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THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Seventy-fourth Meeting
Montreal, 18-22 May 2015

# OVERVIEW OF ISSUES IDENTIFIED DURING PROJECT REVIEW

1. This document consists of the following sections:

   (a) An analysis of the number of projects and activities submitted by bilateral and implementing agencies to the 74th meeting;

   (b) Issues identified during the project review process:

      (i) Modalities for the fund disbursement threshold for the HCFC phase-out management plans (HPMP) (decision 72/24(a));

      (ii) Progress and verification reports of country's compliance with the HPMP agreement after the approval of the last tranche of HPMPs;

      (iii) Temporary use of a high-global warming potential (GWP) technology by enterprises that were converted to a low-GWP technology; and

      (iv) Requests for funding to conduct inventories or surveys on alternatives to ODS (decision XXVI/9);

   (c) Projects to demonstrate low-GWP technologies and feasibility studies on district cooling pursuant to decision 72/40;

   (d) Blanket approval:

      (i) Verification reports of low-volume-consuming (LVC) countries' compliance with their HPMP agreement in 2014;

      (ii) Projects and activities submitted for blanket approval; and

   (e) Investment projects for individual consideration.

**Projects and activities submitted by bilateral and implementing agencies**

2. Bilateral and implementing agencies submitted to the 74th meeting 219 funding requests for tranches of approved multi-year agreements, projects and activities amounting to US $65,162,749, including agency support costs where applicable. The funding requests covered:

(a) One stage II of the HCFC phase-out management plan (HPMP) for an LVC country;

(b) Second/third/fourth tranches of approved HPMPs for 31 countries;

(c) One new methyl bromide (MB) technical assistance programme;

(d) Renewals of institutional strengthening (IS) projects in 26 countries;

(e) Project preparation for stage II of the HPMP/HCFC phase-out investment activities for six countries;

(f) One project preparation for establishment of a regional centre of excellence;

(g) Twenty-seven project preparation, two projects to demonstrate low-global-warming potential (GWP) technologies and three feasibility studies on district cooling pursuant to decision 72/40; and

(h) Inventories or surveys on alternatives to ozone-depleting substances (ODS) in 86 countries (decision XXVI/9 of the Meeting of the Parties).

3. Following the project review process, 65 projects and activities totalling US $10,131,733 including support costs, are recommended for blanket approval and 137 projects and activities totalling US $51,989,179 are being forwarded for individual consideration. Together, the projects for blanket approval and those for individual amount to US $62,120,912.

IS renewal requests

4. The Secretariat reviewed the terminal reports and requests for extension of IS funding for 26 countries against relevant decisions[1]. All requests were cross-checked against: previous IS reports; progress reports on the implementation of country programmes and HCFC consumption and production data submitted under Article 7 of the Montreal Protocol; the latest reports on implementation of HPMPs; bilateral and implementing agencies' progress reports; and relevant decisions on compliance adopted by the Parties to the Montreal Protocol. The Secretariat also checked the date of submission of country programme data and requested clarifications from agencies about whether countries would be able to submit information in advance of the 1st May deadline. The responses received indicated that many countries would be able to or would attempt to submit country programme data reports in advance of the 1st May deadline although in some cases countries stated that it would not be possible[2].

Requests for project preparation funding for stage II of HPMPs

5. Implementing agencies submitted a request for funding for the preparation of stage II of HPMPs for one country (preparation of the overarching strategy for Turkey) and two requests (Egypt and the Islamic Republic of Iran) for funding in addition to what had already been approved for stage II HPMP preparation

[1] The IS renewal requests for four countries (Bhutan, Bosnia and Herzegovina, Libya and Oman) were submitted six or more months in advance of the date of renewal and were reviewed in accordance with decision 70/23(b)(ii).

[2] This issue is further discussed in the document on country programme data and prospects for compliance (UNEP/OzL.Pro/ExCom/74/11).

for them. These requests were reviewed in light of the guidelines in decision 71/42; phase-out priorities[3]; and previous funding provided for the preparation of stage I, and for stage II of HPMPs (for Egypt and the Islamic Republic of Iran, approved at the 73rd and 72nd meetings, respectively).

6. The recommendations by the Secretariat were made after all outstanding issues were satisfactorily addressed. The Secretariat noted that these requests for project preparation funding for stage II were comprehensive, and provided the information required in line with the guidelines.

Projects and activities submitted and subsequently withdrawn

7. During the project review process, issues associated with the following tranches of HPMPs, at a total cost of US $1,656,522, could not be addressed on time, and therefore, were withdrawn by the relevant lead implementing agency: Bahrain (second tranche), Guatemala (third tranche), Jordan (second tranche), Senegal (second tranche) and the Bolivarian Republic of Venezuela (fourth tranche). The reasons for the withdrawal of these tranches are described in the document on tranche submission delays[4].

8. A stand-alone project for the phase-out of HCFC-141b contained in imported pre-blended polyols in Ecuador was also withdrawn, as the alternative technology for some foam applications had not yet been identified. In addition, one request for ODS survey, one request for preparation of a demonstration project for low-GWP alternatives and project preparation for stage II of the HPMP/HCFC phase-out investment activities for three countries were withdrawn.

**Issues identified during project review**

9. During the project review process, the Secretariat identified several issues for which guidance is sought from the Executive Committee. The Secretariat is also presenting information requested by the Committee on specific issues that were identified in previous meetings.

Modalities for the fund disbursement threshold for HPMPs (decision 72/24(a))

*Background*

10. At the 71st meeting, in the context of the discussion of the document on the overview of issues identified during project review[5], the Executive Committee recalled that there was a need for a common understanding on the application of the 20 per cent disbursement threshold as a precondition for the approval of a tranche of an HPMP and, *inter alia,* requested the Secretariat to review it with a view to clarifying and ensuring its consistent application, and to enable consideration of alternative options for defining pre-conditions for submission of multi-year tranches (decision 71/29).

11. In reporting to the 72nd meeting on this issue, the Secretariat drew the Committee's attention to the fact that the 20 per cent disbursement threshold was not the only condition for tranche submissions; a significant level of implementation of investment and other activities was also required. Withdrawal of tranche submissions was often associated with a low level of implementation[6]. Following a discussion the Executive Committee, *inter alia,* requested the Secretariat to continue assessing different modalities for the fund disbursement threshold for HPMPs and to inform the Executive Committee of the results of this analysis no later than the first meeting in 2015 (decision 72/24(a)).

[3] Bilateral agencies, implementing agencies and Article 5 countries were reminded to prioritize the phase-out of HCFC-141b and compliance with the 2020 target, when requesting and using project preparation funds for projects in non-LVC countries (decision 72/18).
[4] UNEP/OzL.Pro/ExCom/74/6.
[5] UNEP/OzL.Pro/ExCom/71/64.
[6] Paragraph 101 of document UNEP/OzL.Pro/ExCom/72/47.

12. The Secretariat is presenting the following analysis in response to decision 72/24(a).

*Objective of the 20 per cent disbursement threshold*

13. The pre-conditions for the release of a funding tranche of the HPMP for an Article 5 country are listed in paragraph 5 of the Agreement between the Article 5 country concerned and the Executive Committee for reductions in consumption of HCFCs. These pre-conditions include *inter alia*:

(a) That the HCFC consumption targets for all relevant years have been met, and that they have been independently verified (unless the Executive Committee has decided that such verification would not be required);

(b) That the country has submitted a tranche implementation report covering each previous calendar year; that it has achieved a significant level of implementation of activities initiated with previously approved tranches; and that the rate of disbursement of funding available from the previously approved tranche was more than 20 per cent; and

(c) That the Country has submitted a tranche implementation plan covering each calendar year until and including the year for which the funding schedule foresees the submission.

14. Accordingly, the 20 per cent disbursement threshold is always used in conjunction with a thorough review of the progress in implementing previously approved activities. Only one of these two conditions would not be sufficient for a comprehensive assessment of the progress being achieved.

*Reasons for and solutions to tranche submission delays*

15. In responding to decision 72/24(a), the Secretariat reviewed the reasons for delays in the submission of tranches provided by bilateral and implementing agencies at the last four meetings, and the information in the consolidated progress report of the Multilateral Fund. Based on this review, it was found that there were several other reasons that prevented the submission of tranches, even if the reason had been initially reported as "non-compliance with the 20 per cent disbursement". The reasons identified are summarized in Table 1.

**Table 1: Reasons for tranche submission delays as reported by bilateral and implementing agencies**

| Reason for delay | Executive Committee meeting | | | | | % of total |
|---|---|---|---|---|---|---|
| | 71st | 72nd | 73rd | 74th | Total | |
| Signing of agreement | 6 | 6 | 4 | 5 | 21 | 19 |
| Insufficient progress in implementation (expected milestones not achieved; procurement issues; enterprises issues) | 4 | 4 | 3 | 3 | 14 | 13 |
| Change of NOU or other Government's delays | 4 | 2 | 4 | 2 | 12 | 11 |
| Lack of the mandatory verification report | | | 4 | 6 | 10 | 9 |
| External factors (e.g., political unrest, security, difficulty to travel) | 2 | | 4 | 3 | 9 | 8 |
| Delays by bilateral and/or implementing agencies | | 2 | 1 | 4 | 7 | 6 |
| Recent approval of the previous tranche | | 3 | | 7 | 7 | 6 |
| Sufficient funds available | | | | 3 | 6 | 5 |
| Lack of submission of progress and financial reports | | 5 | | | 5 | 5 |
| Administrative issues (change of implementation modality, difficulties in opening bank account) | 2 | 3 | | | 5 | 5 |
| Lack of confirmation of operational licensing system | | | 3 | 1 | 4 | 4 |
| Other technical reasons not specified | | | 4 | | 4 | 4 |
| Lack of the letter of endorsement by the Government | | | 2 | 1 | 3 | 3 |
| Exclusively below the 20 per cent disbursement threshold | 1 | | 1 | | 2 | 2 |
| Reasons not reported | | 1 | | | 1 | 1 |
| **Total** | **19** | **26** | **30** | **35** | **110** | **100** |

16. As shown in Table 1, only 15 per cent of the tranches that were not submitted were exclusively attributed to disbursements below the 20 per cent threshold (i.e., 13 per cent were due to insufficient progress, which affects the level of disbursement; and two per cent (associated with two tranches), where disbursement was below 20 per cent. For the majority of the reasons cited for the delays in Table 1, the Secretariat would have been unable to recommend the next funding tranche, even if the 20 per cent disbursement threshold had not been considered.

17. Based on the experience gained so far in the implementation of stage I of HPMPs, and taking into account common reasons for delays as shown in Table 1, bilateral and implementing agencies may consider the following actions in advance of the submission of funding tranches of HPMPs:

(a) Preparing internal implementation documents, including draft documents (e.g., agreements, memorandum of understanding), between the Government and the agency concerned to facilitate signature immediately after project approval is given;

(b) Defining and negotiating implementation modalities between the Government and the agency concerned; and

(c) Designing the schedule of funding tranches according to the type of activities to be implemented and their costs.

*Assessment of the 20 per cent disbursement threshold*

18. The 20 per cent disbursement threshold serves as an indicator to quantitatively assess the progress achieved in the implementation of the activities included in tranches of HPMPs (project milestones). It measures disbursement rather than obligations or commitments, or that an activity will take place but not necessarily that the specific implementation milestones have been completed. This indicator is applied equally to all countries, regardless of their size, or the nature of the activities included in their HPMP.

19. One limitation of the 20 per cent disbursement threshold is that it cannot provide a quantitative assessment of the progress associated with all previously approved tranches, as it only relates to the disbursement of the last approved funding tranche. While this is a limitation, the Secretariat does assesses whether significant progress has been achieved in the activities planned from the previous tranche, as this is also a precondition for recommending approval of the requested tranche.

*Modalities for the 20 per cent disbursement threshold*

20. Although the limitations of applying the 20 per cent threshold do not appear to be significant, the Secretariat considered other modalities, in particular, a model based on a minimum disbursement threshold that takes into account all approved tranches[7]. The model assumes that the period of implementation of each funding tranche is four years, with minimum annual disbursement levels required for each year of the tranche. In applying this model, it is assumed that the minimum level of disbursement will increase over time, making the precondition for the approval of the future tranches more difficult to achieve.

21. Based on feedback from the implementing agencies, the Secretariat modified the model by increasing the duration of the tranches to up to five years and reducing the minimum disbursement thresholds as shown in Table 2.

[7] The model was discussed with bilateral and implementing agencies during the Inter-agency coordination meeting, held Montreal in February 2015.

**Table 2. Parameters used in an alternative model for the disbursement threshold**

| Duration of one tranche (year) | Disbursement rate (%) | | | | |
|---|---|---|---|---|---|
| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| 5 | 10 | 10 | 30 | 40 | 10 |
| 4 | 10 | 20 | 60 | 10 | |
| 3 | 10 | 30 | 60 | | |
| 2 | 30 | 70 | | | |

22. For illustration purposes, the Secretariat applied the model to stage I of the HPMPs for Brazil, China (polyurethane foam), and El Salvador, representing different funding structures, as shown in Table 3.

