UNITED
NATIONS

EP

United Nations
Environment
Programme

Distr.
LIMITED

UNEP/OzL.Pro/ExCom/36/35
22 February 2002

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-sixth Meeting
Montreal, 20-22 March 2002

POLICY PAPER ON ISSUES SURROUNDING THE CHOICE OF HCFC-141B FOR CONVERSION PROJECTS

(Submitted by the Government of France to the 36th Meeting of the Executive Committee of the Multilateral Fund)

Justification and intention

1. Based on an intervention from the German delegation, the 35th Executive Committee noted that the Government of Germany would prepare, for submission to the Committee at its 36th Meeting, and for timely circulation to members, a policy paper on issues surrounding the choice of HCFC-141b for conversion projects[1]. This paper has been prepared on the above basis.

2. Germany as well as other countries have sensed a tendency towards an increasing number of HCFC projects. This paper tries to assemble sufficient information to allow evaluation of this presumed trend, identify potential critical areas and show possibilities for action. The "Report on the Study on Alternatives to CFCs in Rigid Foam Applications"[2], presented at this 36th Meeting of the Executive Committee, focussed exclusively on small projects and - as per Terms of Reference - not at all on the foam component of refrigeration projects. The Refrigeration Sector incorporates about 45% of the rigid foam experience of the Multilateral Fund. Since because of these limitations no sufficient evaluation of the overall experience of the Multilateral Fund could be found in that report, it was necessary to perform some data assessments in order to provide the necessary background to suggestions made at the end of this paper.

Background and past decisions of the Meeting of the Parties and the Executive Committee

3. Both CFCs as well as HCFCs are listed as controlled substances under the Montreal Protocol. A5-Countries which have ratified the Copenhagen Amendment have agreed to phase out HCFCs. Due to the lower Ozone Depletion Potential of HCFCs compared to CFCs, HCFCs have a considerably longer time until final phase-out. Article 5 Countries may use HCFCs until 2040.

4. The technical properties of certain CFCs and HCFCs are sufficiently similar to allow replacement of a CFC by an HCFC with relatively little effort. This relates in particular to the use of HCFC-141b as a foam blowing agent, replacing CFC-11. Within the group of HCFCs, HCFC-141b is the most potent ODS with an ODP of 0.11 compared to 1.0 of CFC-11.

5. It is obvious that the replacement of one ODS by another poses a controversial issue, especially if this replacement is funded by the Multilateral Fund. The Multilateral Fund has been established in order to support Article 5 Countries in complying with the control measures of the Montreal Protocol; some countries believe that in supporting the A5 Countries to comply with early reduction targets by funding HCFC projects, the Multilateral Fund increases the problems for compliance with subsequent HCFC reduction targets.

6. Over the years, several discussions at the levels of the Meeting of the Parties as well as of the Executive Committee have taken place. In short, they were caused by the problem of conflicting priorities concerning HCFC-141b projects. On the one hand, there is the objective to

[1] UNEP/OzL.Pro/ExCom/35/67 para. 73
[2] UNEP/OzL.Pro/ExCom/36/34

achieve a substantive reduction in ODP weighted consumption of ODS as fast as possible, which is often simpler by using HCFCs than other technologies, especially given that the resources of the Multilateral Fund are limited. On the other hand, a simpler conversion away from a CFC might lead to more problems in the later phase-out of HCFCs. This might be in particular the case because the Multilateral Fund has, in addition to the projects funded, also a significant indirect effect on the technology choice of other consumers in the country.

7. It seems to have been the consensus in the past decisions of the ExCom that HCFC in general and HCFC-141b in particular should be used only if either

- there is no other CFC replacement technology viable for the problem, or
- other viable replacement technologies can not be used by the enterprise, because of lack of supply of the necessary chemicals or similar problems, or
- the responsible use of alternative technologies would lead to costs which are in comparison to other projects of the Multilateral Fund in that sector exceptionally high.

