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# PRIORITIZATION OF HCFC PHASE-OUT TECHNOLOGIES TO MINIMIZE OTHER IMPACTS ON THE ENVIRONMENT (DECISION 57/33 AND PARAGRAPH 147 OF THE REPORT OF THE 58TH MEETING OF THE EXECUTIVE COMMITTEE)

Pre-session documents of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol are without prejudice to any decision that the Executive Committee might take following issuance of the document.

Introduction

1. In document UNEP/OzL.Pro/ExCom/55/47 the Secretariat had presented a "Revised analysis of relevant cost considerations surrounding financing of HCFCs phase-out"; this document also included a section on environmental issues and a related annex, which described a proposal of a Functional Unit Approach for the evaluation of climate relevant emissions during the life cycle of a unit. The Executive Committee, in its decision 55/43, requested the Secretariat to further analyse if an approach of the type outlined in document UNEP/OzL.Pro/ExCom/55/47 would provide a satisfactory and transparent basis for the prioritization of HCFC phase-out technologies to minimise other impacts on the environment, including on the climate, as originally envisaged in decision XIX/6 of the 19th Meeting of the Parties.

2. In document UNEP/OzL.Pro/ExCom/57/59, the Secretariat presented a status report on the further analysis of the work on the indicators. These were identified as a satisfactory and transparent basis for the prioritization of HCFC phase-out technologies to minimise other impacts on the environment, including on the climate. The Secretariat highlighted already at that time that it was difficult, in countries without a manufacturing sector, to give priority to cost effective projects and programmes that focussed, *inter-alia*, on substitutes and alternatives that minimised impact on climate. The Executive Committee noted the status report, and requested the Secretariat to prepare a document presenting four concrete examples of the application of the methodology to two technologies in the foam sector and two in the refrigeration sector for further consideration of the methodology; and decided to discuss subsequently issues related to the type of incentives to be associated with the indicators being developed, and other relevant questions relating to the indicators. (Decision 57/33)

3. Since the Secretariat reported to the Executive Committee at the 57th Meeting, the model has undergone a number of simplications, refinements and differentiations to enable the mandate of the Meeting of the Parties to be met; in particular, attempts were made to increase the transparency and usability of the results. As part of these efforts, it was decided to use for the approach the term "MLF climate impact indicator" instead of the both complicated and somewhat generic "Functional Unit Approach". At the same time the development of the Multilateral Fund (MLF) climate impact indicator continued to use the same principles as the functional unit approach in terms of its approach vis-à-vis the use of greenhouse warming potential (GWP) or of Life Cycle Climate Performance as other potential indicators. The related information and the selection as presented in document UNEP/OzL.Pro/ExCom/57/59 continues to be valid.

Objective

4. The Secretariat, in preparing this document, first started by defining the scope of the MLF climate impact indicator. The MLF climate impact indicator will only be applied to the conversion of manufacturing capacity, its replacement or closures of such capacity. As already foreshadowed at the 57th Meeting, the indicator will not aim to address activities in the servicing sector, which typically does not offer the possibility for a technology choice since it reacts to conditions already prevailing in the country. The indicator will provide guidance only for activities in consumption sectors, and not to production sector activities of the Multilateral Fund. It is the objective of the MLF climate impact indicator to have the possibility to not only determine the climate impact of a single activity in a given country. It will also allow the aggregation of several activities to calculate a sector or country wide overall climate impact. With this result, the Executive Committee will receive valid information about the consequences of the technology choice for the climate, and should be able to make informed policy and funding decisions.

5. The indicator is determined using a scientific simulation model which provides differentiated results based on a relatively few data inputs and a large amount of background data. The actual scientific model has been programmed and discussed with TEAP experts in the refrigeration and foam sectors, and at the moment the Secretariat is working on interfaces to enable broad and convenient access and use by countries, bilateral and implementing agencies and the Secretariat. The scope was defined so that the indicator should primarily inform on the alternative technology for a given activity that has the minimum climate impact. At the same time, a number of secondary objectives for the MLF climate impact indicator exist. These secondary objectives are to provide an understanding of the absolute climate impact of an activity, as well as of the climate impact compared to the continued use of HCFCs, and/or to compare different alternative technologies[1]. Other desired characteristics of the indicator are that it needs to be fair and equitable, and minimalist in data needs for each single activity.

6. One of the requirements for the MLF climate impact indicator is that only a small amount of data is required to determine the value of the indicator for a given activity. Input data needed for the indicator are:

(a) The number of units produced annually;

(b) The amount of ODS used for each unit;

(c) Basic characteristics such as refrigeration capacity or foam thickness;

(d) The share of exports; and

(e) The alternative technology to be used.

