revenues if the operation of the plant would be stopped. This may result in continued operation of less efficient old plants with potentially higher HFC-23/HCFC-22 ratios, whereas these plants may, in the absence of the CDM, be replaced by new production facilities with potentially lower HFC-23/HCFC-22 ratios.

How are these issues addressed in the proposed revision?

The above-mentioned concerns are addressed in this request mainly by introducing a cap on the HFC-23/HCFC-22 ratio used to estimate baseline emissions. The proposed cap addresses all four issues at the same time. The cap significantly reduces the economic incentives for operates that arise from the revenues from CERs for the destruction of HFC-23. This will avoid perverse incentives to produce higher amounts of HCFC-22 under the project situation than without CDM incentives, including when HCFC-22 demand will decrease due to the accelerated phase out under the Montreal Protocol. The cap also removes any incentives for operators to operate their plant at an artificially high HFC-23/HCFC-22 ratio, as the proposed level of the cap is significantly below the actual values achieved so far in the industry. Finally, the cap reduces the incentives to continue to operate an existing facility longer as a result of the CDM. However, even if some of these effects are not fully mitigated, a low cap on the HFC-23/HCFC-22 ratio indirectly compensates for such effects, as the actual GHG abatement would in this case be larger than the amount of CERs issued.

An important issue is the choice of an appropriate level for the cap. The cap must ensure that CER revenues do not significantly impact the HCFC-22 production costs but should, at the same time, ensure that still sufficient incentives are provided to undertake the CDM project activity. The most sensitive parameter is the CER price which may vary considerably over time. Moreover, the cap should clearly not exceed 1%, given that one plant operated at a HFC-23/HCFC-22 ratio of 1.1% during a period where no CERs could be claimed.

We propose a cap on the HFC-23/HCFC-22 ratio of 0.2%. The figure below illustrates that this cap limits strongly the impact of CER revenues on the HCFC-22 production costs. For the considered range of CER prices (from US$ 10 to US$ 30) it is avoided that HCFC-22 production costs decrease by more than 1/3 due to the CDM. At the same time, the HFC-23 abatement is still economically attractive at the lower end of this CER price range. The underlying values and information in the table are mostly based on UNFCCC (2005) and Schneider et al. (2005).

Table 2: Implications of the proposed cap on the HFC-23/HCFC-22 ratio

Scenario		Low CER price	Reference	High CER price
Assumptions				
Actual HFC-23 / HCFC-22 ratio		2,5%	2,5%	2,5%
Cap on HFC-23 / HCFC-22 ratio	-	0,2%	0,2%	0,2%
HFC-23 abatement costs	US$/$CO_2$e	0,5	0,5	0,5
Market price for CERs	US$/CER	10	20	30
Market price for HCFC-22	US$/kg HCFC22	1,7	1,7	1,7
Economic effects of CER revenues				
CER revenues	US$ / kg HCFC22	0,23	0,47	0,70
Abatement costs	US$/kg HCFC22	0,15	0,15	0,15
Net revenues from CDM	US$/kg HCFC22	0,09	0,32	0,56
Reduction of HCFC-22 production costs due to the CDM	-	**5%**	**19%**	**33%**

In practice, the HFC-23 abatement costs are lower, since the revision would mostly or only apply to projects at their renewal of the crediting period. For these projects the investment costs for the HFC-23 facility were already fully recovered during the first crediting period. The marginal operation costs for destroying HFC-23 are even lower. They can be estimated to be less than 0,1 US$/$CO_2$e. An example calculation for operational costs is provided in Table 3 below.[3]

Table 3: Estimation of marginal operational costs for HFC-23 destruction

Energy costs	
Electricity consumption (MWh / t HFC-23 destroyed)	1
Steam consumption (t steam / HFC-23 destroyed)	2
Electricity price (US$ / MWh)	100
Steam price (US$ / t)	80
Total energy costs (US$ / t HFC-23)	260
Total energy costs (US$ / t CO2e)	0,022
Staff costs	
Staff costs (US$ / year)	200000
Typical HFC-23 destruction of a medium size plant (t/yr)	450
Staff costs (US$ / t HFC-23)	444
Staff costs (US$ / t CO2e)	0,038
CDM related transaction costs	
CDM related transaction costs (US$ / year)	100000
Typical HFC-23 destruction of a medium size plant (t/yr)	450
CDM related transaction costs (US$ / t HFC-23)	222
CDM related transaction costs (US$ / t CO2e)	0,019
Total operation costs (US$ / t CO2e)	0,079

If only operational costs are taken into account, the abatement of HFC-23 emissions would, with the proposed default waste ratio of 0.2%, still be attractive at a price of US$ 1 per CER.[4] This shows that this approach will, for plausible range of CER prices, limit the impact of the CDM on HCFC-22 prices, while still providing strong economic incentives to abate the HFC-23.

Other changes

The draft revised methodology contains also a number of other changes which are partly editorial and partly changes which simplify and streamline the methodology, improve the presentation of the methodology and make the methodology consistent with methodologies that have been approved more recently:

- The methodology was restructured. The previous emission reduction calculation had a section “emission reduction” and a section “baseline”, while a section on project emissions was lacking. The “baseline” section did not really provide the baseline emissions (as in the understanding of more recently approved methodologies) but included the potential emission reduction that would also occur in the baseline. The methodology was restructured in line with more recently approved methodologies in the following sections: “project emissions”, “baseline emissions”, “leakage” and “emissions reductions”. This also ensures that any remaining HFC-23 emissions from the project plant are appropriately accounted as project emissions, which is consistent with methodologies for N2O destruction.
- Project emissions from electricity consumption, fossil fuel consumption and carbon contained in HFC-23 are neglected. An evaluation of monitoring reports shows that these emissions are generally

[3] Data on electricity and steam consumption is based on an evaluation of monitoring reports. Electricity and steam prices are estimated at the likely higher end of the possible range. Staff costs and costs for CDM related transaction costs are estimates based on expert judgments.

[4] This value was calculated based on the marginal operational destruction costs of US$ 0,08 per tCO2e and data from Table 2.

smaller than 1% and can thus be ignored. In addition, the proposed revised methodology estimates baseline emissions in a very conservative manner which over-compensates the neglection of these project emissions. This will reduce transaction costs for project developers.

- Leakage emissions (emissions from transportation of sludge) are very small. Given that such minor emission sources are also neglected in other methodologies, they are not considered in the revised methodology for simplicity. Other leakage emissions (e.g., fossil fuel combustion for steam generation) are similarly small and negligible compared to the overall emission reductions.
- The monitoring section has been updated, according to the changes in the baseline methodology and using the type of tables that have been used in more recently approved methodologies.

Conclusions

Data from registered projects shows that the current methodology AM0001 can create perverse incentives which can seriously risk the objective of the CDM to achieving real and additional emission reductions and which can exacerbate the achievement of objectives pursued under the Montreal Protocol. These concerns can be addressed through the proposed revision to AM0001.

Apart from addressing the methodological issues raised in this request, the proposed revision will have positive benefits for other policy objectives pursued under the Kyoto Protocol and the UNFCCC: As the number of CERs issued is significantly lower compared with the actual GHG abatement, there is a significant net climate benefit from crediting HFC-23 under the CDM. In addition, a reduced supply of CERs from this project type could positively affect the regional distribution of CERs, given that no such installations are in Least Developed Countries (LDCs) and in Africa. Finally, a lower CER supply from HFC-23 projects may indirectly result in more other projects being developed, including project types that have very larger benefits for sustainable development, and may thus attract larger investment in innovative technologies.

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