8. Consequently, the Executive Committee bearing in mind the London Resolution on HCFCs took several decisions over the years that were meant to limit the funding of conversion projects to HCFCs according to the above criteria. The Twelfth Meeting of the Executive Committee recommended that consideration of the use of HCFC in Multilateral Fund projects should be sector-specific and approved for use *only in areas where more environment-friendly and viable alternative technologies are not available*.[3] Further, the Fifteenth Meeting requested that Implementing Agencies should note a presumption against HCFCs when preparing projects; and, where HCFC projects were proposed, the choice of this technology should be fully justified and include an estimate of the potential future costs of second-stage conversion.[4] The latter request was dropped later because it turned out to be not practical. The Nineteenth Meeting decided that in the future, in cases where conversion to HCFCs was recommended, the Implementing Agencies should be requested to provide a full explanation of the reasons why such a conversion was recommended, together with supporting documentation that the criteria laid down by the Executive Committee for transitional substances had been met, and should make it clear that the enterprises concerned had agreed to bear the cost of subsequent conversion to non-HCFC substances.[5] As a next step, the Executive Committee requested the Implementing Agencies to ensure that adequate information on all alternative technologies was provided to enterprises converting from CFCs[6]. Further on, where, upon review by the Fund Secretariat, a project proposal requesting HCFC technology was considered to provide inadequate information justifying the choice of that technology, the project should be submitted for individual consideration by the Sub-Committee on Project Review.[7]

9. Finally, the 27th Meeting of the Executive Committee decided to request that Implementing Agencies provide, for all future projects or groups of projects for HCFCs from any country, a letter from the Government concerned. In the letter, the country should:

[3] UNEP/OzL.Pro/ExCom/12/37, para. 168
[4] UNEP/OzL.Pro/ExCom/15/45, para. 129
[5] UNEP/OzL.Pro/ExCom/19/5, para. 12
[6] UNEP/OzL.Pro/ExCom/20/72, Decision 20/48, para 72 (b, c)
[7] UNEP/OzL.Pro/ExCom/26/70, Decision 26/26 (para. 50)

(a) Verify that it had reviewed the specific situations involved with the project(s) as well as its HCFC commitments under Article 2F;
(b) State if it had nonetheless determined that, at the present time, the projects needed to use HCFCs for an interim period;
(c) State that it understood that no funding would be available for the future conversion from HCFCs for these companies.[8]

We have noted that in response to decision 27/13 the majority of letters received to date are signed by the heads of National Ozone Units. The evaluation of Institutional Strengthening projects showed that these units are, with some exceptions, "generally on a relatively low hierarchical level with limited access to the top decision makers".[9] In this context the commitment of the country concerned with respect to the letter required in decision 27/13 might be questionable.

Overview of past foam projects supported by the Multilateral Fund

10. In order to understand the actual impact of HCFC-141b projects, an analysis of projects in the foam sector up to and including the 34th Meeting of the Executive Committee has been performed on the basis of the Inventory of Approved Projects[10]. Contrary to the report contained in document 36/34 "Report on the Study on Alternatives to CFCs in Rigid Foam Applications", this policy paper takes into account the rigid foam part of refrigeration projects. Its impact on the analysis is apparent from table 1 below.

Table 1: Projects including conversion of rigid foam manufacturing in the Foam Sector and the Refrigeration Sector (as of September 2001).

	Amount of projects		**CFC phased out [ODP tons]**	
	Number	**Percentage of total**	**Amount**	**Percentage of total**
Rigid Foam total	892	100.0%	42 310 ODP tons	100.0%
Rigid foam in Foam Sector	487	54.6%	21 314 ODP tons	50.4%
Rigid foam in Refrigeration Sector	405	45.4%	20 996 ODP tons	49.6%

11. Refrigeration projects with a foam component were included in the analysis, using only the the foam component of the project; similarly, projects in multiple sub-sectors were divided into the different sub-sectors. The foam projects were divided into four groups: Rigid foam, flexible and molded foam, integral skin, other. The result of the analysis is shown in table 2.