**Table 3. Minimum thresholds of cumulative disbursement per year**

| Country | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Funding (US $)** | | | | | | | | | | |
| Brazil | 566,736 | 1,720,946 | 4,308,829 | 9,238,798 | 15,475,573 | 19,607,231 | | | | |
| China | 3,885,900 | 8,323,800 | 21,892,700 | 42,218,600 | 60,976,400 | 73,000,000 | | | | |
| El Salvador | 69,685 | 139,370 | 348,425 | 627,164 | 704,592 | 738,835 | 788,563 | 899,034 | 1,012,777 | 1,039,277 |
| **Disbursement rate (%)** | | | | | | | | | | |
| Brazil | 2.89 | 8.78 | 21.98 | 47.12 | 78.93 | 100.00 | | | | |
| China | 5.32 | 11.40 | 29.99 | 57.83 | 83.53 | 100.00 | | | | |
| El Salvador | 6.71 | 13.41 | 33.53 | 60.35 | 67.80 | 71.09 | 75.88 | 86.51 | 97.45 | 100.00 |

23. Although the same methodology was applied in all three cases, the minimum levels of disbursement varied widely as these depend on the funding levels of each of the tranches, the periodicity of the tranches and the total number of tranches.

24. In providing feedback about considering an alternative disbursement threshold, UNDP and the World Bank indicated that, as funds from each tranche are combined into a single account, a threshold based on cumulative disbursements would better fit their system. In the cases of UNEP and UNIDO, where each tranche is kept distinct from the other, UNEP indicated that, in general, meeting the 20 per cent threshold is not an issue for tranches in LVC countries, while UNIDO indicated that the 20 per cent disbursement threshold could continue to be used but that a certain flexibility would be useful as sometimes disbursements from a new tranche could, for a variety of reasons, start late (e.g., when funds are retained by the Treasurer due to the lack of a satisfactory verification).

25. While the proposed model addresses several inputs provided by the implementing agencies, especially those from UNDP and the World Bank, it is more of a financial management tool than a progress indicator, as it would mostly focus on limiting the accumulation of funds. In doing so, it poses a larger risk of becoming a negative factor in providing financial assistance and causing delays in implementation, compared to simply meeting a disbursement requirement to indicate performance. For instance, in almost all of the sample cases the disbursement thresholds required for future tranches became very high, despite using the very conservative assumption of five-year periods for each tranche (when currently the majority of tranches have a duration of only one or two years, and the average duration of an investment project is three years). In addition, extending the duration of tranches by as long as five years brings additional monitoring difficulties, as this would create a situation where three or more tranches are being implemented at the same time. The experience during the implementation of national CFC phase-out plans, where the end of tranches was defined by a year (e.g., 2009) without consideration of those activities included therein resulted in balances that were not known until 2011.

26. Based on this experience, the Secretariat considered it more prudent to continue using the existing threshold in combination with existing monitoring tools in a more complementary and efficient manner, as this is an indicator that is applicable to all bilateral and implementing agencies without difficulty. Moreover, the primary indicators of first disbursement, advancement of activities from one milestone to the next, and achievement of planned completion without delays are the key historic progress indicators of the Fund.

Coupled with a close monitoring of planned activities for the tranche (achievement of milestones) and completion (normally up to three years) during progress reporting for each request for future tranches, the 20 per cent disbursement threshold would be a good indicator of progress as required in the Agreement between the recipient countries and the Executive Committee.

27. An example of this is the current tranche request from Brazil[8]. Based on the overall level of fund disbursement and upon a request by the Secretariat, UNDP confirmed that the established date of completion of stage I (i.e., December 2016) was to be maintained and provided a plan of disbursements up to December 2016 based on the implementation milestones. In the case of Iraq[9], as the second tranche is being requested in 2015, after the last consumption target should have been achieved, the Secretariat is requesting UNEP to provide a revised HCFC reduction strategy based on the current situation.

*Flexibility in applying the 20 per cent disbursement threshold*

28. There has been flexibility in applying the 20 per cent threshold as a requirement for the approval of a tranche as the Committee has taken into account other progress indicators such as the completion of project milestones, the requirement of the next tranche in relation to the achievement of compliance, and reconsideration of tranches in the light of delays in meeting the initial conditions of project implementation. During the review of projects at this meeting, the Secretariat is recommending that the Executive Committee consider approving the tranche for Kuwait[10] for the second reason despite the fact that the 20 per cent threshold has not been met. The existing conditions in agreements for stage I HPMPs allow for such flexibility in the consideration of tranche requests.

*Conclusion*

29. Based on the above analysis, the Secretariat concluded that the 20 per cent disbursement threshold should be maintained as one of the indicators for assessing progress on implementation of previously approved funding tranches and for recommending approval of future tranches.

*Secretariat's recommendation*

30. The Executive Committee may wish to consider:

(a) Maintaining the 20 per cent disbursement threshold in line with decision 72/24(b); and

(b) Requesting bilateral and implementing agencies, in assisting Article 5 countries in the preparation of future stages of their HCFC phase-out management plans, to carefully design the schedule of submission of tranches and their completion according to the activities to be implemented in the next one to three years and their associated costs, and commence all preparatory work, such as legal agreements or memorandums of understanding as required, in advance of the submission of funding tranches.

<u>Progress and verification reports of countries' compliance with the HPMP agreement after approval of the last tranche of HPMPs</u>

31. For most of stage I of HPMPs, the last funding tranche is requested in the last year of implementation in line with decision 62/17[11]. However, for a few HPMPs the last funding tranche is

[8] UNEP/OzL.Pro/74/22.
[9] UNEP/OzL.Pro/74/34.
[10] UNEP/OzL.Pro/74/35.
[11] Bilateral and implementing agencies were requested, when preparing multi-year HCFC phase-out management plans, to ensure that the last tranche comprised 10 per cent of the total funding for the refrigeration servicing sector in the agreement and was scheduled for the last year of the plan.

requested one or more years prior to last year for which a consumption target has been established. This has been the case when, during the negotiation of stage I of their HPMPs at the Executive Committee meeting, countries agreed to reduce their HCFC consumption in larger amounts than originally committed, extending the completion date and maintaining the funding schedule.

32. On behalf of the Government of the Islamic Republic of Iran, UNDP as the designated implementing agency had submitted to the 74th meeting the last funding tranche of stage I of the HPMP[12]. In its Agreement with the Executive Committee the Government committed to reducing its HCFC consumption by 10 per cent of the baseline in 2015, but at the 72nd meeting it was extended to a reduction of 15 per cent of the baseline by 2017. In discussing this request with UNDP, the Secretariat indicated that progress reports and independent verification reports of HCFC consumption should be submitted on a yearly basis until completion of stage I in order to confirm compliance with the consumption targets agreed in Appendix 2-A of the Agreement. If stage II of the HPMP were to be approved before completion of stage I, verification reports will be based on the consumption targets committed to in stage II. The Secretariat noted that this approach was taken in previously implemented performance-based agreements (e.g., national CFC phase-out plans, or methyl bromide phase-out plans).

*Secretariat's recommendation*

33. For HPMPs where the last funding tranche is requested one or more years prior to the last year for which a consumption target has been established, the Executive Committee may wish to consider requesting the lead implementing agency and relevant cooperating agencies to submit annual tranche implementation reports and verification reports of the current stage of HPMPs until all activities foreseen are completed and HCFC consumption targets are met, on the understanding that, during consecutive stages of HPMPs being concurrently implemented, the verification reports should be based on the lower HCFC consumption target committed to by the country concerned.

Temporary use of a high-GWP technology by enterprises that were converted to a low-GWP technology

34. During the review of funding tranches of stage I of the HPMPs for the Dominican Republic[13] and El Salvador[14] submitted to the 74th meeting, it was noted that the conversion of foam enterprises from HCFC-141b to methyl formate-based polyols systems (MF systems) had been completed. The Secretariat noted the assistance provided by UNDP to convert the foam enterprises to the MF technology selected in both countries, where foam equipment was retrofitted, drums of MF were purchased for trials and testing, and experts were engaged to optimize the systems for local conditions. However, several of those enterprises were currently using HFC-245fa-based polyols as MF systems were not locally available, and bans on imports of HCFC-141b contained in pre-blended polyol systems were already in effect in both countries.

35. Given the unavailability of MF systems in local markets, one foam enterprise in each country selected water-blown technology, as this was the only technology locally available, albeit with higher operating costs. However, in the Dominican Republic one converted foam enterprise selected HFC-245fa systems while others are testing these systems in their ongoing conversion; and in El Salvador one enterprise has tested HFC-245fa systems with its own resources.

36. UNDP had advised that it is currently in discussion with systems houses and/or distributors of polyol systems operating in other countries (mainly Mexico and the United States of America) to supply MF systems in both countries as soon as possible. On this basis, the Secretariat proposed to UNDP to report on the status of interim use of HFC-245fa systems at each meeting up until these enterprises have introduced MF systems or other low-GWP-based polyol systems.

[12] UNEP/OzL.Pro/ExCom/74/33.
[13] UNEP/OzL.Pro/ExCom/74/27.
[14] UNEP/OzL.Pro/ExCom/74/29.

*Secretariat's recommendation*

37. The Executive Committee may wish to consider:

(a) Requesting bilateral and implementing agencies to continue assisting Article 5 countries during implementation of their HCFC phase-out management plan, in securing the supply of the alternative technologies that were selected; and

(b) Further requesting bilateral and implementing agencies to report to the Executive Committee on the status of use of the interim technology selected by an Article 5 country at each meeting up until the original technology selected or another low-global warming potential-based technology has been fully introduced.

Requests for funding to conduct inventories or surveys on alternatives to ODS (decision XXVI/9)

*Background*

38. Implementing agencies submitted a total of US $7,608,250 (including agency support costs) to conduct national surveys on alternatives to ODS in response to paragraph 4 of decision XXVI/9[15], for 85 countries. These requests are contained in the documents on the work programmes of the implementing agencies[16].

39. The objective of the surveys would be to assist Article 5 countries to better understand their consumption trends for non-ODS alternatives, and their distribution by sector and subsector. The inventories on ODS alternatives may also provide the countries with an overview of their national markets where ODS alternatives have been (and will be) phased in, while taking into consideration existing technologies. The surveys will estimate the amounts of each ODS alternative currently used in the country, identify alternatives that could be potentially used in the future to replace HCFCs and HFCs; and forecast the amounts of each of the ODS alternatives currently used and potentially to be used in the country for the 2015-2030 period.

40. In response to the request by the Parties to the Executive Committee in paragraph 4 of decision XXVI/9, the Secretariat has prepared document UNEP/OzL.Pro/ExCom/74/53, presenting the text of the decision and seeking guidance from the Executive Committee on how to address this request from the Meeting of the Parties. Attached to the document is a "Note from the Secretariat" which contains information on the matter of providing additional funding to conduct inventories or surveys on ODS alternatives in interested Article 5 countries.

41. As the Executive Committee has not decided how to address the request by the Parties, the Secretariat has not reviewed the requests for surveys on ODS alternatives submitted by Article 5 countries. In its deliberations, the Executive Committee may wish to note that the requests for surveys were not included in the 2015-2017 business plan of the Multilateral Fund, and are not required to meet or accelerate the HCFC compliance needs of Article 5 countries.

*Secretariat's recommendation*

42. The Executive Committee may wish to consider the requests to conduct national surveys on alternatives to ODS submitted to the 74th meeting in the context of its discussion on agenda item 12 on

[15] The Parties to the Montreal Protocol decided inter alia "to request the Executive Committee of the Multilateral Fund to consider providing additional funding to conduct inventories or surveys on alternatives to ozone-depleting substances in interested parties operating under paragraph 1 of Article 5 upon their request".
[16] UNEP/OzL.Pro/ExCom/74/15 to 74/18.

follow-up to decision XXVI/9 (paragraph 4) of the Twenty-sixth Meeting of the Parties on additional funding to conduct inventories or surveys on ODS alternatives.

**Projects to demonstrate low-GWP technologies and feasibility studies on district cooling pursuant to decision 72/40**

Background

43. At the 72nd meeting, the Executive Committee considered a document on options for a number of additional projects to demonstrate climate-friendly and energy-efficient alternative technologies to HCFCs, including not-in-kind technologies[17], in line with decision 71/51(a). Subsequent to a discussion the Executive Committee *inter alia:*

(a) Agreed to consider, at its 75th and 76th meetings, proposals for demonstration projects for low-GWP alternatives to HCFCs, specifying criteria to be applied when selecting such projects, and set aside an amount of US $10 million (including agency support costs) for these projects;

(b) Invited the submission of four feasibility studies for district cooling (including business cases) to be funded at a maximum of US $100,000 per study (including funding for project preparation and agency support costs); and

(c) Requested the Secretariat to prepare a paper analysing the remaining eligible HCFC consumption in sectors and subsectors of potential demonstration relevance, for consideration at the 74th meeting (decision 72/40).

44. At the 73rd meeting, the Executive Committee further discussed the low-GWP demonstration projects and feasibility studies on district cooling in the context of the consolidated business plan of the Multilateral Fund[18]. During the discussion a number of issues were raised, including an over-programming of over US $23 million compared with the US $10 million approved in decision 72/40(b); the possible negative effect of disqualifying certain proposals that did not sufficiently include low-GWP alternatives; and the need to have a range of proposals so that the Committee could choose those that would best meet the needs of Article 5 countries.

45. Through further discussions in a contact group, a consensus was reached that the business plan would include a US $10 million window for the demonstration projects, and that the list of demonstration projects included in the consolidated business plan would remain open for additional ideas and proposals to enable the Executive Committee to make decisions at the 74th meeting regarding which of these project preparation proposals might be funded. Additional guidance was also provided in order to ensure that the best proposals for demonstration projects were submitted[19].

46. To assist bilateral and implementing agencies in operationalizing decision 72/40 and to ensure that the submission of project proposals to demonstrate climate-friendly and energy-efficient alternative technologies to HCFCs fulfils the criteria established by the Executive Committee, and to facilitate the decision-making process of the Executive Committee, the Secretariat developed a "Guide for the preparation and submission of additional projects to demonstrate climate-friendly and energy-efficient alternative technologies to HCFCs, and feasibility studies" which was presented at the Inter-agency Coordination

[17] UNEP/OzL.Pro/ExCom/72/40.
[18] UNEP/OzL.Pro/ExCom/73/18.
[19] The suggestions made by Executive Committee members are contained in paragraph 97 of document UNEP/OzL.Pro/ExCom/73/62.