7. The indicator will develop a differentiated picture of climate impact. Factors taken into account are the thermal physical and product characteristics of the different alternatives as well as of HCFCs as the baseline technology, as well as the climate in terms of occurrence of different temperatures in different countries, the $CO_2$ emissions caused by energy consumption, and the use profile including a generic emission profile. The software tool is based on simplified but still very detailed calculations; the accuracy expected is high, in particular compared with the inherent inaccuracies of any long term forecast[2].

[1] The results of the calculation are the aggregated climate impact of the products manufactured after a conversion in comparison to a baseline, i.e. HCFC scenario. There are some limitations to the accuracy of such an approach: Even for products from a given manufacturing facility to be converted as part of a Multilateral Fund project, the climate impact is likely to have never been fully assessed in terms of its energy consumption or the emissions from the product. Consequently, there is no exact baseline available to which any product manufactured after a conversion could be compared to. In addition, the exact use of each product remains unknown. For example, an air conditioner could be used to cool a recreational home for three weeks in the summer, leading to an annual running time of only 40 hours, or could be used to cool an apartment in a major town in a tropical humid climate, where the annual running time would reach 5,000 hours/year. Also, the equipment to be manufactured after the conversion has not yet been designed or built. Consequently, forecasts about its quality will always have an uncertainty associated with it.

However, the same uncertainties apply both to the HCFC baseline and the converted scenario; the related uncertainties are largely canceling each other out. In addition, the design parameters used by manufacturers to design their products represent very exact, generalized estimates of the average future use profile of the products. In the main sectors of refrigeration, air conditioning, and polyurethane and polystyrene foams, the design parameters such as the heat conductivity for insulation foam and the achievable quality of the equipment are fairly generalized and strongly dependent on the particular characteristics of each alternative technology, and less on the particular application of this technology in a given product. Consequently, the qualitative assessment of the climate impact is expected to be accurate, and any quantitative results will provide a good indication of the climate impacts of activities.

[2] One major uncertainty is for example whether a company will still produce in three years the same number of units when applying for conversion. However, this is irrelevant for the technology choice, and any mistakes are likely to average themselves out on a higher level (national, regional, global).

Fair technology comparison

8. The comparison of different alternative technologies in relation to their climate impact has two different components:

(a) The direct emissions of the HCFC or its replacement, being often substances with significant GWP, causing an impact on the climate based on the GWP of HCFCs and alternatives and the amount emitted; and

(b) The energy efficiency, which through the use of a conversion factor specific for each country relates to emissions of CO2 during the production of energy.

9. While the emission parameters of HCFCs or their alternatives are reasonably well known, the application of energy efficiency information is more challenging. The challenge can be demonstrated using submissions to the Secretariat to this meeting as an example. The figures for the energy consumption of alternative technologies in project proposals, for example in the project proposal for Jordan (see document UNEP/OzL.Pro/ExCom/59/36), showed significant improvements in energy efficiency as compared to HCFC technology. Inquiries with the implementing agency made clear that the calculation assumed that substantially better components would be used for the equipment for one alternative investigated, but not for others. While improvements of energy efficiency are without doubt positive, taking such improvements into account for some alternatives and not for others will certainly render any comparison meaningless.[3] Technically, it is virtually always possible to increase the energy efficiency of any product further, independent of the technology used. If different levels of advancement in terms of energy efficiency are assumed for different technologies, the resulting comparisons of different technologies are not necessarily fair. It becomes therefore evident that a standard for comparisons is missing.

10. For the purpose of the MLF climate impact indicator the Secretariat had to define a common basis for both existing HCFC as well as alternative technologies, i.e. a common standard to allow comparison across technologies on an equal basis. The standard is simply the assumption that the components used to manufacture a product with an alternative technology should be of the same quality as they are presently used for HCFC-containing products, and that characteristic parameters of the product should not be changed; this quality assumption is relatively simple to incorporate into a software tool. It should be kept in mind that this assumption is exclusively made to help in selecting the most environmentally beneficial technology, i.e. the technology leading to the overall lowest total emissions of greenhouse gases, and is limited to this purpose. In particular the Secretariat would like to state that the proposed standardisation is not meant as an indication to what extent a conversion should be funded or supported by the Multilateral Fund[4].

(a) As a definition of similar quality components, the Secretariat used the assumption that the components used for manufacturing are of similar quality, except where upgrades are needed for the use of alternative technologies. Such improvements are seen as

[3] In case of the project proposal for Jordan, for example, it is assumed that components will be available and will be used in the design for one alternative technology, leading to a fundamental improvement of the energy efficiency of about 7 per cent as compared to the HCFC-22 baseline. This figure is based on presentations by manufacturers of air-conditioning equipment showing improvements in energy efficiency that these manufacturers claim for their own products after conversion to the same technology. However, in discussions, the company in Jordan also agreed that a conversion with a similar technology level after the conversion as presently used with HCFC will yield for the same alternative technology a decrease in energy efficiency, not an increase.