[8] UNEP/OzL.Pro/ExCom/27/48, Decision 27/13
[9] UNEP/OzL.Pro/ExCom/33/7;"Final Report on the Evaluation of Regional Networks"
[10] "Inventory of Approved Projects" database provided by the Multilateral Fund Secretariat November 2001; Implementing agency version

Table 2: Conversion to HCFC-141b by sub-sectors (as of September 2001)

Sub-sector	Total phaseout	Replaced by HCFC-141b	percentage of sub-sector total	Replaced by other HCFC	percentage of sub-sector total
Rigid (including PUR component of refrigeration projects)	42 151 ODP tons	22 072 ODP tons	52.4%	551 ODP tons	1.3%
Integral skin	4 652 ODP tons	1 053 ODP tons	22.6%	182 ODP tons	3.9%
Flexible, molded	16 693 ODP tons	140 ODP tons	0.8%	35 ODP tons	0.2%
Other	1 001 ODP tons	10 ODP tons	1.0%	0 ODP tons	0.0%
Total	**64 496 ODP tons**	**23 275 ODP tons**	**36.1%**	**768 ODP tons**	**1.2%**

12. It is obvious that by far most important sub-sectors in terms of use of HCFC-141b are the Rigid and Integral Skin Sub-Sectors. In the integral skin sub-sector, it is only allowed to use HCFC-141b in those cases where no other technology is available. This provision allows projects in companies manufacturing for the automotive industry to continue to use HCFC-141b, since there are no replacements available which are fulfilling the quality requirements of the automotive industry. According to information provided by the Multilateral Fund Secretariat and consistent with the 1998 Assessment of the TOC Foam, non-HCFC technologies for this market are proprietary and can therefore not be transferred. Therefore the only sub-sector of relevance for a more detailed assessment of the use of HCFC-141b is the Rigid Foam Sub-Sector, combined with the rigid foam part of Refrigeration Sector projects.

Rigid Foam Sub-Sector projects and Foam component of Refrigeration Sector projects

13. There are several technologies used as CFC replacement in projects in the rigid foam sector. From the comparison in table 3 it becomes clear that the predominant technologies in the sub-sector are HCFC141b and hydrocarbons (Cyclopentane and Pentane). Consequently, the analysis concentrates on HCFC-141b and its most important alternative in the sub-sector, hydrocarbon technology.

14. It has been noted that there is a general perception that HCFC-141b projects are mainly used for small projects, since hydrocarbon technology is presumed to be not suitable for such projects. Both the perception concerning HCFC-141b projects as well as the presumption about hydrocarbon technology were assessed. The structure of the HCFC-141b projects in terms of size is shown in table 4. The analysis was performed twice, once for all projects and then - since umbrella projects combining several enterprises in one project mislead about the individual project size – only for the non-umbrella projects. Sector strategies and similar approaches were not considered.

Table 3: Technology overview of rigid foam projects

	CFC phased out [ODP tons]		Number of projects	
	Amount	**Percentage of total**	**Number**	**Percentage of total**
Total	42 310 ODP tons	100%	892	100%
HCFC-141b	22 072 ODP tons	52%	672	75%
Cyclopentane / Pentane	17 684 ODP tons	42%	145	16%
Water /CO2	1 325 ODP tons	3%	48	5%
HCFC-22	551 ODP tons	1%	13	1%
CFC 11-50% reduced CFC (only until 1994)	496 ODP tons	1%	7	1%
HCFC-22/HCFC-142b	83 ODP tons	0%	2	0%
HFC-134a	98 ODP tons	0%	5	1%