Meeting held in Montreal from 26 to 27 February 2015. A copy of the guide is contained in Annex I to the present document.

47. In response to decision 72/40(d), the Secretariat submitted to the 74th meeting a document on the analysis of the remaining eligible HCFC consumption in various sectors and subsectors of potential demonstration relevance[20].

An overview of the submissions

48. In response to decision 72/40, bilateral and implementing agencies submitted to the 74th meeting:

(a) Funding requests for the preparation of 26 demonstration projects on low-GWP technologies in 17 countries and in three regions;

(b) Two requests for the funding of fully developed demonstration projects in Colombia and Egypt; and

(c) Three funding requests for feasibility study on district cooling in Dominican Republic, Egypt and Kuwait.

49. The breakdown of all the funding requests is summarized in Table 4.

**Table 4. Overview of submission of demonstration projects and feasibility studies for district cooling**

| Agency | No. of requests | Funds requested at the 74th meeting (US $) | | Estimated project cost (US$) |
|---|---|---|---|---|
| | | Project preparation | Fully developed projects | |
| **Demonstration projects** | | | | |
| Germany | 1 | 50,000 | | 500,000 |
| Japan | 2 | (*) | | (*) |
| UNDP | 11 | 275,500 | 799,450 | 11,630,000 |
| UNDP/Japan | 1 | 20,000 | | 400,000 |
| UNIDO | 10 | 490,000 | | 7,603,000 |
| UNIDO/Italy | 2 | 80,000 | | 650,000 |
| World Bank | 1 | 30,000 | | 1,046,100 |
| **Feasibility studies for district cooling** | | | | |
| UNDP | 1 | - | 91,000 | |
| UNIDO/UNEP | 2 | | 179,600 | |
| **Total** | 31 | 945,500 | 1,070,050 | 21,829,100 |
| Support costs | | 69,185 | 85,362 | 1,574,837 |
| **Grand Total** | | 1,014,685 | 1,155,412 | 23,403,937 |

(*) To be determined

50. With regard to the demonstration projects on low-GWP technologies, ten were in the refrigeration and air-conditioning sector, nine in the foam sector, five in the refrigeration servicing sector, three in the refrigeration installation and assembly sector, and one in the solvent sector. The funding level requested ranged from US $15,000 to US $100,000, plus agency support costs, bringing the total amount requested for project preparation to US $945,500 plus agency support costs of US $69,185. An additional US $799,450, plus support costs of US $55,962 was requested for two fully developed demonstration projects; and a total of US $300,000 was requested by UNDP, UNIDO and UNEP for feasibility studies for district cooling.

[20] Document UNEP/OzL.Pro/ExCom/74/49 describes the methodology used to determine the remaining HCFC consumption in Article 5 countries; presents an analysis of the remaining HCFC consumption per sector and subsector; and provides an assessment of the sectors and subsectors of potential demonstration relevance.

Detailed information concerning the requests is contained in the documents on the bilateral cooperation[21] and work programmes of the implementing agencies[22].

Review of proposals by the Secretariat

51. The Secretariat undertook an assessment of all the proposals for preparation of demonstration projects on low-GWP technologies, including the two fully developed demonstration projects, taking into consideration the following criteria:

(a) Increase in current know-how with respect to a low-GWP alternative technology (i.e., a significant technological step forward);

(b) The added value of the project for established technologies;

(c) Description of technology and link to other activities in a country;

(d) Replicability (i.e., facilitating its introduction in HPMPs);

(e) Geographical distribution (i.e., where the demonstration projects will be implemented);

(f) Sector (i.e., refrigeration and air-conditioning sector, particularly air-conditioning manufacturing, as a priority sector; for the foam sector, the added value as compared to projects completed in stage I of HPMPs);

(g) Energy efficiency promotion, and consideration of other environmental impacts; and

(h) Commitment from an eligible manufacturing enterprise to undertake the conversion to the alternative technology.

52. For the assessment of the feasibility studies for district cooling, the Secretariat took into consideration if the proposals included a description of the following elements:

(a) Objectives, expected outputs and methodology to be used;

(b) Technical and financial feasibility of the selected approach;

(c) Proposed business model;

(d) Potential partners, where relevant;

(e) Funding opportunities after the study is completed;

(f) Activities to be undertaken and cost breakdown; and

(g) Work plan, including milestones and a schedule for completion.

53. Based on the above-mentioned criteria, the Secretariat provided comments to bilateral and implementing agencies on all the project proposals, followed by discussions to further clarify outstanding issues and obtain a better understanding of the proposals. For projects in the refrigeration and air-conditioning sector, the Secretariat sought technical advice from an independent refrigeration expert. All issues were satisfactorily addressed.

[21] UNEP/OzL.Pro/ExCom/74/14.
[22] UNEP/OzL.Pro/ExCom/74/15 to 74/18.

54. The Secretariat appreciated the efforts made by Article 5 countries, bilateral and implementing agencies to develop meaningful concept proposals on alternative technologies. While all the proposals are of relevance for specific HCFC consuming sectors in Article 5 countries, their funding value largely surpasses the US $10 million funding available in decision 72/40.

*Assessment of ODS demonstration projects*

55. The Secretariat grouped the demonstration projects in the following five groups according to the sector/sub-sector of relevance:

(a) Refrigeration and air-conditioning manufacturing sector;

(b) Refrigeration and air-conditioning assembly and installation sector;

(c) Refrigeration servicing sector;

(d) Foam sector; and

(e) Solvent sector.

56. Based on the Secretariat's assessment, within each sector/sub-sector group, project proposals were divided into the following three major categories:

(a) Proposals that largely comply with the criteria;

(b) Proposals that partially comply with the criteria or for which there were outstanding issues (e.g., no remaining eligible consumption in the country, overlap with activities already funded under the HPMP, limited replicability); and

(c) Proposals that may be considered as lower priority (e.g., refrigeration servicing sector; overlap with previously approved activities; not suitable for demonstration under decision 72/40) or that additional information is required.

57. The results of the assessment of the ODS demonstration projects in refrigeration and air-conditioning manufacturing, installation and assembly, foam, refrigeration servicing and solvent sectors are summarized in Tables 5 to 9. In each table, the project title includes an identification code (e.g., [RAC1], [ASMB1]) unique to that project. The column "Cost US $" in each table, provides two figures: the first represents the cost for preparation of the project (excluding support cost) and the figure in parenthesis represents the estimated overall cost of the demonstration project (i.e., project preparation, full project cost and agency support cost). More detailed and comprehensive information of each of the project proposals could be found in Annex II contained in the present report.

**Table 5. Results of the assessment of the refrigeration and air-conditioning manufacturing sector**

| Country | Agency | Title/Assessment | Subsector/ application | Alternative | Cost (US $) |
|---|---|---|---|---|---|
| **Largely comply with the criteria** | | | | | |
| China | UNDP | [RAC 1] Proposals of demonstration project of ammonia semi-hermetic frequency convertible screw refrigeration system in the industrial and commercial refrigeration industry<br>$NH_3$-compressor is already produced in non-Article 5 countries. The combination of smaller capacity $NH_3$ systems with $CO_2$ as secondary refrigerant represents a technological advancement in Article 5 countries. It includes compressor production and testing, but excludes manufacture and installation of the refrigeration system. If a $NH_3$-based compressor is made available, conversion of refrigeration equipment, installation, servicing and development of safety regulations could be promoted through HPMPs | Industrial/ commercial/ screw compressor | $NH_3$, $CO_2$ | 24,000 (2,700,680) |
| Kuwait | UNDP | [RAC 6] Project preparation for demonstration of HCFC-free low-GWP technology performance in air-conditioning applications<br>The project intends to evaluate the performance and suitability (field testing and servicing) of AC equipment using different refrigerants in high ambient temperature (it ties into the UNEP/UNIDO PRAHA project[23]). Further consideration may be required on whether the performance should be evaluated in a more controlled environment (such as a laboratory). The project will increase the know-how at the country level and is highly replicable given the number of AC systems required for high ambient temperature conditions. | Room AC | HFC-32, HC-290 | 20,000 (342,400) |
| Philippines | Germany | [RAC 7] Converting commercial A/C products and associated production line from HCFC-22 to HC-290 at Koppel Inc.<br>The project will demonstrate the introduction of HC in larger residential AC equipment, which is an advance in technology. It will also address applicability of related standards and safety issues. The project has potential for energy savings given the efficiency of HCs. An AC manufacturer has been identified. Information generated on the design and engineering will be made available, which will benefit small-scale producers of commercial units located in several Article 5 countries. Replicability would depend on the regulations and standards on the use of flammables in other countries. | Room AC | HC-290 | 50,000 (621,500) |

[23] "Promoting low-GWP refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia (PRAHA)" approved at the 69th meeting.

| Country | Agency | Title/Assessment | Subsector/ application | Alternative | Cost (US $) |
|---|---|---|---|---|---|
| Saudi Arabia | UNIDO | [RAC 8] Preparation of a demonstration project on promoting HFO-based low-GWP refrigerants for air-conditioning sector in high ambient temperature<br>The demonstration addresses new technologies that have never been demonstrated in the field in a high ambient temperature environment. A manufacturing enterprise has been identified. Most suitable technologies will be selected from the results of the UNEP/UNIDO PRAHA project[24] under implementation. Standards and guidelines for A2L refrigerants[25] will be reviewed. It can be seen as a second step after PRAHA to implement the technology on a larger scale in the manufacturing process. Given the remaining HCFC consumption in several AC applications, there is potential for replicability. | Room AC | HFO/HFC blends (L-20, DR-3, L-41), or HFC-32 | 30,000 (1,958,100) |
| **Partially comply with the criteria** | | | | | |
| China | UNDP | [RAC 2] Proposal for demonstration project for developing screw high temperature heat pump compressor units with low GWP refrigerant in the industrial and commercial refrigeration industry<br>The project addresses a new technology that has not been previously demonstrated. A compressor manufacturer has been identified to demonstrate the technology in the field. Due to limited information for HFO-1336Mzz(Z) use as refrigerant, it would be important to include heat pump development, installation and training especially in high ambient temperature. As the enterprise already has a tester centre, it is unclear why most of the project items are requested as they are equally needed for any screw compressor already produced. Rather than addressing current HCFC-22 consumption, the project aims to avoid future increase of HCFC 22 consumption. Although replication may be limited to the application within China, viewing the growth of consumption in this area, the potential avoidance of HCFC consumption could be significant. | Industrial/ commercial/ heat pumps | HFO-1336Mzz(Z) | 36,500 (2,179,055) |
| China | UNIDO | [RAC 3] Demonstration project for the conversion of heat pumps compressors from HCFC-22 to $CO_2$<br>The $CO_2$ heat pump compressor is a mature technology in non-Article 5 countries, but not available in Article 5 countries. The enterprise selected has already developed a $CO_2$ compressor prototype on a laboratory scale with | AC/ domestic heat pumps | $CO_2$ | 30,000 (1,637,100) |

[24] "Promoting low-GWP refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia (PRAHA)" approved at the 69th meeting.

[25] ASHRAE classification A2L and B2L correspond to lower flammability refrigerants with a maximum burning velocity of ≤ 10 cm/s.

| Country | Agency | Title/Assessment | Subsector/ application | Alternative | Cost (US $) |
|---|---|---|---|---|---|
| | | its own resources, which could be a good foundation for the demonstration; however, if pursued, the proposal should consider the development of the heat pump itself. Rather than addressing current HCFC-22 consumption, the project aims to avoid future increase of HCFC 22 consumption. Although replication may be limited to the application within China, viewing the growth of consumption in this area, the potential avoidance of HCFC consumption could be significant. | | | |
| China | UNIDO | [RAC 4] Preparation of demonstration project on low-GWP alternatives in various applications for transport refrigeration: cryogenic[26] and natural refrigerants<br>The demonstration would advance know-how in transport refrigeration. However, the use of HC refrigerant in this sub-sector is challenging due to flammability issues, while the generation of liquid $N_2$ is energy intensive unless it is obtained as a by-product of another process such as liquid oxygen production. If selected, the project should focus on one or two of the proposed technologies only Although HCFC-22 is consumed for this application in China, level of consumption is unknown in other countries. An enterprise that produces both compressors and refrigerated containers, a transport enterprise and a supermarket chain have been identified for the project. | Commercial/ transport | Natural refrigerants ($CO_2$, HC, $NH_3$, water) and cryogenic fluids (liquid $N_2$ or $CO_2$) | 50,000 (909,500) |
| Egypt | UNDP / Japan | [RAC 5] Demonstration of HCFC free low GWP technologies performance in the commercial refrigeration sector<br>The target application is central AC. Demonstration of $NH_3$ and $CO_2$ performance in central AC in high ambient temperature will increase the know-how in the country. The issues to be addressed are the efficiency of $CO_2$ and the safety use of $NH_3$. If successfully demonstrated, they could be replicated in several Article 5 countries. However, the equipment that will be used and the location of the installation have not been identified yet. | Commercial refrigeration/ Central AC | $CO_2$, $NH_3$ | 20,000 (449,400) |
| **Lower priority under decision 72/40 or more information required** | | | | | |
| Trinidad and Tobago | UNDP | [RAC 9] Demonstration project for the production of hydrocarbon refrigerants for refrigeration and air conditioning applications in Latin America and the Caribbean<br>The country has a refinery facility to produce refrigerant quality HC. With the demonstration setting up bottling and distribution of HC refrigerant, the country will be able to supply the HC refrigerants to the region. A similar | Domestic/ commercial | HC | 40,000 (599,200) |