[4] In addition to being a meaningful standardised basis for comparison of technologies, the assumption of similar quality components or similar characteristics of the product frequently corresponds to the status quo for equipment for the low or medium segment of the market, where the concern for, in particular, optimised energy consumption among many end users appears to be lower than the desire to pay the lowest price. It is also true for equipment which is produced in small quantities where optimisation is not cost effective for the manufacturer.

unavoidable in those cases where they are necessary to allow the use of specific alternatives, and are typically generic to that alternative - one example for an unavoidable improvement is the use of ester oils for HFC refrigerant. On the other hand, improvements which would have had a similarly beneficial impact on the baseline technology (HCFC) or on other alternatives are not taken into account. An example of what can not be taken into account would be the use of a larger heat exchanger in a refrigeration or air-conditioning equipment, leading to a better energy efficiency level, and so being used to compensate for a lower intrinsic energy efficiency level of an alternative. The same approach could be applied to the baseline technology or to any other alternative with similarly positive results.

(b) As a definition of similar characteristics of the product, the Secretariat used the assumption that product would not significantly change its appearance to the customer, except where unavoidable, because of specific characteristics of a particular alternative technology. Comparable to (a) above, such changes in appearance are seen as unavoidable in those cases where they are necessary to allow the use of specific alternatives, and are typically generic to that alternative - one example for an unavoidable change in appearance is the change in weight of an insulation post a conversion, because of a different density of the resulting foam. On the other hand, changes which would have had a similarly beneficial impact on the baseline technology (HCFC) or on other alternatives are not taken into account. An example of what can not be taken into account would be the use of an increased insulation thickness of a building, leading to a lower energy consumption of that building, and so being used to compensate for a lower intrinsic insulation quality of an alternative.

Approach

11. A number of different profiles represent broadly the main applications of HCFCs in refrigeration and air conditioning as well as in foam blowing. The software tool will require the selection of the appropriate profile, such as, for the refrigeration and air-conditioning sector, namely:

(a) Air conditioning, factory assembly;

(b) Air conditioning, on-site assembly;

(c) Commercial cooling, factory assembly;

(d) Commercial cooling, on-site assembly;

(e) Commercial freezing, factory assembly; and

(f) Commercial freezing, on-site assembly.

And for the foam sector:

(g) Building insulation; and

(h) Insulation of refrigerated space.

12. Each of the eight profiles mentioned above takes into account a considerable amount of characteristic use data, such as whether the equipment is usually located inside or outside, normal running times, emissions, design conditions and other information. The input data needed for the model has been already mentioned in paragraph 6 above. Even products using the most environmentally beneficial

technology can and should be improved further in regard to their emissions of greenhouse gases. Such further improvements can also be assessed using the MLF climate impact indicator, by, for example, allowing the calculation of the effect of using higher quality components than presently used with HCFCs, or changing characteristics such as the foam thickness.

Information generated

13. The calculation produces a set of quantitative data which can be used for two different purposes in different formats:

(a) Identification of the alternative with minimum climate impact; and

(b) Calculation of the climate impact of the conversion.

14. The identification of the alternative with minimum climate impact provides a list of the different technologies considered. This list is provided in the sequence of their environmental impact in comparison to HCFCs, so that the technology at the top of the list is the one with the lowest climate impact and the one at the bottom with the highest. The list will also provide a qualitative comparison of how the different technologies compare with the status quo. This output follows most closely decision XIX/6 of the Meeting of the Parties. However, the Secretariat would suggest call for caution in the use of the result, since the climate impact of a technology is only one of a number of parameters determining the technology selection; others are e.g. economic sustainability, availability of components, and market acceptance.

15. The calculation of the climate impact of a conversion provides a quantification. The impact of the conversion is the difference between the climate impact before the conversion, using as a basis the calculation of the HCFC baseline, and the selected alternative technology. For calculating the climate impact of the latter, the assumption of similar components or characteristics can be replaced by specifying changes, based on the planned activities. The result of this calculation can be used for example for the following purposes:

(a) Calculating an aggregated climate impact of several activities or projects, thus determining the climate impact at a sector or country level[5];

(b) Calculation of the potential climate impact for an activity to allow for applying co-funding from energy-efficiency and climate change funding facilities, and a prediction of the effect of a conversion activity on energy consumption and greenhouse gas emissions, taking also into account possible improvements of components or changing of characteristics;

(c) Aggregating Multilateral Fund climate impact monitoring; and

(d) Documentation of the climate impact for national statistical or public awareness purposes.