Table 4: Size of HCFC-141b projects

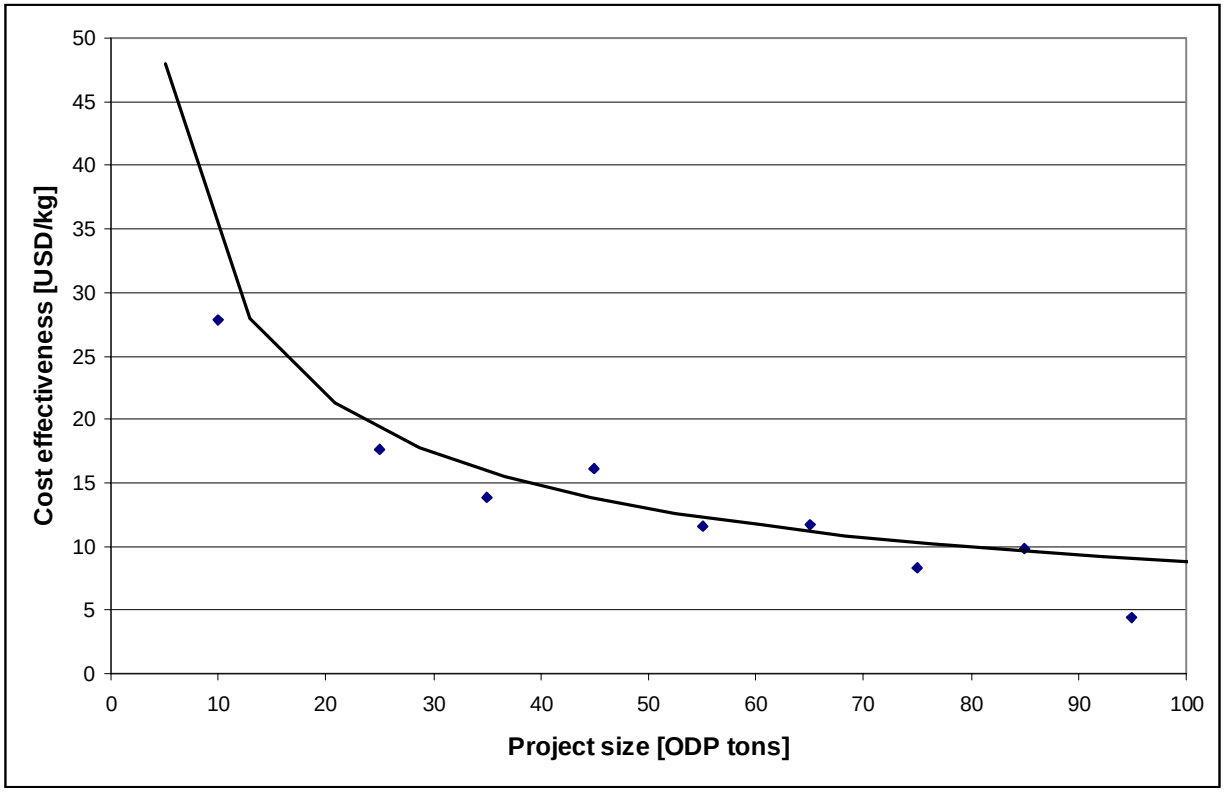
	Including umbrella projects		Excluding umbrella projects	
	Number	**Percent of total**	**Number**	**Percent of total**
Total projects	672	100.0%	617	100.0%
above 100 ODP tons	35	5.2%	25	4.1%
Between 50 and 100 ODP tons	69	10.3%	62	10.0%
Between 40 and 50 ODP tons	31	4.6%	25	4.1%
Between 30 and 40 ODP tons	41	6.1%	38	6.2%
Between 20 and 30 ODP tons	84	12.5%	77	12.5%
Between 10 and 20 ODP tons	231	34.4%	219	35.5%
Between 0 and 10 ODP tons	181	26.9%	171	27.7%

15. As expected, the focus of HCFC-141b projects are projects with a lower replacement level, more than 60% of the projects replace 20 ODP tons or less. A similar comparison for Pentane and Cyclopentane projects is given in the below table 5; since only one umbrella project with hydrocarbons has been carried out, table 5 does not differentiate between umbrella and standard projects. While clearly the focus of the hydrocarbon technology application is at larger projects, more than 40% of the projects were phasing out less than 50 ODP tons, more than 30% even below 30 ODP tons. This is somewhat contrary to the general assumption that projects below 50 ODP tons can hardly be implemented under the given cost effectiveness requirements of the Multilateral Fund.

