Information Note

Note on the revision of AM0001

I. Background

At its fifty-eighth meeting, the CDM Executive Board (the Board) considered the outcome of the work undertaken by the Meth Panel on HCFC-22 production and HFC-23 generation as related to methodology AM0001 and requested the Meth Panel to revise the methodology. The Board also requested the Meth Panel to consider the extent of revision of the methodology AM0001 based on the shortcomings identified in their analysis, and report to the Board at its sixty-first meeting.

This note summarizes how the issues identified by the panel were addressed in the draft revised methodology, taking into account external expertise, as appropriate. This note first highlights the main elements of the revision and then describes how the proposed revision addresses each of the identified issues.

II. Main elements of the draft revised methodology

The main elements of the draft revised methodology are the following:

- **Waste generation rate *w* (includes options):** The methodology introduces a lower cap on the baseline waste generation rate *w* (the amount of HFC-23 formed per amount of HCFC-22 produced). In view of the issues raised in the report prepared by the panel at its forty-sixth meeting, two options for setting this cap (1.0% and 1.4%) are included in the draft revised methodology for consideration by the Board (see discussion of the values below);

- **Eligible quantity of HCFC-22 for crediting:** The methodology calculates the quantity of HCFC-22 that is eligible for crediting based on the *average* instead of the *maximum* historical HCFC-22 production levels. This provision is made to ensure consistency with other methodologies and to address some of the issues identified (see below);

- **Project emissions (includes options):** The methodology provides for two options regarding the coverage of project emissions for consideration by the Board:

    - All HFC-23 emissions from the plant are accounted for as project emissions. This provides strong incentives for the plant operators to also reduce HFC-23 emissions from the quantity of HCFC-22 production that is not eligible for crediting (many plant operators reported that they abate these emissions regardless of their eligibility for crediting);

    - Another option is to limit project emissions to undestroyed HFC-23 emissions from HCFC-22 production lines that are eligible for crediting. It could be argued that accounting undestroyed HCFC-22 from production lines which are excluded from crediting is overly punitive.

- **Other modifications:** The draft revised methodology is completely restructured and several other improvements were made. This includes the following:
    - A section is added to provide definitions of key terms applied in the draft methodology;
    - The calculation of project and baseline emissions is separated;
    - The emission reductions are calculated for monitoring periods (instead of years), and some elements from the "Guidance on accounting eligible HFC-23" are incorporated;
    - The possibility of different production lines and different HFC-23 destruction facilities is fully accounted for; HCFC-22 production lines that do not have an operation history for at least three years between 2000 to 2004 are not eligible for crediting.
    - The methodology allows for temporary storage and subsequent destruction of HFC-23, similar to earlier versions of the methodology. The methodology ensures that storage of HFC-23 is accounted in a way to avoid a situation where credits could be gained from releasing stored HFC-23 to the atmosphere after the end of the crediting period;
    - Additional guidance on an HFC-23 mass balance and on measurement of HFC-23 is included;
    - Provisions for the renewal of crediting period are included;
    - Clearer and more rigorous monitoring requirements are included, requiring monthly reporting of key parameters;
    - Provisions to calculate historical waste generation rates based on the fluorine balance and carbon balance are introduced. As a conservative approach, the lower value of the waste generation rate calculated by fluorine balance and carbon balance is used in order to account for uncertainties.

III. Issues identified by the panel and approaches proposed to address them

The following section describes the issues that were identified by the panel and elaborates on how these issues are addressed in the draft revised methodology.

(1) Disincentive to reduce the waste generation rate

Issue: In the absence of the CDM, plant operators have economic incentives to reduce the waste generation rate (within the level of operational parameters which ensure the safety of the plant). The CER revenues form a strong disincentive to reduce the waste generation rate below the cut-off value used in previous versions of this methodology. However, process optimization may lead, without the CDM, to the reduction of the waste generation rate over time.

Proposed solution: The draft revised methodology addresses this issue by introducing a conservative value for the cap for the baseline waste generation ratio. The conservative default value for the baseline waste generation rate strongly reduces the disincentives to reduce the waste generation rate. With the new cap the incentives for the project participants to reduce the waste generation rate will be retained.

(2) CDM plants may displace HCFC-22 production in more efficient plants

Issue: Variable production costs (without CERs) for registered CDM plants might be higher than for non-registered plants and in the absence of the CDM the new plants may be higher on the "merit order" and may produce more, while registered plants may produce less. As newer HCFC-22 plants tend to have a higher efficiency than older plants (including swing plants), this potential substitution of production in newer (non-CDM) plants may lead to an overestimation of the baseline waste generation rate and therefore emission reductions.

