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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
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**RELEVANT ASPECTS OF COMPONENT UPGRADE IN HCFC
CONVERSION PROJECTS (DECISION 59/13(b))**

Introduction

1. At the 59th Meeting of the Executive Committee, the issue of eligibility of measures to improve the climate impact of the conversion from HCFCs was raised, and the Executive Committee decided to discuss the issue at its 60th Meeting. It requested in its decision 59/13 that the Secretariat prepare a document for the 60th Meeting providing information regarding the relevant aspects of component upgrade in HCFC conversion projects. This document has been prepared in response to the request.

Background

2. The Secretariat has so far received three project proposals for the conversion of manufacturers of refrigeration and air conditioning equipment from HCFCs to alternative technologies. All three proposals contain cost elements related to components which strongly influence the energy efficiency, and have a major impact on the overall costs of the project.

3. The components mentioned are the heat exchangers and the compressor used in refrigeration and air conditioning equipment. When converting from HCFCs to an alternative substance, the heat exchanger might require changes depending on the alternative technology used. The compressor typically has to be modified or replaced by another model, often from a different manufacturer. Compressors are available in several performance levels, but the different levels are not standardised and not clearly distinguishable, in particular across different manufacturers.

4. As is implied by the information provided above, a conversion of the manufacturing of HCFC-containing refrigeration and air conditioning products requires a redesign of the product to accommodate the changed components. Manufacturers that have already converted typically use the opportunity to carry out a number of optimisations, using new technologies, better know-how and improved components to achieve a higher energy efficiency of their product; consequently, the products with alternative technology have often a better energy efficiency than the previous HCFC systems. These optimisations, however, would also have led to improvements in energy efficiency when applied to HCFC technology.

Relevant decisions of the Executive Committee and the Meeting of the Parties

5. The Meeting of the Parties, in its decision XIX/6 paragraph 11, requested the Executive Committee, when developing and applying funding criteria for projects and programmes, to give priority to cost-effective projects and programmes which focus on, *inter alia*, alternatives that minimize impacts on the climate, taking into account global-warming potential and energy use.

6. In its decision 18/25, the Executive Committee decided that costs associated with avoidable technological upgrades should not be considered as eligible incremental costs and therefore should not be funded by the Multilateral Fund. An upgrade in technology is defined as an improvement compared to the baseline, in this case the HCFC air conditioning equipment.

7. In order to assess incremental cost, a baseline for refrigeration and air conditioning equipment relating to energy efficiency needs to be defined. Any costs for improvements beyond this baseline would be seen as an avoidable technological upgrade.

Baseline

8. The Secretariat has developed a list of possible definitions for a baseline for refrigeration and air conditioning equipment, and has sorted it approximately according to increases in effort and, therefore, the resulting costs that each of these definitions would represent in a conversion project. A baseline could be defined as:

- (a) The physical characteristics of the equipment as no more than the sum of the physical characteristics of its components, so that after a conversion the defining characteristics of the components would remain largely unchanged or only improved to the degree necessary where no similar component would be available (“component option”);
- (b) The energy efficiency of the equipment, so that after a conversion the energy efficiency would remain largely unchanged (“energy efficiency option”);
- (c) The climate impact of the equipment, so that after the conversion the climate impact would remain largely unchanged, taking into account its energy efficiency and any direct emissions related to the HCFCs (“climate impact option”); and
- (d) The energy efficiency of competing products of a similar quality after their conversion (“peer quality option”).

9. Each of the above options has certain consequences in terms of policy and practicality issues related to it. In the following paragraphs this document aims at highlighting some of the consequences in terms of policy and practicality.

Policy

10. Should the Executive Committee choose one of the above options, the dividing line between eligible and non-eligible activities will be established. This should also help to establish a clear understanding to what degree companies eligible under the Multilateral Fund can turn to carbon markets to fund activities beyond those eligible under the Multilateral Fund. Should the Executive Committee wish to establish a facility as discussed during this meeting, and should this facility be meant to address activities not eligible under the Multilateral Fund, including energy efficiency, agencies and countries could turn to the facility and apply for funding for increases in energy efficiency beyond the defined eligibility.