Table 5: Size of Pentane and Cyclopentane projects

	Number	Percent of total
Total projects	145	100.0%
above 100 ODP tons	48	33.1%
between 50 and 100 ODP tons	34	23.4%
between 40 and 50 ODP tons	11	7.6%
between 30 and 40 ODP tons	7	4.8%
between 20 and 30 ODP tons	17	11.7%
between 10 and 20 ODP tons	25	17.2%
between 0 and 10 ODP tons	3	2.1%

16. Next the cost effectiveness of hydrocarbon projects was determined, using the actual costs of completed and approved costs in case of ongoing projects. For projects below 100 ODP tons phase-out, the results are shown in graph 1. It shows the average cost effectiveness for different amounts of ODS tons and a fitted curve. The increase of project costs up to a project size of 30 ODP tons is relatively linear, then rises sharply with smaller projects. Typically, the projects below 50 ODP tons phase-out are foam components of refrigeration projects. While the project size relates only to the size of the foam – component, the cost effectiveness is on the basis of the effectiveness of the whole project, i.e. foam and refrigeration part. A certain cross financing within one project between the refrigeration and foam part can not be excluded, therefore the cost effectiveness values for smaller projects can only be indicative.



Graph 1: Cost effectiveness of hydrocarbon foam projects vs. their project size

Information concerning technologies

17. CFC11 and HCFC-141b are sufficiently alike to use one as a replacement for the other with relatively little incremental investment costs. HCFC-141b is slightly more reactive with some plastics, which leads to certain conversion costs. HCFC-141b and HCFC-141b suited chemicals for the foam cause moderate incremental costs. HCFC-141b has an ODP of 0.11 and a GWP of 810 CO_2 equiv. (100a).

18. For rigid foams, two zero ODP alternatives are presently established. One is the technology of HFC-134a, which provides noticeably poorer insulation (-10%) compared to HCFC-141b and has high operating costs, but low conversion costs if the enterprise is equipped with high pressure foam equipment; this is typically not true for very small enterprises. HFC-134a has a GWP of 1300 (100 a). The second existing alternative are the hydrocarbons Pentane and Cyclopentane, which have a negligible GWP of 12, a slightly lower insulation quality than HCFC-141b (~ -3%), lower operating but higher investment costs. The latter are due to the flammability of hydrocarbons, which requires safety precautions. It is assumed that these safety related costs are for installations below 100 ODP tons capacity relatively independent from the size of the installation, i.e. they constitute unavoidable minimum costs. According to the "Report on the Study on Alternatives to CFCs in Rigid Foam Applications" presented to this 36th Meeting of the Executive Committee, there have been cases where local fire or safety authorities were hesitant to approve installation of such hydrocarbon equipment, in particular if the manufacturing site is located within a densely populated residential area.

19. Two emerging technologies are HFC-245fa and HFC-365mfc; both are patented substances. HFC-365mfc is flammable and will therefore probably require the same or similar safety technology as Cyclopentane. HFC-245fa appears to be a near-identical replacement for CFC-11. HFC-245fa has been developed especially for highly efficient insulation against lower temperatures. HFC-365fa covers most of the remaining foam applications. In both cases, these fluids have not reached the market as of yet, commercial quantities are expected within this year. The GWP of both alternatives is higher than HCFC-141b. Within a recent article, the probable costs for these blowing agents in industrialised countries (USA) are given; costs in other countries, particularly in developing countries, will vary. These costs are given in table 6.