Proposed solution: The draft revised methodology reduces the incentives for a potential shift of production from non-CDM plants to CDM plants because the amount of HCFC-22 that is eligible for crediting is calculated based on the *average* historical production and not the *maximum* historical production, as in the previous versions of the methodology. In addition, any remaining shifts are addressed through a conservative cap on the waste generation rate. The cap ensures that it is unlikely that newer non-CDM HCFC-22 production plants in developing countries would achieve lower waste generation rates (the issue of HCFC-22 production shifts from Annex I to non-Annex I countries is addressed under point 5 below).

(3) Operation of CDM plants beyond their operational lifetime

Issue: Previous versions of the methodology do not restrict the crediting period to the operational lifetime of the plant and its components, as other methodologies do. In case the CDM plant is operated above its operational lifetime, in the absence of the CDM the plant would be replaced by a new plant (new equipment) which tends to have lower waste generation rate and therefore emission reductions would be overestimated.

Proposed solution: The draft revised methodology reduces the incentives for operation of CDM plants beyond their operational lifetime because the incentives from the CDM are reduced due to: (a) a lower quantity of HCFC-22 that is eligible for crediting; and (b) a lower cap on the waste generation rate. The lower cap also ensures that emission reductions are very unlikely to be overestimated if the HCFC-22 production plant would be operated longer than in the absence of the CDM, or if key plant equipment affecting the waste generate rate would be replaced. In such a situation, the HCFC-22 would be produced in other plants. It is unlikely that these other plants have a lower waste generation rate than the conservative cap.

(4) Replacement of plant equipment

Issue: Plant equipment affecting the waste generation rate is regularly exchanged (about every 3 to 7 years). As the plant equipment design is a key factor determining the waste generation rate, the waste generation rate determined based on historical values may loose its validity.

Proposed solution: The conservative cap on the waste generation rate ensures that emission reductions are very unlikely to be overestimated if plant equipment affecting the waste generate rate would be replaced, because it is unlikely that the waste generation rate that will be achieved by the plant after exchange of the equipment will be below the cap.

(5) Potential displacement of production of HCFC22 in Annex-I countries

Issue: The production of HCFC-22 in developing countries may potentially displace production in Annex I countries. This would not result in emission reductions, as the total emissions of Annex I countries are capped.

Considered approach: The panel considered to address this issue in a similar way as in some other approved methodologies (e.g. AM0037). This approach would discount the CERs generated by a factor. This factor would be determined based on the net global export of HCFC-22 from the group of non-Annex-I countries to the group of Annex-I countries. This data could potentially be derived from aggregated data on production and consumption of HCFC-22 provided by the UNEP Ozone Secretariat. More disaggregated data is unlikely to be available. Given that only aggregated trade data on HCFC-22 is available, this would imply that the same single discount factor would be applied to all installations and countries.

This approach has several limitations, as follows:

- Different plants are not involved to the same extent in export to Annex-I countries. Using the same simple default value for all plants in all countries might be considered to adversely impact some plants, or be generous for other plants;
- Trade data is only available for HCFC-22 that is used for emissive applications;
- Similar to the case of national grid emission factors, there is a time gap of about two years between the vintage of data and the date of its actual release .

Proposed solution: Instead of introducing a discount factor based on trade data, it is proposed to address this issue by introducing a conservative default value for the baseline waste generation rate. The extent to which this issue is addressed, depends on the conservativeness of the cap selected for the baseline waste generation rate.

(6) Disincentive to shut-down CDM plants in the course of the phase-out of HCFC-22 under the Montreal Protocol

Issue: The accelerated phase-out of HCFC-22 for emissive uses under the Montreal Protocol could lead to situations, depending on the market conditions, where (on average older) CDM production lines would be shut down in the absence of the CDM or be converted into HCFC-22 plants for non-emissive uses.

Considered approach: The panel considered to address this issue by introducing an additional cap on the amount of HCFC-22 that is eligible for crediting for those production lines that produce HCFC-22 for emissive purposes. The cap would limit the amount of HCFC-22 production for emissive uses in line with the phase-out schedule of HCFCs under the Montreal Protocol. This provision would have avoided disincentives to continue the production of HCFC-22 for emissive uses when phased out, and would have provides incentives for a shift to production for feedstock purposes.