11. All presently available alternatives to HCFCs in the refrigeration and air conditioning sector, which are currently significant or have the potential to become so, use the same working principle and similar components. The energy efficiency therefore depends mainly on the substance, the quality of the components, and the engineering skills employed when designing the system out of the components. Significant improvements in any of the alternative technologies are possible as a function of the effort spent on components and on system design. In order to establish a comparable energy consumption, the use of components of similar quality is meaningful; this is also one of the underlying principles of the Multilateral Fund Climate Impact Indicator. The Executive Committee might wish to discuss whether the Meeting of the Parties referred in decision XIX/6 to energy efficiency as a typical characteristic of an alternative, rather than as an independent objective. Should the Executive Committee share the understanding that it is rather a characteristic of an alternative, then the Secretariat believes that the component option (a) would be the definition most accurately reflecting decision XIX/6 paragraph 11.

12. The energy efficiency option (b) would, in contrast, require that the Executive Committee would fund energy improvements in technologies with lower inherent energy efficiency, to achieve an improvement in the energy efficiency up to the level achieved with HCFCs.

13. The same point raised regarding the energy efficiency option (b) above also holds true for the climate impact option (c). In addition, while for all likely technology choices for a given application the energy efficiency of an alternative will show a limited deviation from the baseline, the situation is different for the climate impact. Since in many countries annual running hours of equipment are low, or electricity is produced with relatively small associated emissions of CO₂, the climate impact indicator will be strongly influenced by the global warming potential (GWP) of the alternative substance. Even moderate increases in the GWP (for example from HCFC-22 to HFC-410A with an increase in GWP of about 15 per cent) would require measures to reduce the amount of refrigerant in the refrigeration cycle, i.e. possibly a change in heat exchanger tube diameter (see also document UNEP/OzL.Pro/ExCom/60/47) to achieve substantial increases in the energy efficiency. This might, in the view of the Secretariat, lead to the creation of false incentives by inflating project budgets for alternatives that are inherently less sustainable and less desired, at least in terms of climate impact, since substantial improvements in technologies that are inherently adverse to the climate would be eligible, while technologies more beneficial for the climate would, in comparison, receive significantly less funding.

14. Should the Executive Committee decide to pursue either the option energy efficiency (b) or climate impact (c) funding levels for both could be established in a generic way, where funding is linked to a parameter such as HCFC consumption rather than a particular replacement technology. This would actually create an incentive to use the overall most beneficial technology, since the most cost effective way for a company to achieve the same energy efficiency or climate impact would point towards the most inherently benign alternatives. This concept is inherent in the approach to incremental operating cost discussed at this meeting under Agenda item 9 c).

15. The peer quality option (d) is in effect an extension of the previous option (b). The peer quality would be established in terms of energy efficiency of peer systems, and would create a moving benchmark for the energy efficiency aspect. However, choosing this option would, in the view of the Secretariat, stretch the intent of decision XIX/6 of the Meeting of the Parties.

Practicality

16. The scenarios above present a number of political considerations for the Executive Committee to consider. Another aspect is the issues related to the implementation of any decision taken. Any of the policies will lead to the need for the relevant implementing agency to incorporate related information into the project submission, and to the Secretariat having to review it. The following approaches appear possible:

17. The agency provides baseline information for each model or, in case of many models, for models manufactured in significant quantity. This baseline information could be:

- (a) For the heat exchanger a similar air-side surface area providing a reasonable approximation of the performance that is easy to determine, calculate and monitor; and
- (b) For the compressor the issue is more complicated. The Secretariat suggests comparing compressors of the same working principle except where a change would yield cost benefits without performance disadvantages. However, in particular when switching between manufacturers or between the model series of one manufacturer, considerable effort might be required to assemble the data and review the process, and will involve the determination of a comparative performance figure. The Secretariat will need to contract out the related work to a specialised service provider still to be identified.

18. The issue becomes more complicated still if increases in energy efficiency are required and related to the performance of the components, as is the case for the options energy efficiency (b), climate impact (c), and peer quality (d). Any refrigeration system is a balance between the different components,

and if the performance of any component is increased the system will likely improve, but the rate of improvement will be depending on the system and its other components. The Multilateral Fund Climate Impact Indicator (MCII) could be used to provide an indication of the result of component performance changes on the overall system; this could be used for the options (b), (c), and (d).