Table 6: Cost comparison of CFC-11 alternatives (values for USA)[11]

Blowing agent	Approximate (initial) costs [USD/kg blowing agent]	Costs compared to costs of HCFC-141b
HCFC-141b	2.60	100%
Pentane (flammable)	0.44	17%
Cyclopentane/Isobutane (flammable)	1.65	63%
HFC-134a	4.40	169%
HFC-245fa	10.00	385%
HFC-365mfc (flammable)	5.00	192%

[11] Costs: all except HFC-365mfc from "PlasticsTechnology", Jan.12th, 2002; HFC-365mfc: Manufacturer

Restrictions on future HCFC-141b use in Article 2 Countries

20. During the next years restrictions concerning HCFC-141b are scheduled in major Article 2 Countries and regions. As the first country, the United States will phase-out the consumption of HCFC-141b by the end of 2002. While US manufacturer are only allowed to use the remaining stockpile before converting, there are no restrictions (yet) for imports of products containing HCFCs.[12] One year later, the EU will phase out the use of HCFC-141b and will not allow imports of products containing HCFC-141b. This is relevant e.g. for the import of refrigerators and cars containing HCFC-141b blown integral skin foam.

Conclusions and possible actions

21. In our opinion, the above information demonstrates the following:

- Outside the Rigid Foam, the Integral Skin Sub-Sector and the rigid foam conversion in refrigeration products, there is no need for using HCFC-141b as CFC replacement. In the Integral Skin Sub-Sector, only automotive applications should be allowed to use HCFC-141b. Mechanisms to ensure these restrictions are already incorporated in the project evaluation process of the Multilateral Fund.
- In the rigid foam sector, a significant share of ODS phase-out has been achieved through non-ODS technologies (45%), with Pentane/Cyclopentane being the most prominent ones.
- In the rigid foam sector, there are technical reasons to assume that projects below a certain size (in terms of ODS being phased out) using hydrocarbon foaming technology will increase the project costs significantly. The "Report on the Study on Alternatives to CFCs in Rigid Foam Applications" to be discussed at the 36th meeting suggests as the borderline for a meaningful project size 50 ODP tons, largely based on interviews with the beneficiaries. A similar figure has been given by foam sector experts. Nevertheless, in the refrigeration sector, projects below this level are numerous. First investigations indicate that these cause only a moderate cost increase even below 50 ODP tons. Despite the fact that there is a certain agreement that non-ODS projects above 50 ODP tons can typically be implemented within the financial limitations of existing Multilateral Fund rules, there are still a significant number of HCFC-141b projects above 50 ODP tons. These constitute actually in the order of 30% to 50% per year of projects above 50 ODP tons.

22. Based on these considerations, the Government of Germany would like to suggest to the Executive Committee to consider the following ways forward:

- To use a phase-out of 50 ODP tons per enterprise as a provisional threshold limit above which HCFC-141b projects are no more considered, except when the Implementing Agency has demonstrated – e.g. by a letter of the local fire department - that in a particular case other technologies can not be implemented.

[12] Regulations to control Ozone Depleting Substances: A guidebook; by UNEP DTIE, MLF, SEI; Stockholm, Sweden / Paris, France, 2000

- To request the Multilateral Fund Secretariat to provide to the 37th Meeting an overview paper about historic and expected future cost effectiveness of hydrocarbon foam projects, and, on that basis, prepare a proposal on how to modify the provisional threshold limit, if the study suggests that such a modification is meaningful.
- To request that agencies determine in case of umbrella projects and, in particular, in case of Sector or Sub-Sector projects, the viability of including supply support for non-ODS pre-blended polyol instead of using pre-blended polyol with HCFC-141b. In order to assess the viability of such an approach, up to three demonstration projects outside the rigid foam threshold can be funded within 2002.
- To request agencies to add to the adequate enterprise information as per decision 20/48 data concerning import restrictions into A2C and the cost situation for alternatives. The enterprises should acknowledge having received this information; the according documentation should accompany the project proposal.
- To request the Multilateral Fund Secretariat to send to the National Ozone Unit of the recipient country, with copies to the Environment and Foreign Affairs Ministries, a letter recalling that HCFC-141b projects will be excluded for funding in the future (no second conversion).
- To request the Multilateral Fund Secretariat to issue an overview report on this issue within the annual report of the Multilateral Fund. This report should state by country the amount of HCFC-141b consumption through projects using HCFC as replacements, a consumption which will - in application of decision 27/13 - be excluded from funding at future stages.