[26] Use of materials at very low temperatures (below −150 °C).

| Country | Agency | Title/Assessment | Subsector/ application | Alternative | Cost (US $) |
|---|---|---|---|---|---|
| | | demonstration project had been approved for Nigeria under its HPMP[27]. Before bottled HC-refrigerants could be distributed, regulations and standards for the use of flammable refrigerants should be adopted and barriers to the operation of HC-based refrigeration equipment should be removed. | | | |
| To be determined | Japan | [RAC 10] To be determined | | AMOLEA, HFO blend | To be determined |
| Total | | | | | 300,500 (11,396,935) |

**Table 6. Results of the assessment of refrigeration and air-conditioning assembly and installation sector**

| Country | Agency | Title/Assessment | Subsector/ Application | Alternative | Cots (US $) |
|---|---|---|---|---|---|
| **Largely comply with the criteria** | | | | | |
| Costa-Rica | UNDP | [ASMB 1] Demonstration project for the transition of HCFC-22 based refrigerant unit to $NH_3$ cascade system in refrigeration applications<br>The project aims to introduce $NH_3$ in a cold storage facility (where an end-user has been identified), and address safety-related barriers. Indirect $NH_3$ in small cold storage facilities is well established in non-Article 5 countries. However, in Costa Rica (and in the majority of Article 5 countries) the use of $NH_3$ is limited to larger industrial refrigeration systems. The initial higher capital costs as compared to HFC-based systems, could be partially compensated with lower operational costs due to an increased in energy efficiency. If proven technically feasible and economically viable, it could be replicated in all/most of Article 5 countries. | Commercial / cold rooms | $NH_3$ | 40,000 (674,100) |
| Global (Tunisia, Argentina) | UNIDO | [ASMB 2] Concept on a demonstration project in the refrigeration assembly sector<br>$CO_2$ refrigeration-based technology for supermarkets is available in several non-Article 5 countries. However, its introduction in Article 5 countries would be a significant technological advancement. As refrigeration systems in supermarkets are usually assembled by installers or owners, there is potential replicability of the technology in several Article 5 countries. Small-scale demonstration projects have been included in a few stage I of HPMPs (e.g., Chile[28]); however, no relevant information is yet available. | Refrigeration / Supermarket | $CO_2$ | 60,000 (1,134,200) |

[27] Document UNEP/OzL.Pro/ExCom/62/43; decision 62/58.
[28] UNEP/OzL.Pro/ExCom/63/25.

| Country | Agency | Title/Assessment | Subsector/ Application | Alternative | Cots (US $) |
|---|---|---|---|---|---|
| **Partially comply with the criteria** | | | | | |
| Uruguay | UNDP | [ASMB 3] Assessment of unsaturated HFC (HFO) in air-conditioning and refrigeration applications in a small non-LVC country<br>The demonstration intends to address the barrier of lack of knowledge on technical, economic and safety issues on the use of HFOs for AC and refrigeration applications in non-LVC countries with small HCFC consumption. A laboratory to undertake performance tests has been identified; however, the HFOs to be assessed have not yet been selected. As HFOs usually have a flammability of A2L[29] and are developed for use in new equipment, their use as retrofit candidates is not generally accepted given the complexity of the conversion and the potential inheriting risks. | Domestic/ commercial | HFO (specific substance not determined yet) | 40,000 (385,200) |
| Total | | | | | 140,000 (2,193,500) |

**Table 7. Results of the assessment of the foam sector**

| Country | Agency | Title/Assessment | Subsector/ Application | Alternative | Cots (US $) |
|---|---|---|---|---|---|
| **Largely comply with the criteria** | | | | | |
| Colombia | UNDP | [FOAM 1] Demonstration project to validate the use of HFO for discontinuous panels and spray through the development of cost-effective formulations<br>The project increases know-how in the use of HFOs in discontinuous panels and spray foam in SMEs. The HFO/$CO_2$ mixture, if technically feasible, could increase performance of using only $CO_2$ and also help reduce operational cost of using only HFOs. Given the potential increase in performance and reduction in costs, the technology could be replicated in several Article 5 countries. A systems house and a downstream user have been identified. The systems houses selected already participated successfully in a demonstration project for supercritical $CO_2$ in spray foam. | Rigid PU foam: discontinuous panels, spray | Reduced HFO-1233zd(E); Reduced HFO-1336maam(z) | 0 (491,612) |
| Egypt | UNDP | [FOAM 2] Demonstration of low cost options for the conversion to non-ODS technologies in PU foams at very small users<br>The project will facilitate the use of methyl formate pre-blended polyol systems for pour in place applications by very small foam users with no baseline equipment. If successful, it could be replicated given the large number of these foam users in several Article 5 countries. The only concern is the fact that the implementation of another demonstration project in the country[30] | Rigid PU, pour-in-place, spray foam | Methyl formate | 0 (363,800) |

[29] ASHRAE classification A2L and B2L correspond to lower flammability refrigerants with a maximum burning velocity of ≤ 10 cm/s.

[30] UNEP/OzL.Pro/ExCom/58/33; decision 58/31.

| Country | Agency | Title/Assessment | Subsector/ Application | Alternative | Cots (US $) |
|---|---|---|---|---|---|
| | | approved at the 58th meeting extended over a long period of time and is still ongoing. | | | |
| Morocco | UNIDO/ Italy | [FOAM 5] Demonstration project on the use of compact high-pressure foaming equipment for the safe introduction of pentane technology to SMEs<br>The project increases know-how on the use of HC-based polyols in PU foam SMEs to be addressed in stage II of HPMPs. Given the large number of SMEs in several Article 5 countries, it has potential for replication. However, uncertainty on the technical feasibility of the proposal remains as a prototype of the foam machine has not yet been developed. No amount of ODS phase-out has been associated with the proposal. If fully developed, the project should include detailed information on the safety use and handle of HC-based systems by downstream foam users. | Rigid PU foam: Several | HC (Pentane) | 40,000 (315,300) |
| Thailand | World Bank | [FOAM 8] Project preparation for demonstration of low-GWP alternatives for a systems house<br>The project increases know-how in the use of reduced HFO- and HC-pre-blended polyol systems used by SMEs in several applications including spray foam (large number of SMEs in Thailand will be converted to HFC-245fa-based polyol systems). Reduced formulations of HFOs, if technically feasible, could increase performance of using only $CO_2$, reduce operational cost of using only HFO, and avoid the use of HFC-245fa. If demonstration is pursued, HFC-245fa should be removed from the project. Three systems house developing a wide set of formulations have been identified. Stage I of the HPMP[31] included a technical assistance programme for systems houses (US $88,003) to get acquainted with emerging low-GWP alternatives; however, this demonstration project is broader in scope. | Rigid PU foam: Several including spray | Reduced HFO-1233zd (E), HFO-1336mzzz(Z) pre-blended HC, reduced HFC-245fa | 30,000 (1,151,427) |
| **Partially comply with the criteria** | | | | | |
| Turkey | UNIDO | [FOAM 9] Preparation of demonstration project for the phase-out of HCFCs by means of using HFOs as foam blowing agent in the manufacture of reefers and truck trailer bodies<br>Potential manufacturers of refrigerated trucks have been identified to demonstrate the use of HFO-1233zd or HFO-1336mzz(Z) as blowing agents for the production of panels for trailer trucks. If viable, this technology could be replicated in the manufacturing of panels with high insulation requirements in several Article 5 countries. Stage I of the HPMP for Turkey[32] had included the entire conversion of the rigid PU foam industry and all locally-owned systems houses had received assistance to develop and supply non-HCFC-based polyols to downstream foam users. | Rigid PU foam panels | HFO-1233zd or HFO-1336mzz(Z) | 30,000 (353,100) |

[31] UNEP/OzL.Pro/ExCom/68/41
[32] UNEP/OzL.Pro/ExCom/68/42

| Country | Agency | Title/Assessment | Subsector/ Application | Alternative | Cots (US $) |
|---|---|---|---|---|---|
| **Lower priority under decision 72/40 or more information is required** | | | | | |
| India | UNDP | [FOAM 3] Proposal for a demonstration project for development and evaluation of polyol systems for foam products using HFOs as blowing agent<br>The projects will increase the know-how on the use of HFO-1233zd(E) technology in rigid PU foam applications by SMEs. If the technology is technical viable and commercially available, its replicability would depend on the final operational cost. Stage I of the HPMP for India[33] included technical assistance for 15 systems houses (US $4.3 million) for customizing, evaluating and validating formulations using emerging low-GWP alternatives, including HFOs. Technical assistance for at least 30 downstream foam users was also included. | Rigid PU foam: Several | HFO-1233zd(E) | 30,000 (3,135,100) |
| India | UNDP | [FOAM 4] Proposal for development and evaluation of spray foam polyol systems for buildings using HFOs as blowing agent<br>This is similar project to project [FOAM3] but to demonstrate the technology in spray foam applications (thus, the assessment is the same). | Rigid PU foam: Spray | HFO-1233zd(E) | 30,000 (2,493,100) |
| Saudi Arabia | UNIDO | [FOAM 6] Preparation of a demonstration project for the phase-out of HCFCs by using HFO as foam blowing agent in the spray foam applications in high ambient temperatures<br>The project offers an increase of know-how in the use of HFOs in spray foam in Article 5 countries and, has potential for replicability in countries with similar climatic conditions. It is noted that all eligible HCFC-141b consumption has already been addressed as stage I of the HPMP for Saudi Arabia[34] had included the entire conversion of the rigid PU foam industry and all locally-owned systems houses had received assistance to develop and supply non-HCFC-based polyols to downstream foam users. | Rigid PU foam: Spray | HFO-1233mmz(Z)<br><br>HFO-1336zd(E) | 30,000 (293,700) |
| South Africa | UNIDO/ Italy | [FOAM 7] Demonstration project on the technical and economic advantages of the vacuum assisted injection in discontinuous panel's plant retrofitted from HCFC-141b to pentane<br>The use of vacuum-assisted injection increases know-how in the use of pentane in discontinuous panels by improving insulation properties of the foam. An equipment provider has been identified and the actual concept is already developed so it seems to be ready for testing. If successful, it could be applied to several panel producers that can use a flammable blowing agent; however, the approach focuses on optimizing an already consolidated technology in enterprises that can already introduce HC, rather than on removing barriers for other enterprises (for example SMEs) to access the | PU foam | Pentane | 40,000 (470,800) |

[33] UNEP/OzL.Pro/ExCom/66/38.
[34] UNEP/OzL.Pro/ExCom/68/39; UNEP/OzL.Pro/ExCom/72/34.

| Country | Agency | Title/Assessment | Subsector/ Application | Alternative | Cots (US $) |
|---|---|---|---|---|---|
| | | technology. While it could potentially reduce operational cost it may increase capital cost. It is noted that there is no remaining eligible consumption for South Africa as stage I of the HPMP[35] had included the entire conversion of the rigid PU foam industry and all locally-owned systems houses had received assistance to develop and supply non-HCFC-based polyols to downstream foam users. | | | |
| Total | | | | | 230,000 (9,067,939) |

**Table 8. Results of the assessment of the refrigeration servicing sector**

| Country | Agency | Title/Assessment | Subsector/application | Cots (US $) |
|---|---|---|---|---|
| **Low priority under decision 72/40** | | | | |
| China | UNIDO | [SERV 1] Preparation of a demonstration project on leakage reduction for large/industrial refrigerating appliances<br>The project does not demonstrate a new technology. Refrigerant containment are established practices and have been implemented in all/most of stage I of HPMPs | Industrial cooling, supermarket, central AC | 50,000 (535,000) |
| Maldives | UNDP | [SERV 2] Project preparation for a demonstration project for HCFC-free low-GWP alternatives in refrigeration in fisheries sector<br>The project does not demonstrate a new technology. Alternative refrigerants would need to be identified during project implementation. Non-flammable low-GWP refrigerants for retrofitting HCFC-22 systems are not available, while flammable refrigerants pose safety concerns, which is particularly important in fishing vessels. The HPMP for Maldives[36] had included the complete phase-out of HCFC consumption in the country. | Servicing: Fisheries | 15,000 (234,050) |
| Region: Africa | UNIDO | [SERV 3] Demonstration project to ensure safety standards and market availability of high quality refrigerants (Kenya, Rwanda, Tanzania, Uganda, and Zambia)<br>The project does not demonstrate a new technology. It proposes a strategy for addressing several issues to facilitate implementation of activities in the servicing sector included in stage I of HPMPs. It is not clear how it would fit into the framework defined in decision 72/40 | Servicing | 100,000 (909,500) |

[35] UNEP/OzL.Pro/ExCom/67/29.
[36] UNEP/OzL.Pro/ExCom/60/33.

| Country | Agency | Title/Assessment | Subsector/application | Cots (US $) |
|---|---|---|---|---|
| Region: Latin America/ Caribbean | UNIDO | [SERV 4] Demonstration project on refrigeration and AC servicing sector activities, with focus on low-GWP flammable refrigerants (Bahamas, Grenada, Saint Lucia, Saint Vincent and the Grenadines, Suriname)<br>The project does not demonstrate a new technology. Activities proposed are being implemented in stage I of HPMPs for several Article 5 countries. It is not clear how it would fit into the framework defined in decision 72/40. | Servicing | 60,000 (720,110) |
| Region: West Asia | UNIDO | [SERV 5] Preparation of a demonstration project on refrigerant containment and refrigerant leakage prevention in high ambient temperature (Egypt and Gulf countries)<br>The project does not demonstrate a new technology. Refrigerant containment are established practices and have been implemented in all/most of stage I of HPMPs. | Servicing: Leakage reduction | 50,000 (217,000) |
| Total | | | | 275,000 (2,615,660) |

**Table 9. Results of the assessment of the solvent sector**

| Country | Agency | Title/Assessment | Subsector | Alternative | Cost (US $) |
|---|---|---|---|---|---|
| **More information required** | | | | | |
| To be determined | Japan | [SOLV 1] Reduce HCFC-141b used as solvent for silicon to cover disposal needles<br>To be determined | Solvent | CGS-4, HFO blend | To be determined |

*Assessment of feasibility studies for district cooling*

58. Information on the feasibility studies for district cooling submitted is presented in Table 10. Detailed information on each one of the feasibility studies could be found in Annex II to the present document.