[5] This would in consequence allow the assessment of different activities under a plan, informing about the climate impact of this plan as a whole. The Executive Committee could use such a calculation to consider defining jointly with the country a certain objective for the climate impact – for example climate neutrality as compared to HCFCs – and the country could select for each activity the most suitable technology, allowing the necessary flexibility to combine the use of high GWP technologies where necessary with the use of low GWP technologies where possible.

Status

16. The scientific simulation models for the different profiles specified in paragraph 11 above have been provided. The information for climate data for the different countries, $CO_2$ emissions during energy generation, and data regarding the different profiles is included in the model. A number of improvements of components are also already incorporated in the model. Data input and certain multipliers, for example multiplying the number of units with the climate impact, is so far still done manually, and so is the conversion of the climate impact calculated to the results presented in paragraph 14. However, these last steps are very easy to incorporate into a software, the only open question remains how the software to be made available and what output the user exactly needs. Examples for the output to be provided are in an annex to this document to be issued as UNEP/OzL.Pro/ExCom/59/51/Add.1.

17. In order to determine what output the user exactly needs beyond the examples provided by the Secretariat, the Executive Committee will need to come to a better understanding of the general direction of its policies towards the climate impact of conversions. Currently, the Meeting of the Parties is discussing its position to the phase-down of HFC under the Montreal Protocol. The Secretariat would like to point out that independent of the outcome of these discussions, the fact that there has been a submission for an amendment to the Montreal Protocol that is being discussed is a clear indication that a number of both Article 5 and non-Article 5 countries are seriously concerned regarding the climate impact of HFCs, and the proliferation of their use. The Secretariat would further like to point out that the MLF climate impact indicator will allow a comparative assessment to be used helping to determine where HFCs might be acceptable as alternatives to HCFC, and where not. As is also visible in the discussions in the Executive Committee itself, the absence of such a tool for comparative assessment might lead to the use of a less differentiated approach, e.g. the use of simply the GWP of a substance as a criterion whether to fund a particular approach to conversion. The Secretariat believes that it is in the interest of achieving broad compliance with the reduction steps for HCFCs to allow HFCs where necessary, and to support other alternatives where possible. The MLF climate impact indicator will help the Executive Committee in doing so.

18. Given the above need for discussions in the Executive Committee, combined with the considerable number of outstanding issues on HCFC projects, the Secretariat believes that the best way forward for the Executive Committee will be to start using the indicator to inform the Executive Committee in its assessment of projects subsequently. With progress in the discussions regarding the acceptable or desired climate impact of Multilateral Fund projects, the indicator can be a useful tool for the Committee in its decision making.

19. The Secretariat has largely exhausted the funding provided by the Executive Committee in decision 53/37, to cover the costs of consultations with technical experts and other stakeholders required for the preparation of documents related to the HCFC phase-out. The related funds were used for the work on the guidelines for HPMPs, the HCFC phase-out cost paper, the development of the significant software for the scientific simulation models for the MLF climate impact indicator, and preliminary work on the production sector. The remaining efforts to develop a user-friendly version of the MLF climate impact indicator can not be covered from the remaining funds. The Secretariat therefore proposes to create an additional budget of US $50,000 for the development of the software in a user-friendly way.

20. The Executive Committee had decided in its decision 57/33 to discuss the type of incentives to be associated with the indicators being developed, and other relevant questions relating to the indicators. Depending on the progress achieved in other discussions in this forum and at the Meeting of the Parties, the Executive Committee might wish to discuss the issues further at the 60$^{th}$ Meeting.

Recommendations

21. The Executive Committee may wish to consider:

(a) Noting the report prepared by the Secretariat on prioritization of HCFC phase-out technologies to minimize other impacts on the environment;

(b) Discussing the type of incentives to be associated with the MLF climate impact indicator, and other relevant questions relating to it, at the 60th Meeting;

(c) Approving the preliminary use of the MLF climate impact indicator on project submissions for the 60th Meeting onward to inform agencies and countries about the climate impact of technology choices and to collect further data on the use of the MLF climate impact indicator for the Executive Committee's consideration;

(d) Finalising the development of the MLF climate impact indicator as outlined in the Secretariat's paper, using the examples provided by the Secretariat in the Annex as a basis for the output to be provided;

(e) Approving for the related work including programming of software a budget of US $50,000; and

(f) Requesting a report from the Secretariat on the experiences gained not later than to the 62nd Meeting of the Executive Committee.

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