19. However, to implement the option of using peer quality (d) as a baseline, the peer quality would have to be established first. In order to determine the quality of peer systems in the market, the Secretariat would have to undertake, through a contractor, a market study of different types and sizes of air conditioning systems as well as subsequent updates, the latter probably about once every triennium. The resulting information on energy efficiency would form the basis for establishing energy efficiency targets for conversion projects.

20. Once the technical level of the components past conversion has been determined, the related incremental costs have to be established. This involves, in case of incremental capital cost (ICC), determining the cost of the conversion. While complex, the prices for the capital equipment items needed in a conversion can, with experience, be estimated with reasonable accuracy. In case of incremental operation cost (IOC), past experience of the Secretariat shows clearly that it is very difficult to assess the costs on a case-by-case basis. In particular compressors vary significantly in costs depending on source, quality, local or regional market, quantity purchased, and cost of the raw materials. The IOC for the component option (a), i.e. to fund a similar compressor, can be assessed with acceptable accuracy, since the cost per compressor would relate mainly to the cost increases in refrigeration oil, and in case of hydrocarbons the electrical components. The issue is more complicated for options (b) to (d) involving an upgrade of the compressors' performance. Depending on the decisions made under Agenda item 9 c) relating to the funding of IOCs and the selected baseline definition under this agenda item, the Secretariat might suggest a market study is undertaken to provide the necessary base data for a model on how to fund IOCs for compressors.

21. Should the Executive Committee decide on any of the options (b) to (d), potentially involving improvements in energy efficiency to meet the baseline, the Committee might wish to also consider how to ensure that the expected benefits actually arise. Any refrigeration or air conditioning product represents in its design an optimisation by the manufacturer of his manufacturing cost and the quality of the product the customer is expecting. In many cases the conversion will increase the manufacturing cost per unit, since the cost of HCFC-22 is presently very low compared to most alternative substances. A higher energy efficiency will increase manufacturing cost further. Depending on the market, the customer might be accepting a proportional increase in the unit price, or an even bigger increase, or might not be willing to pay as much. For the current products using HCFCs this optimisation has been carried out.

22. Should the Executive Committee provide funding for the energy efficiency upgrade of components, the potential for a subsequent reduction in the performance of components by the system manufacturer to yield per-unit cost benefits will increase. The wider the gap is between the current per-unit cost and the future ones, the more the Executive Committee will have to consider which assurances and, potentially, what monitoring activities are needed to ensure that any improvements agreed on are sustainably realised by the manufacturer. The Secretariat would like to point out that in cases where co-funding from carbon markets for energy efficiency improvements is being considered, monitoring will be required anyhow by the institutions issuing the carbon credits.

Conclusions

23. The Secretariat has provided above policy and operational considerations regarding four different options to define the baseline for funding of the conversion of refrigeration and air conditioning equipment. All four options can be implemented, and the documents shows what steps would be necessary. However, the Secretariat would like to suggest that consideration is only given to the options component (a) and energy efficiency (b). The option of climate impact (c) has, in the view of the

Secretariat, the disadvantage of providing false incentives, while the option of peer quality (d) would suggest that considerable funds might have to be diverted to covering energy efficiency improvements.

24. The component option is the easiest one to implement, and will allow a fair and simple project review and costing process. However, since some alternatives tend to have a lower energy efficiency than the baseline technology if there is no additional optimisation, the component option might lead to systems with a lower energy efficiency being introduced as compared to the HCFC baseline technology. The energy efficiency option (b) would address this concern. In order to operationalise the energy efficiency option, the Secretariat needs either to collect significant additional information through an external service provider and establish a complex calculation system, so placing an additional burden on the Secretariat's resources, or the Executive Committee would have to establish a generic system of determining IOCs, as presently discussed under Agenda item 9 c).

Secretariat's recommendation

25. The Executive Committee might wish to consider defining as a baseline for currently manufactured equipment in the refrigeration and air conditioning sector, against which funding is provided for the conversion of manufacturing facilities, either as:

- (a) The physical characteristics of the equipment to be no more than the sum of the physical characteristics of its components, so that after a conversion the defining characteristics of the components would remain largely unchanged or only improved to the degree necessary where no similar component would be available;

Or

- (b) The energy efficiency of the equipment, so that after a conversion the energy efficiency would remain largely unchanged; and
- (c) Request the Fund Secretariat to develop, in time for the 61st Meeting, terms of reference for a market study to provide the necessary base data for a model on how to fund incremental operating costs for compressors.