**Table 10. Information on the feasibility studies for district cooling submitted**

| Country | Agency | Project title | Technology | Cost (US $)* |
|---|---|---|---|---|
| Dominican Republic | UNDP | [DC 1] Feasibility study for district cooling in Punta Cana | Absorption chiller (waste heat) and deep sea water cooling | 100,000 |
| Egypt | UNIDO (lead), UNEP | [DC 2] Feasibility study addressing district cooling | Hybrid solar and gas thermal driven absorption chiller | 100,000 |
| Kuwait | UNIDO (lead), UNEP | [DC 3] Feasibility study addressing district cooling | Deep sea water cooling, absorption chiller (waste heat and solar energy) | 100,000 |

*A maximum of US $100,000 per proposal including support cost.

59. The project proposal for the feasibility study for district cooling in Punta Cana, Dominican Republic, fulfilled the criteria established under decision 72/40. The objectives, assessment methodology and milestones are clearly described; a funding partner for the study has been identified; and, if the feasibility of the district cooling is demonstrated, it will be implemented.

60. The two requests of funds for the feasibility studies for district cooling in Egypt and Kuwait did not contain sufficient information, in particular both lack details on the business model and co-financing opportunities.

Recommendation

61. The Executive Committee may wish to consider the assessment on the proposals for demonstration projects for low-GWP alternatives to HCFCs and the feasibility studies for district cooling contained in document UNEP/OzL.Pro/ExCom/74/13, together with the analysis of the remaining eligible HCFC consumption in various sectors and subsectors of potential demonstration relevance contained in document UNEP/OzL.Pro/ExCom/74/49, for selecting the demonstration projects for low-GWP alternatives to HCFCs and the feasibility studies for district cooling to be implemented within the funding levels established under decision 72/40.

**Blanket approval**

62. This section presents verification reports of LVC countries' compliance with their HPMP agreement in 2014 and the projects and activities submitted for blanket approval

Verification reports of low-volume-consuming countries' compliance with their HPMP agreement in 2014

63. In line with decision 61/46(c)[37], the Secretariat selected a sample of 17 countries for the purpose of verifying compliance with the HPMP agreement, as shown in Table 11. These countries were selected using the following criteria:

(a) Geographical distribution of the countries (eight in Africa, one in Asia and the Pacific, four in Europe and Central Asia and four in Latin America and the Caribbean);

(b) Level of HCFC consumption among countries (i.e., ten countries with an HCFC consumption baseline below 100 mt; four countries with a consumption baseline between 101 and 200 mt, and three countries with a consumption baseline over 200 mt);

(c) Countries that had not yet received funding for a verification report;

(d) Countries with HCFC consumption only in the servicing sector (12) and also countries with consumption in the manufacturing sector (5); and

(e) Distribution among bilateral and implementing agencies (three for Germany, nine for UNEP, two for UNDP and three for UNIDO).

**Table 11. Sample of Article 5 countries for verification of compliance with their HPMP agreement**

| No. | Country | HCFC baseline (mt) | Lead/cooperating agency |
|---|---|---|---|
| 1 | Barbados | 66.73 | UNEP/UNDP |
| 2 | Bosnia and Herzegovina | 70.65 | UNIDO |
| 3 | Brunei Darussalam | 110.62 | UNEP/UNDP |
| 4 | Congo (the) | 160.65 | UNEP/UNIDO |
| 5 | Costa Rica | 224.94 | UNDP |
| 6 | Dominica | 7.24 | UNEP |
| 7 | Equatorial Guinea | 114.36 | UNEP/UNIDO |
| 8 | Ethiopia | 100.00 | UNEP/UNIDO |
| 9 | Georgia | 93.00 | UNDP |
| 10 | Mali | 272.25 | UNEP/UNDP |
| 11 | Mauritius | 144.98 | Germany |

[37] The Secretariat was requested to provide, at the first meeting of each year, a list representing 20 per cent of countries with an HCFC consumption baseline of up to 360 metric tonnes (mt), and with an approved HPMP, to approve funding for them for the purposes of verification of that country's compliance with the HPMP agreement for that year.

| No. | Country | HCFC baseline (mt) | Lead/cooperating agency |
|---|---|---|---|
| 12 | Montenegro | 13.88 | UNIDO |
| 13 | Rwanda | 74.77 | UNEP/UNIDO |
| 14 | Seychelles | 24.89 | Germany |
| 15 | Suriname | 35.92 | UNEP/UNIDO |
| 16 | The former Yugoslav Republic of Macedonia | 32.78 | UNIDO |
| 17 | Zimbabwe | 314.94 | Germany |

64. Since the 71st meeting, funding of US $30,000, plus agency support costs has been approved for verification reports.

*Secretariat's recommendation*

65. The Executive Committee may wish to request relevant bilateral and implementing agencies to include in their respective amendments to the work programmes for submission to the 75th meeting, funding for verification reports for stage I of the HCFC phase-out management plans for the Article 5 countries listed in Table 11.

Projects and activities submitted for blanket approval

66. Annex III to the present document lists 65 projects and activities totalling US $10,131,733 including support costs that are recommended for blanket approval. The approval of these projects by the Executive Committee would include the relevant conditions or provisions in the corresponding project evaluation sheets as well as the approval of implementation programmes associated with the relevant tranches of multi-year projects.

**Investment projects for individual consideration**

67. One hundred and thirty-seven projects/activities, totalling US $51,989,179 including support costs, after the review by the Secretariat, are proposed for individual consideration. To facilitate the Executive Committee's consideration of the investment projects for individual consideration, the Secretariat has classified the projects by sector, and has grouped them according to the issues, as shown in Table 12.

**Table 12. Projects submitted for individual consideration**

| Country | Project | Agency | ExCom | Issue |
|---|---|---|---|---|
| **HPMP stage II** | | | | |
| Kyrgyzstan | HCFC phase-out management plan stage II - first tranche | UNDP | 74/36 | Stage II; all issues resolved |
| **HPMP tranche request** | | | | |
| Dominican Republic | HCFC phase-out management plan stage I – second tranche | UNDP | 74/27 | Temporary use of high-GWP alternative |
| El Salvador | HCFC phase-out management plan stage I – second tranche | UNDP/UNEP | 74/29 | Temporary use of high-GWP alternative |
| Iraq | HCFC phase-out management plan stage I – second tranche | UNEP/UNIDO | 74/34 | Reprogramming of the activities; revision of funding distribution of tranches and among agencies |
| Islamic Republic of Iran | HCFC phase-out management plan stage I – fourth and last tranche | UNDP/UNIDO/ Germany | 74/33 | Withdrawal of a technical assistance project |
| Kuwait | HCFC phase-out management plan stage I – second tranche | UNEP/UNIDO | 74/35 | Potential non-compliance with Agreement |
| Lebanon | HCFC phase-out management | UNDO | 74/38 | Revision of work plan as |

| Country | Project | Agency | ExCom | Issue |
|---|---|---|---|---|
| | plan stage I – third tranche | | | per paragraph 7 of the Agreement (flexibility) |
| Republic of Moldova | HCFC phase-out management plan stage I – second tranche | UNDP | 74/45 | Revision of Agreement and funding level |
| Thailand | HCFC phase-out management plan stage I – second tranche | World Bank/Japan | 74/48 | Above US $5 million; revision of work plan as per paragraph 7 of the Agreement (flexibility) |

## Annex I

## GUIDE FOR THE PREPARATION AND SUBMISSION OF ADDITIONAL PROJECTS TO DEMONSTRATE CLIMATE-FRIENDLY AND ENERGY-EFFICIENT ALTERNATIVE TECHNOLOGIES TO HCFCS, AND FEASIBILITY STUDIES

### Background

1. At the 72nd meeting, the Executive Committee considered a document on options for a number of additional projects to demonstrate climate-friendly and energy efficient alternative technologies to HCFCs, including not-in-kind technologies[1], in line with decision 71/51(a). Subsequent to a discussion the Executive Committee, in decision 72/40*:*

(a) Agreed to consider, at its 75th and 76th meetings, proposals for demonstration projects for low-GWP alternatives to HCFCs, specifying criteria to be applied when selecting such projects, and set aside an amount of US $10 million (including agency support costs) for these projects;

(b) Invited the submission of four feasibility studies for district cooling (including business cases) to be funded at a maximum of US $100,000 per study (including funding for project preparation and agency support costs); and

(c) Requested the Secretariat to prepare a paper analysing the remaining eligible HCFC consumption in sectors and subsectors of potential demonstration relevance, for consideration at the 74th meeting.

(d) At the 73rd meeting, the Executive Committee further discussed the low-GWP demonstration projects and feasibility studies on district cooling in the context of the consolidated business plan of the Multilateral Fund[2]. During the discussion a number of issues were raised, including an over programming of over US $23 million compared with the US $10 million approved in decision 72/40(b); the possible negative effect of disqualifying certain proposals that did not sufficiently include low-GWP alternatives; and the need to have a range of proposals so that the Committee could choose those that would best meet the needs of Article 5 countries.

2. Through further discussions in a contact group, a consensus was reached that the business plan would include a US $10 million window for the demonstration projects, and that the list of demonstration projects included in the consolidated business plan would remain open for additional ideas and proposals, to enable the Executive Committee to make decisions, at the 74th meeting, on which of these project preparation proposals might be funded. Additional guidance was also provided in order to ensure that the best proposals for demonstration projects were submitted[3].

[1] UNEP/OzL.Pro/ExCom/72/40.
[2] UNEP/OzL.Pro/ExCom/73/18.
[3] The suggestions made by Executive Committee members are contained in paragraph 97 of document UNEP/OzL.Pro/ExCom/73/62.

Objective and scope of the guide

3. The Secretariat has developed this guide to assist bilateral and implementing agencies to operationalize decision 72/40, ensuring that the submission of demonstration project proposals and feasibility studies for district cooling fulfil the mandate and conditions established by the Executive Committee at its 72nd and 73rd meetings, and facilitate the decision-making process of the Executive Committee to approve projects within the US $10.4 million window agreed at the 72nd meeting.

4. The guide presents a summary of the criteria established by the Executive Committee for selecting proposals and suggests a set of indicators in support of the proposals. The guide briefly considers projects to demonstrate alternative technologies that have been approved as stand-alone proposals or in the context of HPMPs, as well as the TEAP report to the 26th Meeting of the Parties pursuant to decision XXV/5[4], which could facilitate the selection of demonstration projects. It describes the key elements to be included in the proposals, and also includes four annexes with relevant information that will further facilitate the task of bilateral and implementing agencies in preparing and submitting proposals for demonstration project.

**Criteria for selecting proposals**

5. The criteria to be applied when selecting proposals for demonstration projects for low-GWP alternatives to HCFCs projects are provided in decision 72/40(b)(i). Full texts of the decision and additional guidance provided at the 73rd meeting are provided in Appendix I to the present guide (Appendix I also contains a set of definitions on project concept, project preparation, project proposal and feasibility study). These are summarized below:

(a) The proposal should offer a significant increase in current know-how in terms of a low-GWP alternative technology (i.e., a significant technological step forward);

(b) Projects that demonstrated already established technologies, should clearly describe the added value of those projects. Demonstration projects for the foam sector should clearly describe their added value as compared to projects completed in stage I of HPMPs;

(c) The technology should be clearly described, linked to other activities in a country, provide information on its replicability (i.e., facilitating its introduction in HPMPs) in the medium future, across a significant amount of activities in target sectors or regions. It should also take into account geographical distribution (i.e. where the demonstration projects will be implemented);

(d) Priority will be given to proposals for the refrigeration and air-conditioning sector (particularly air-conditioning manufacturing)[5] without excluding other sectors;

[4] TEAP Task force report on additional information to alternatives on ODS, October 2014.

[5] Some delegations that commented on the air-conditioning manufacturing sector emphasized demonstration on unitary systems or larger mini-splits, for example using low-GWP hydrofluoroolefin (HFO) blends, as well as the importance of focusing on the challenges of high ambient temperatures. Some Executive Committee members also suggested that the following might be addressed in demonstration projects: adsorption-based systems, the design of centralized cooling systems, or ways to best address the safe use of ammonia, $CO_2$ or hydrocarbons in refrigeration or air conditioning equipment. If possible, applications with a significant share of HCFC use should be highlighted rather than niche applications.

(e) The proposal should promote energy efficiency improvements, where relevant, and address other environmental impacts; and

(f) The proposal should include a commitment from an eligible manufacturing enterprise to undertake the conversion to the new alternative technology, and whether it will cease using HCFCs after the conversion.

6. When submitting requests for feasibility studies, including business cases for district cooling, submissions should include information that would:

(a) Assess possible projects, their climate impact, economic feasibility and options for financing such undertakings; and

(b) Enable stakeholders to understand the advantages and challenges of using these new approaches as compared to business as usual.

Suggested indicators to fulfil the criteria for proposals

7. To facilitate the preparation, submission and review of proposals for demonstration projects, the Secretariat is proposing the indicators suggested in Table 1 in support of the proposals which have taken into account the criteria described in sub-paragraph (b) of decision 72/40, including the further guidance provided in paragraph 97 of document 73/62.