This approach has the following limitation: Under a national phase-out programme, different plants would stop operation at different points in time and may not simultaneously reduce HCFC-22 production. Using the same cap for all plants might be considered to adversely impact some plants, or to be generous for other plants.

Proposed approach: Instead of introducing a cap to account for the phase-out of HCFC-22, it is proposed to address this issue by (a) using the *average* instead of the *maximum* historical production to determine the amount of HCFC-22 that is eligible for crediting and (b) introducing a lower cap on the waste generation rate. The extent to which this issue is addressed depends on the conservativeness of the cap selected for the baseline waste generation rate.

Rationale for the proposed caps for the waste generate rate

Two values for the waste generation rate are included in the draft revised methodology for the consideration by the Board:

- A value of 1.0%: this value corresponds approximately to the lowest reported and verified waste generation rates achieved by plants in developing countries.[1] The IPCC and TEAP reported that thermal oxidation would be required to reduce HFC-23 formation below a 1% level (IPCC/TEAP 2007, page 410);
- A value of 1.4%: this value corresponds to the lower end of the range of values that can be achieved by process optimization according to the 2006 IPCC Guidelines (chapter 3.10, page 3.99).

In the following it is discussed how these values address the issues described above.

Generally, there is only limited reliable information available on the waste generation rates of non-CDM plants or the values at which the CDM plants would operate in the absence of the CDM. Therefore, it cannot be assessed with certainty to what extent the different values address the issues identified above.

HCFC-22 production reactors operate within the conditions (e.g. pressure, temperature, etc.) which are limited by reactor design. Operating outside the conditions can increase the risk of corrosion which may give rise to safety issues, and avoidance of which is of the highest priority for the plant operators. It has been pointed out that, for most reactors in CDM plants, operation under stable condition has resulted in an observed long-term average *w* between 1.8% to 3.3%.

Therefore, it could be concluded that, in absence of CDM, most CDM plants are likely to operate within the stable range of conditions that are specific to the reactors, and therefore *w* is likely to stay well above the value of 1.4% which represents the lower end of the range indicated in the 2006 IPCC Guidelines. There is little evidence that HCFC-22 plants can achieve a long-term waste generation rate *w* of 1.4% or below. However, one plant operated for a period of six months at lower rates.[1]

The value of 1.4% would, for example, address the issue of avoiding disincentives to reduce the waste generation rate *w* (issue 1) for plants which cannot reduce the waste generation rate below this value. Plants which could reduce the waste generation rate below this value would still have a disincentive to reduce their waste generation rate below this value. Similar considerations apply to the other issues. For example, if CDM plants displace the HCFC-22 production in non-CDM plants, a value of 1.4% sufficiently addresses this issue if the plant(s), where the production is displaced, operate(s) at a higher waste generation rate. If a CDM plant would displace production in a specific (newer) non-CDM plant which operates at a lower value than 1.4%, the issue would not be sufficiently addressed. Another argument for using the higher value (1.4%) may be that a lower value is very conservative and may not fully reward those operators who could not achieve this performance in their specific plant arrangement.

[1] A value of 1.06% was achieved by a CDM plant over the period of 6 months (from November 2008 to April 2009), ranging on a monthly basis between 0.88% and 1.47%.

An argument for using the lower value for *w* (1.0%) could be that such a value practically eradicates the incentive not to reduce waste. Furthermore, *w* values below 1% have been observed on a monthly basis in one of the CDM plants. In addition, this provides a very high probability that the issues of export of HCFC-22 to Annex I countries and the disincentive to shut down plants in the course of the phase-out of HCFC-22 under the Montreal Protocol are addressed.

Rationale for consideration of project emissions from HCFC-22 production lines that are not eligible for crediting

The draft revised methodology contains two options (Option 1 and Option 2) for the consideration by the Board:

- All HFC-23 emissions from the plant are accounted for as project emissions. This would provide strong incentives for the plant operators to also reduce HFC-23 emissions from the quantity of HCFC-22 production that is not eligible for crediting (many plant operators reported that they abate these emissions regardless of their eligibility for crediting);
- Another option is to limit project emissions to undestroyed HFC-23 emissions from HCFC-22 production lines that are eligible for crediting. It could be argued that accounting undestroyed HFC-23 from production lines which are excluded from crediting may lead to inconsistencies and may be overly punitive.

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History of the document

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