**Table 1. Suggested indicators/information in support of proposals for demonstration projects**

| Criteria | Suggested indicators/information |
|---|---|
| Offer a significant increase in current know-how in terms of a low-GWP alternative technology, concept or approach or its application and practice in an Article 5 country, representing a significant technological step forward. | • Information supporting the fact that the technology to be demonstrated has not been tested in conditions prevailing in Article 5 countries. If it has (i.e., funded by the MLF or other financial mechanism), justification why this is required and what would be its added value.<br>• Confirmation/demonstration that there is limited information on the application of the technology<br>• Status of commercial availability of the technology: Is it available non-Article 5 and/or Article 5 countries?<br>• Description of potential impacts of not demonstrating this technology (e.g., delays in conversion). |
| The technology, concept or approach to be demonstrated had to be concretely described, linked to other activities in a country. | • Brief description of new substances to be used, if any (major relevant physical, chemical, performance, environmental, safety and health features in comparison with HCFCs currently used).<br>• Brief explanation of expected changes in the manufacturing process using the proposed technology, including, e.g., potential variations in equipment, method of application, know-how, flammability or toxicity considerations.<br>• Brief description of potential benefits and/or difficulties resulting from using the proposed technology in comparison with the use of HCFCs.<br>• Description of the sector, its share of the remaining HCFC consumption, and how the demonstration project would contribute to HCFC phase-out. |

| Criteria | Suggested indicators/information |
|---|---|
| | • Relationship of the demonstration project to the HPMP under current implementation. |
| Potential to be replicated in the medium future in a significant amount of activities in the same sub-sector; provide information on its replicability and its demonstration value and how those elements would contribute to the direction being taken by the Executive Committee in facilitating the introduction of new low-GWP technologies as alternatives in HCFC phase-out. | • Remaining eligible consumption of HCFC in the particular subsector:<br>o In the country (in value and percentage);<br>o In the region; and<br>o In other Article 5 countries (where available).<br>• Indicate number of potential enterprises that could adopt the technology in the country, and information of potential use/replication in the region/world<br>• Description of potential barriers (legal or market) that might prevent the technology's further replication<br>• Indicate if it is a niche application. |
| Identify an eligible company stating its willingness to undertake the conversion of the manufacturing process to the new technology which had been identified, and whether it will cease using HCFCs after the conversion. | • Commitment in writing from the enterprise clearly stating that it would undertake project, and whether it will cease using HCFCs after the conversion, to be submitted at the same time as full project proposals<br>• Eligibility criteria of the enterprise (Article 5 stakeholder composition, exports to non-Article 5 countries, date of establishment, date of installation of equipment using HCFC, HCFC consumption last three years, information on baseline equipment, production information). |
| Priority will be given to proposals for the refrigeration and air conditioning sector without excluding other sectors; particularly air-conditioning manufacturing, where there were emerging technologies that could be demonstrated | • Indicate if the project is for the RAC sector? What are current alternatives commercially available for the sector?<br>• Is the technology proposed specifically for countries with climates with high ambient temperatures? |
| Does the proposal promote energy efficiency improvements, where relevant, and address other environmental impacts? | If yes, describe how energy efficiency gains will be achieved.<br>If no, could the proposal have taken these aspects into consideration? |
| Does the proposal target sectors or regions for which the technology had not been demonstrated in the past? | If yes, please describe how.<br>If no, provide a justification why this project is required |
| Projects that demonstrated already established technologies should clearly describe the value of those projects | The added value of these projects should be clearly articulated, with specific examples if possible. |
| Demonstration projects for the foam sector should clearly describe and delineate the added value of those projects compared to projects completed in stage I, what was new, and how relevant all this was to the remaining consumption to be phased out in the sector. | What currently unresolved issues are the proposal intending to address? |
| Projects should also consider regional and geographical distribution. | Has a demonstration project funded by the Fund already been implemented in the proposed country?<br>If yes, why is it not possible to undertake the same demonstration in another country? |
| Some Executive Committee members would prefer not to see demonstration projects in the servicing sector, except for those covering local assembly of equipment. | Any requests for demonstration projects in the servicing sector except those to local assembly of equipment will be given low priority in the initial evaluation, or asked to be removed altogether. |

**Sector distribution of remaining eligible HCFC consumption**

8. In response to decision 72/40(d), the Secretariat submitted to the 74th meeting a document on the analysis of the remaining eligible HCFC consumption in various sectors and subsectors of potential demonstration relevance[6]. The results of the analysis are presented in Table 2.

**Table 2. Remaining HCFC consumption in Article 5 countries per sector and subsector**

| Sector | Subsector | China | 14 second largest countries | 125 remaining countries | Total | % of total |
|---|---|---|---|---|---|---|
| **Metric tonnes** | | | | | | |
| PU foam | Rigid | 18,486 | 8,765 | 3,106 | 30,356 | 8 |
| | Spray | 9,135 | 3,351 | 1,187 | 13,674 | 4 |
| | Integral skin | 6,562 | 524 | 186 | 7,271 | 2 |
| XPS foam | | 32,694 | 902 | 883 | 34,479 | 9 |
| AC manufacturing | Room AC | 64,028 | 26,914 | 10,382 | 101,324 | 26 |
| | Others AC | 31,291 | 1,486 | 573 | 33,350 | 9 |
| Refrigeration manufacturing | | 4,129 | 5,971 | 2,303 | 12,403 | 3 |
| Refrigeration servicing | | 69,113 | 54,726 | 21,266 | 145,106 | 38 |
| Others | Aerosol | - | 310 | - | 310 | 0 |
| | Solvents | 3,899 | 796 | 393 | 5,088 | 1 |
| | Fire fighting | - | 573 | 1 | 574 | 0 |
| | Others | - | 291 | - | 291 | 0 |
| **Total** | | **239,338** | **104,609** | **40,280** | **384,227** | **100** |
| Percentage of total | | 62 | 27 | 10 | 100 | |
| **ODP tonnes** | | | | | | |
| PU foam | Rigid | 2,034 | 955 | 341 | 3,329 | 14 |
| | Spray | 1,005 | 369 | 131 | 1,505 | 6 |
| | Integral skin | 722 | 58 | 21 | 800 | 3 |
| XPS foam | | 1,929 | 53 | 51 | 2,033 | 8 |
| AC manufacturing | Room AC | 3,521 | 1,480 | 572 | 5,573 | 23 |
| | Others AC | 1,721 | 80 | 31 | 1,832 | 8 |
| Refrigeration manufacturing | | 216 | 324 | 125 | 665 | 3 |
| Refrigeration servicing | | 3,845 | 3,011 | 1,166 | 8,022 | 33 |
| Others | Aerosol | - | 24 | - | 24 | 0 |
| | Solvents | 428 | 79 | 22 | 529 | 2 |
| | Fire fighting | - | 12 | 0 | 12 | 0 |
| | Others | - | 7 | - | 7 | 0 |
| **Total** | | **15,420** | **6,452** | **2,459** | **24,331** | **100** |
| Percentage of total | | 63 | 27 | 10 | 100 | |

(*) The PU foam manufacturing sector consumes mostly HCFC-141b and a small amount of HCFC-22; the XPS foam manufacturing sector consumes a combination of HCFC-22 and HCFC-142b in different proportions depending on the country; the refrigeration and air-conditioning (RAC) manufacturing and servicing sectors consume mostly HCFC-22 and small amounts of HCFC-123, HCFC-124 and HCFC-142b; other sectors (aerosol, solvents, fire-fighting) consume small amounts of HCFC-21, HCFC-22, HCFC-123, HCFC-124, HCFC-141, HCFC-141b, HCFC-142b and HCFC-225.

9. The analysis of consumption data (measured in mt) in Table 2 shows that:

[6] Document UNEP/OzL.Pro/ExCom/74/49 describes the methodology used to determine the remaining HCFC consumption in Article 5 countries; presents an analysis of the remaining HCFC consumption per sector and subsector; and provides an assessment of the sectors and subsectors of potential demonstration relevance.

(a) The RAC manufacturing sector combined and the refrigeration servicing sector[7] consume 38 per cent each of the remaining HCFC consumption, while the foam sector (both PU and XPS) consumes the remaining 23 per cent;

(b) The largest manufacturing subsector with remaining HCFC consumption is the room-AC sector (101,324 mt), where 63 per cent of the consumption is in China;

(c) The second subsector with the largest remaining HCFC consumption is the XPS foam manufacturing sector (34,479 mt), followed by the "other AC manufacturing" subsector[8] (32,824 mt). For both subsectors, almost all the consumption is in China; and

(d) The 51,301 mt of remaining HCFC-141b consumption in the PU foam sector is distributed as follows: 30,356 mt in several rigid applications, 13,673 mt in spray foam (used by a large number of small enterprises with a very small level of consumption in several countries), and 7,271 mt in integral skin foam, with 66 per cent consumed in China.

**Potential alternative technologies for possible demonstration**

10. In addition to the sector/sub-sector distribution of HCFC consumption in Article 5 countries, the Secretariat also considered the document on the overview of approved HCFC demonstration projects and options for additional projects to demonstrate climate-friendly and energy efficient alternative technologies to HCFCs,[9] and the TEAP report to the 26th Meeting of the Parties pursuant to decision XXV/5[10]. The Secretariat noted that:

(a) Of the 14 demonstration projects approved between the 56th and 64th meetings, nine were for the foam sector, one for compressor manufacturing, one for food processing and cold storage, two for air-conditioning and one for solvents. Eight of these were in China, four in Latin America and the Caribbean, and one for each Africa and Europe and Central Asia regions;

(b) The Executive Committee had also approved a project "Promoting low-GWP refrigerants for air-conditioning sectors in high-ambient temperature countries", which could result in the conversion of manufacturing capacity for manufacturing of air conditioners in high ambient temperature conditions; and

(c) The TEAP report on decision XXV/5 relating to the refrigeration and air-conditioning (RAC) sector provided additional information on alternatives to ODS, and a table summarising the application of each alternative within the respective subsectors in the RAC (presented in Appendix II to the present guide).

11. Based on the information contained in these documents, bilateral and implementing agencies would be able to prioritize alternative technologies most viable to be demonstrated.

[7] From the information available, it was not possible to determine the amount of HCFC used in installation, assembly and initial charge of refrigeration and AC equipment.
[8] Including multi split, ducted split commercial, hot water heating heat pumps, space heating heat pumps.
[9] UNEP/OzL.Pro/ExCom/72/40.
[10] TEAP Task force report on additional information to alternatives on ODS, October 2014.

**Submission requirements**

12. In order to facilitate the selection of the best demonstration projects and feasibility studies for district cooling, bilateral and implementing agencies were invited to submit to the 74th meeting all funding requests for preparation of demonstration projects and, if available, full project proposals. Appendix III to the present guide contains templates for project preparation funding and demonstration projects.

13. For requests for project preparation funding and approval of project concepts, the following information must be provided:

(a) A brief description of the project and the technology to be demonstrated, clearly describing how the project meets the criteria set out by the Executive Committee;

(b) A brief description of how this project would contribute to the phase-out of HCFCs in the specific sector where the demonstration project will be implemented;

(c) Information for the enterprise(s) where the project would be implemented including the date of establishment of each enterprise, HCFC consumption of the enterprise(s)/sector for the last three years, and the amount of HCFCs to be phased out by the resulting demonstration project;

(d) A description of how the technology being demonstrated may be replicated locally and in other countries;

(e) A list and description of activities to be undertaken during project preparation, and the corresponding cost breakdown; and

(f) In addition to the total amount requested for project preparation, an indication of the overall costs of implementing the final demonstration project should be included (this information is of relevance so that the Executive Committee could select the demonstration projects to be implemented within the funding available).

14. For submissions of full project proposals, the following elements should be included:

(a) Updated and more detailed information for all issues mentioned under project preparation funding;

(b) Updated information on the enterprise where the project would be implemented including description of the baseline equipment, what changes need to be made, and the amount of HCFCs to be phased out by the resulting demonstration project;

(c) Assessment of potential risks and barriers that could undermine the success of the commercial application of the technology and expected actions to mitigate them;

(d) A detailed description of all time-critical elements of the project, the institutional and organizational structure for implementation and all the activities to be undertaken;

(e) A detailed description of the costs of the project, financial set-up, approaches for disbursement, and the corresponding capital and operating costs breakdown. Information on costs not covered by the Multilateral Fund, if applicable, and the sources for co-financing should also be included as required in decision 72/40(b)(ii);

(f) A detailed implementation plan including a plan for monitoring progress and ensuring that completion will be achieved under a short implementation period, as required by the Executive Committee; and

(g) Information on how replicability will be ensured, including detailed descriptions of activities that will be undertaken to ensure this.

15. The requests for feasibility studies for district cooling should contain the following:

(a) A description of the study, clearly defining its objectives, expected outputs and methodology to be used;

(b) A description of how the technical and financial feasibilities of the selected approach (e.g. district cooling) will be assessed during the study;

(c) Information on the proposed business model to be used;

(d) Potential partners for the feasibility study, where relevant;

(e) Information on likely co-financing opportunities after the study is completed;

(f) A description and list of all activities to be undertaken and associated cost breakdown; and

(g) A detailed work plan for implementation including milestones and a schedule for completion within the proposed implementation period.

Prerequisites for submission

16. The following are required to be part of the submission for a request for any project preparation funding for demonstration projects, full demonstration project proposals, and feasibility studies for district cooling:

(a) An official endorsement letter from the Government concerned along with the request at the 8-week deadline, which shall indicate among others, the lead agency for implementation and the cooperating agency if any. This letter should include a commitment from the Government that any reductions in the consumption of HCFCs resulting from the demonstration project will be deducted from the country's starting point for sustained aggregate reductions in eligible HCFC consumption, and indicating that it is aware that the identified companies included in the projects are willing to undertake conversion of the manufacturing process to the new technology, and that the company has indicated whether it is in a position to cease using HCFCs after the conversion. Any submission without an endorsement letter containing the above condition will not be considered as an official submission, and therefore, will not be reviewed. In cases where one or more agencies are working together to assist a country in preparing and developing the proposed demonstration project, the official endorsement letter from the Government should clearly indicate the division of tasks among the agencies, along with how the project preparation funding would be distributed between the agencies;

(b) A written commitment from the identified enterprises, in line with decision 72/40(b)(i)c and in paragraph 8(f) above, stating that they are willing to undertake the conversion of the manufacturing process to the new technology and whether they will cease the use of HCFCs after the conversion, due at the time of submission of the full demonstration project proposal; and

(c) Both letters from the Government and the enterprise(s) should convey a message of willingness and readiness to immediately undertake the work.

17. All project preparation funding requests have to be submitted as part of each bilateral/implementing agency's work programme/work programme amendments, on the 8-week deadline for submission, or earlier. Requests for funding feasibility studies for district cooling may be submitted at the 74th and 75th meetings only.

Timing of submissions

18. Funding requests for project preparation, and project concepts where no project preparation funding was required, would be considered by the Executive Committee at the 74th meeting. All submissions should include the indicative costs of the final demonstration project. After this initial selection, bilateral and implementing agencies would be able to submit full demonstration project proposals to the 75th and 76th meetings.

19. Considering that there may be more proposals than funds available, compliance with the above pre-requisites will be strictly enforced.

## Appendix I

## CRITERIA AND ADDITIONAL GUIDANCE ON PROPOSALS FOR DEMONSTRATION PROJECTS AND FEASIBILITY STUDIES, AND SET OF DEFFINITIONS

### Criteria

The Executive Committee decided[11]:

(a) To note the overview of approved HCFC demonstration projects and options for additional projects to demonstrate climate-friendly and energy efficient alternative technologies to HCFCs contained in document UNEP/OzL.Pro/ExCom/72/40;

(b) Pursuant to decision XXV/5 of the Twenty-Fifth Meeting of the Parties, to consider at its 75th and 76th meetings proposals for demonstration projects for low-global-warming potential (GWP) alternatives to HCFCs within the following framework:

(i) The following criteria would be applied when selecting projects:

a. The project offered a significant increase in current know-how in terms of a low-GWP alternative technology, concept or approach or its application and practice in an Article 5 country, representing a significant technological step forward;

b. The technology, concept or approach had to be concretely described, linked to other activities in a country and have the potential to be replicated in the medium future in a significant amount of activities in the same sub-sector;

c. For conversion projects, an eligible company willing to undertake conversion of the manufacturing process to the new technology had been identified and had indicated whether it was in a position to cease using HCFCs after the conversion;

d. The project proposals should prioritize the refrigeration and air-conditioning sector, not excluding other sectors;

e. They should aim for a relatively short implementation period in order to maximize opportunities for the results to be utilized for activities funded by the Multilateral Fund as part of their stage II HCFC phase-out management plans (HPMPs);

f. The project proposals should promote energy efficiency improvements, where relevant, and address other environmental impacts;

(ii) Total funding for such projects described in sub-paragraph (b) above would not exceed US $10 million. The project proposals should also contain information on co-financing;

[11] Decision 72/40.

(iii) Funding requests for project preparation and project concepts where no project preparation funding was required, including indicative costs of the final demonstration project for projects described in sub-paragraph (b) above, would be considered at the 74th meeting. The funding requirements and project concepts should address the criteria described in sub-paragraph (b) above;

(iv) If not extended by decision of the Executive Committee, the demonstration project would be considered financially completed 12 months after the intended completion date, and remaining funds would be returned; reporting obligations for the demonstration project would become part of regular progress reporting under the HPMP, and their fulfilment would be required to allow submission of a tranche;

(v) Any reductions in the consumption of HCFCs would be deducted from the starting point for sustained aggregate reductions in eligible consumption;

(c) To invite bilateral and implementing agencies to provide proposals for feasibility studies, including business cases for district cooling, no later than the 75th meeting. The resulting studies should assess possible projects, their climate impact, economic feasibility and options for financing such undertakings. The studies should enable stakeholders to understand the advantages and challenges as compared to business as usual. The funding for each study would be limited to a maximum of US $100,000, with a maximum of four studies to be funded. The Executive Committee is not agreeing with this approval to consider further funding beyond the feasibility studies; and

(d) To request the Secretariat to prepare a paper analysing the remaining eligible HCFC consumption in various sectors and subsectors of potential demonstration relevance, for consideration by the Executive Committee at its 74th meeting.

**Additional guidance**

Guidance was also provided to ensure that the best proposals for demonstration projects were submitted to the Executive Committee for its consideration. The following suggestions were made by Executive Committee members[12]:

(a) Project proposals should: clearly describe the technology to be demonstrated; provide information on its replicability and its demonstration value and how those elements would contribute to the direction being taken by the Executive Committee in facilitating the introduction of new low-GWP technologies as alternatives in HCFC phase-out plans; and target sectors or regions for which the technology had not been demonstrated in the past;

(b) Projects in the refrigeration and air-conditioning sector would be prioritized, particularly air-conditioning manufacturing, where there were emerging technologies that could be demonstrated. Some delegations that commented on the air-conditioning manufacturing sector emphasized demonstration on unitary systems or larger mini-splits, for example using low-GWP hydrofluoroolefin (HFO) blends, as well as the importance of focusing on the challenges of high ambient temperatures. Some Executive Committee members also suggested that the following might be addressed in demonstration projects: adsorption-based systems, the design of centralized cooling systems, or ways to best address the safe use of ammonia, $CO_2$ or

[12] Paragraph 97 of the document UNEP/OzL.Pro/ExCom/73/62.

hydrocarbons in refrigeration or air-conditioning equipment. If possible, applications with a significant share of HCFC use should be highlighted rather than niche applications;

(c) Projects that demonstrated already established technologies should clearly describe the value of those projects;

(d) Demonstration projects for the foam sector should clearly describe and delineate the added value of those projects compared to projects completed in stage I, what was new, and how relevant all this was to the remaining consumption to be phased out in the sector;

(e) Projects should also consider regional and geographical distribution;

(f) Some Executive Committee members would prefer not to see projects looking at leak reductions, projects on the supply, quality and handling of refrigerants, and global or regional projects; and

(g) Some Executive Committee members would prefer not to see demonstration projects in the servicing sector, except for those covering local assembly of equipment.

**Definitions**

For clarification purposes, the designations below will be used to determine the various types of submissions to the Secretariat. These descriptions were based primarily on the level of information required for each submission/stage, budget requirements, responsibility for completion, and timelines, and are provided only in order to differentiate between each submissions:

(a) Project concept: A brief description of what technology the project aims to demonstrate, its objectives and scope, and the benefits it will deliver as it relates to the phase-out of HCFCs and the implementation of the HPMP. This is the stage that defines what the full demonstration project is, and identifies the significant activities that would lead to the completion of the full demonstration project proposal. The development of the project concept is led by the implementing and bilateral agency in close cooperation with the Article 5 country concerned. An estimate of the funding required for the preparation of the project proposal (if required) and an estimate of the cost of the demonstration project (including agency support costs) must be included (as there is a funding cap of US $10.4 million for demonstration projects and district cooling studies).

(b) Project preparation: The project preparation request will contain the same information as in the project concept (a) above. The main difference is that this will include the activities and funding requested for project preparation.

(c) Project proposal: The full demonstration project proposal should include all the elements of stand-alone project proposals approved under the Multilateral Fund. This document would further describe how the project will be implemented, defines all the different tasks and activities of the project (including procurement), and all the time-critical elements of the project. The document would also include the expected completion date of the project, the organizational structure and responsibilities for implementation, including assessment of risks and barriers, if any. Most importantly, this will include very detailed cost information financial plan for project completion.

(d) Feasibility studies: For purposes of this guide, feasibility studies will refer to those that look at the prospect and utility of district cooling in relation to decision 72/40. The proposal should provide information that would allow for the evaluation and analysis of the potential district cooling, and an understanding of the advantages and challenges of this approach. The study would then support the process of determining whether this is an option that may be used in HCFC phase-out.

## Appendix II

### ALTERNATIVE TECHNOLOGIES IN THE REFRIGERATION AND AIR CONDITIONING SUBSECTORS (TEAP REPORT ON DECISION XXV/5)

| GWP | 0 | 1 | 3 – 5 | 4 | 4 | 6 | 6 | 290 | 330 | 490 | 490 | 600 | 630 | 716 | 1330 | 1410 | 1370 | 1700 | 1820 | 2100 | 2100 | 3700 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R-717 | R-744 | HC-290, HC-1270 | HC-600a | HFC-1234yf | HFC-1234ze(E) | HCFC-1233zd(E) | "L-40" | R-444B | "L-41" | "DR-5" | R-450A | "XP-10" | HFC-32 | R-448A | R-449A | HFC-134a | R-407C | R-407F | R-407A | R-410A | R-404A |
| Domestic refrigeration | | | | C | F | | | | | | | F | F | | | | C | | | | | |
| Commercial refrigeration | | | | | | | | | | | | | | | | | | | | | | |
| — Standalone equipment | | C | C | C | L | F | | F | F | F | F | F | F | F | L | F | C | F | F | F | F | C |
| — Condensing units | | L | L | F | F | | | F | F | F | F | F | F | F | L | F | C | F | F | F | F | C |
| — Centralised systems | L | C | L | | F | | | F | F | F | F | F | L | F | L | F | C | F | C | C | F | C |
| Transport refrigeration | | C | C | | F | | | F | F | F | F | F | F | F | F | F | C | F | F | F | C | C |
| Large size refrigeration | C | C | L | | F | | | F | F | F | F | F | F | F | F | F | F | C | C | C | C | C |
| Air conds. and heat pumps | | | | | | | | | | | | | | | | | | | | | | |
| — Small self-contained | | L | C | | F | | | | F | F | F | F | F | L | F | F | C | C | F | F | C | F |
| — Mini-split (non-ducted) | | L | C | | | | | | F | L | F | F | F | C | F | F | F | C | F | F | C | F |
| — Multi-split | | L | | | | | | | F | L | F | F | F | L | F | F | F | C | F | F | C | F |
| — Split (ducted) | | F | F | | | | | | F | F | F | F | F | L | F | F | F | C | F | F | C | F |
| — Ducted split comm. & non-split | | F | L | | | | | | F | F | F | F | F | L | F | F | C | C | F | F | C | F |
| — Hot water heating HPs | C | C | C | C | F | F | | F | F | F | F | F | F | L | F | F | C | C | F | F | C | F |
| — Space heating HPs | C | C | C | L | F | F | | F | F | F | F | F | F | L | F | F | C | C | F | F | C | C |
| Chillers | | | | | | | | | | | | | | | | | | | | | | |
| — Positive displacement | C | C | C | | L | L | | F | F | L | F | L | L | L | F | F | C | C | F | F | C | C |
| — Centrifugal | | | L | | L | C | C | | | | | | | | | | C | | | | | |
| Mobile air conditioning | | | | | | | | | | | | | | | | | | | | | | |
| — Cars | | F | F | | C | | | | | | | F | F | | | | C | | | | | |
| — Public transport | | F | | | L | | | | | | | F | F | | | | C | C | | | C | |

"C" indicates current use on a commercial-scale
"L" indicates limited use such as for demonstration, trials, niche applications, etc.
"F" indicates use is potentially feasible on a commercial scale, based on fluid characteristics

## Appendix III

## PROPOSED TEMPLATES FOR PROPOSALS

**Project preparation funding request**

Project Title

I. Introduction (no more than half a page)
   a. Why this particular project is relevant and necessary to HCFC phase-out
   b. Justification/description of project replicability
II. Brief project summary (no more than 2-3 paragraphs)
III. Project objectives (summarized in bullet form)
IV. Expected demonstration results (no more than half a page)
V. Institutional arrangements
   a. Brief information on legal and regulatory support for the demonstration project
   b. Description of implementation approach
   c. Government commitment to complete project in the shortest possible time
VI. Company Information
   a. Indication of commitment from enterprise about their willingness to undertake the project, and whether it will be in a position to cease using HCFCs after the conversion, through a notation included in the submission.
   b. Summary of HCFC consumption, at least for the last three years

**Full demonstration project proposal submissions**
**(**Note: the full project proposals should provide updated information in addition to what had been submitted to support project preparation funding request)

Project Title:

I. Introduction (no more than 2 pages)
   a. Why this particular project is relevant and necessary to HCFC phase-out
II. Brief country background including progress in implementation of HPMP
III. Brief project summary (no more than 2-3 paragraphs)
IV. Project objectives (summarized in bullet form)
V. Sector background (no more than 1 page)
   a. Analysis of remaining eligible consumption and how this application was chosen for demonstration
   b. Information on how the demonstration project will contribute to phase out in the sector
VI. Institutional Framework supporting the implementation of the demonstration project (no more than 2 pages)
   a. Policies and regulations
   b. Description of the commitment to complete the project in the short implementation period, and that this would not affect compliance
VII. Detailed project description (no more than 5 pages, this section should include information that support the compliance of the proposal to decision 72/40, see paragraph 14 of the document)
   a. Description of technology to be demonstrated, how it offers a significant increase in knowledge for the sector, what is its demonstration value?

b. Description of how the demonstration project is linked to the HPMP, and how it will contribute to phasing out HCFCs
c. Description of how this proposed technology may be replicated in a significant number of activities in the sector/sub-sector, include potential barriers to replication, if applicable
d. Information on how the demonstration project will contribute to the uptake of low-GWP alternatives for the sector/sub-sector, how it will promote energy-efficiency

VIII. Information on participating companies
a. Letter of commitment from the company stating that if the demonstration project is successful and economically viable, it will completely phase out the use of HCFC associated with that specific application; and that it will provide a comprehensive report on project implementation once completed.

IX. Project costs/budget (table)
a. Include list of activities and unit cost for each
b. Reasons for any major difference between indicative project costs identified during project preparation should be explained (i.e. change in equipment cost, etc.)

X. Project implementation plan

XI. Description of what the final report would contain and how it would be disseminated

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## Annex II

## PROJECTS TO DEMONSTRATE LOW-GWP TECHNOLOGIES AND FEASIBILITY STUDIES ON DISTRICT COOLING

1. Annex II contains a one-sheet summary for each demonstration project on ODS alternatives in the refrigeration and air-conditioning manufacturing sector; installation and assembly sector; foam sector; and refrigeration servicing sector. It also contains a one-sheet summary for each feasibility study on district cooling.

2. Each summary sheet includes: basic information of the demonstration project (e.g., project title and number, name of the agency, country, sector and subsector, alternative technologies, amount of HCFCs to be phased out, and estimated costs); the project concept; the Secretariat's assessment (based on the criteria provided by the Executive Committee and the remaining HCFC consumption); and the Secretariat's comments and agencies' responses.

### Low GWP demonstration project proposals in the refrigeration and air-conditioning manufacturing sector

3. The demonstration projects on ODS alternatives in the refrigeration and air-conditioning manufacturing sector are listed in Table 1.

**Table 1. Low GWP demonstration project proposals in the refrigeration and air-conditioning manufacturing sector**

| Project No. | Country | Agency | Title |
|---|---|---|---|
| RAC 1 | China | UNDP | Proposals of demonstration projects of ammonia semi-hermetic frequency convertible screw refrigeration system in the industrial and commercial refrigeration industry. |
| RAC 2 | China | UNDP | Proposal for demonstration project for developing screw high temperature heat pump compressor units with low GWP refrigerant in the industrial and commercial refrigeration industry. |
| RAC 3 | China | UNIDO | Demonstration project for the conversion from HCFC-22 to $CO_2$ heat pumps compressors. |
| RAC 4 | China | UNIDO | Preparation of demonstration project on low-GWP alternatives in various applications for transport refrigeration: cryogenic and natural refrigerants. |
| RAC 5 | Egypt | UNDP /Japan | Demonstration of HCFC free low GWP technologies performance in the commercial refrigeration sector. |
| RAC 6 | Kuwait | UNDP | Project preparation for demonstration of HCFC free low GWP technologies performance in air-conditioning applications. |
| RAC 7 | Philippines | Germany | Converting commercial AC products and associated production line from HCFC-22 to HC-290 at Koppel Inc. |
| RAC 8 | Saudi Arabia | UNIDO | Preparation of a demonstration project on promoting HFO-based low GWP refrigerants for air-conditioning sector in high ambient temperatures. |
| RAC 9 | Trinidad and Tobago | UNDP | Demonstration project for the production of hydrocarbons (HC) refrigerants for refrigeration and air conditioning applications in Latin America and the Caribbean. |
| RAC 10 | (*) | Japan | (*) |

(*) Not yet available.

| **Project Number** | **RAC 1** |
|---|---|
| Country | **China** |
| Agency | **UNDP** |
| Project title | Proposals of demonstration project of ammonia semi-hermetic frequency convertible screw refrigeration system in the industrial and commercial refrigeration industry |
| Sector/subsector | Industrial and commercial refrigeration |
| Alternative(s) | $NH_3$, $CO_2$ |
| ODP to be phased out* | Indirect 13.48 ODP tonnes of HCFC-22 |
| Preparatory Budget | US $24,000 plus agency support costs of US $1,680 |
| Estimated Project Budget | US $2,500,000 plus agency support costs of US $175,000 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Manufacture of a $NH_3$ screw compressor for use of a $CO_2/NH_3$ cascade system in smaller commercial refrigeration equipment (supermarket, shopping malls) |
| Assessment:<br>$NH_3$-compressor is already produced in non-Article 5 countries. The combination of smaller capacity $NH_3$ systems with $CO_2$ as secondary refrigerant represents a technological advancement in Article 5 countries. It includes compressor production and testing, but excludes manufacture and installation of the refrigeration system. If a $NH_3$-based compressor is made available, conversion of refrigeration equipment, installation, servicing and development of safety regulations could be promoted through HPMPs |

| **MFS comments** | **UNDP response** |
|---|---|
| What is the difference between the proposed demonstration and the demonstration project already conducted in Yantai Moon? | Yantai Moon systems used for cool storage are very big (big capacity chillers). Compressors made by Snowman will be much smaller than those made by Yantai and will be used for freezers, refrigeration cabinets, especially in shopping malls, supermarkets |
| Will the project include the design and construction of production lines for a full system including compressor and refrigeration equipment, testing facilities, and training on operation? | There are three production areas in Snowman, i.e., screw compressors, piston compressors, and ice-making equipment. The project aims to convert the production line of screw compressors, provide testing facilities and training on operation. However, it does not include the refrigeration equipment |
| This technology has been used extensively in different countries. How would the demonstration provide added value to existing know-how, especially in promoting replication and use of the technology? | While this technology has been used extensively in different countries, the use is restricted solely to large capacity equipment. The project will develop small and medium capacity compressors, which will be used for cold chain, and freezers in the supermarket |
| Will the entire HCFC-22 consumption (average 413 mt from 2012-2014) be phased out through the project? | There are three production areas in Snowman. The average of 413 mt is the overall consumption of the company. The indirect average consumption of HCFCs for screw compressors is 245 mt |

* Remaining HCFC consumption: Commercial refrigeration 191 ODP tonnes (3,481mt) in China; unknown in other countries. Refrigeration manufacturing in all Article 5 countries: 665 ODP tonnes (12,403 mt).

| **Project Number** | **RAC 2** |
|---|---|
| Country | **China** |
| Agency | **UNDP** |
| Project title | Proposal for demonstration project for developing screw high temperature heat pump compressor units with low GWP refrigerant in the industrial and commercial refrigeration industry |
| Sector/subsector | Industrial and commercial refrigeration/heat pumps |
| Alternative(s) | HFO-1336Mzz(Z) |
| ODP to be phased out* | 4.95 ODP tonnes indirect |
| Preparatory Budget | US $36,500 plus agency support costs of US $2,555 |
| Estimated Project Budget | US $2,000,000 plus agency support costs of US $140,000 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Development of a high temperature heat pump compressor using HFC-1336Mzz (ICR sector). The demonstration does not include the development of full heat pump system |
| Assessment:<br>The project addresses a new technology that has not been previously demonstrated. A compressor manufacturer has been identified to demonstrate the technology in the field. Due to limited information for HFO-1336Mzz(Z) use as refrigerant, it would be important to include heat pump development, installation and training especially in high ambient temperature. As the enterprise already has a tester centre, it is unclear why most of the project items are requested as they are equally needed for any screw compressor already produced. Rather than addressing current HCFC-22 consumption, the project aims to avoid future increase of HCFC 22 consumption. Although replication may be limited to the application within China, giving the growth of consumption in this area, the potential avoidance of HCFC consumption could be significant |

| **MFS comments** | **UNDP responses** |
|---|---|
| Will the demonstration include redesign of the complete heat pump, installation and on-site training as well? How will the complete heat pump unit be produced? | The enterprise is a compressor manufacturer; the project aims to develop high temperature heat pump compressors using HFO, including design, prototype testing, and relevant activities |
| There limited reported experience in the use of HFO-1336Mzz(Z) as refrigerant. What are the potential risks that could undermine the success of the demonstration project and how would these be addressed? | The HFO compressors have several uncertainties, e.g., technical capacity, cost, development, supplement and matching of key equipment. The risk of new production will be controlled by precise design, deep research, and mass testing, which needs sufficient time and funding. The success of new production with HFO will be a good demonstration for further HFO applications |
| How would the cost and availability of HFO-1336Mzz(Z) affect the commercial application of the technology in Article 5 countries? | The price of HFO-1336Mzz(Z) is higher than other refrigerants, but the cost of refrigerants is a lower share of the total cost of refrigeration systems in big systems as compared to small ones. HFO has the potential to be applied in several areas, and application of the technology in Article 5 countries needs further evaluation. The exact differences in cost of refrigeration system will be evaluated after the project is completed |
| What is the estimated ODP to be phased out and the potential consumption in the sector to be addressed? | The HCFC-22 amount used for chiller/heat pumps in China was 18,750 mt (1,031 ODP tonnes) in 2008. The estimated consumption at enterprise level would be arrived at a future date during the project proposal stage |

* Remaining HCFC consumption: 961 ODP tonnes (17,474 mt) in China in the industrial and commercial chillers/heat pumps application, unknown in other countries.

| **Project Number** | **RAC 3** |
|---|---|
| Country | **China** |
| Agency | **UNIDO** |
| Project title | Demonstration project for the conversion of heat pump compressors from HCFC-22 to $CO_2$ |
| Sector/subsector | AC manufacturing/domestic heat pumps |
| Alternative(s) | $CO_2$ |
| ODP to be phased out* | Potentially between 5.5 and 16.5 ODP (indirect) |
| Preparatory Budget | US $30,000 plus agency support costs of US $2,100 |
| Estimated Project Budget | US $1,500,000 plus agency support costs of US $105,000 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Manufacture of heat pump compressors using $CO_2$ technology. The project includes only the manufacture of compressors, not the whole heat pump system. This is for use of heat pumps for heating only |
| Assessment:<br>The $CO_2$ heat pump compressor is a mature technology in non-Article 5 countries, but not available in Article 5 countries. The enterprise selected has already developed a $CO_2$ compressor prototype on a laboratory scale with its own resources, which could be a good foundation for the demonstration; however, if pursued, the proposal should consider the development of the heat pump itself. Rather than addressing current HCFC-22 consumption, the project aims to avoid future increase of HCFC 22 consumption. Although replication may be limited to the application within China, viewing the growth of consumption in this area, the potential avoidance of HCFC consumption could be significant |

| **MFS comments** | **UNIDO responses** |
|---|---|
| Whether the project targets space heating or water heating. $CO_2$ for domestic heat pumps for water heaters is established technology and a large range of these products are produced (especially in Japan) | Project is targeting water heating. Japan has developed the $CO_2$ technology for domestic heat pump water heaters; however, it is not willing to transfer the technology to China |
| Development of $CO_2$ rotary compressors is not new. Highly already manufactures these compressors (as included in a commercial brochure from a German re-seller). Clarification is needed on how the project interacts with the current business strategy of SHEC/Highly | The development of the $CO_2$ rotary compressors is not new. Compressors are only developed in laboratories. This project is to convert a production line to allow for full-scale production. The brochure from the German re-seller specifies which compressors are suitable for heat pump operation; and this is only HFC-134a and HC-290 |
| Two compressor production lines have been converted to HFC-32 and $CO_2$ under the ICR plan in China. Is this demonstration needed? | Under the ICR, compressors using HFC-32 and $CO_2$ are used in freezing and cold storage applications (larger applications). This conversion is for domestic heat pump water heaters, which have different requirements |
| Estimated indirect ODP phased out if selected compressor production line is converted to $CO_2$ technology. Where is the manufacturing of heat pumps using these compressors going to take place? | Potentially between 100 and 300 mt. The detailed figure will be verified during the preparation of the project document. These compressors are mainly used in domestic heat pump heaters. As the development of domestic heat pump heaters is very fast, some RAC production lines will be used to produce heat pump water heaters in addition to the existing production lines (also to be defined during project preparation) |

* Remaining HCFC consumption for hot water heating heat pump: 90 ODP tonnes (1,637 mt) in China; unknown in other countries.

| **Project Number** | **RAC 4** |
|---|---|
| Country | **China** |
| Agency | **UNIDO** |
| Project title | Preparation of demonstration project on low-GWP alternatives in various applications for transport refrigeration: cryogenic[1] and natural refrigerants |
| Sector/subsector | Commercial refrigeration /transport refrigeration |
| Alternative(s) | Natural refrigerants (i.e., HCs, water, $NH_3$ and $CO_2$), and cryogenic fluids (liquid $N_2$ or $CO_2$) |
| ODP to be phased-out[*] | n/a |
| Preparatory Budget | US $50,000 plus agency support costs of US $3,500 |
| Estimated Project Budget | US $800,000 plus agency support costs of US $56,000 |
| Endorsement letter | yes |

| |
|---|
| Demonstration components:<br>The project intends to demonstrate the manufacture of transport refrigeration systems (including both compressors and refrigerated containers) and the associated servicing using natural refrigerants (i.e., HCs, water, $NH_3$ and $CO_2$), and cryogenic fluids (liquid $N_2$ or $CO_2$). The project will demonstrate 1) adaptation of the production of HCFC-22 piston compressor to $NH_3$ or HC for long distance transportation in refrigerated containers; and 2) use of cryogenic technology for transportation of goods in the metropolitan areas. |
| Assessment:<br>The demonstration would advance know-how in transport refrigeration. However, the use of HC refrigerant in this sub-sector is challenging due to flammability issues, while the generation of liquid $N_2$ is energy intensive unless it is obtained as a by-product of another process such as liquid oxygen production. If selected, the project should focus on one or two of the proposed technologies only Although HCFC-22 is consumed for this application in China, level of consumption is unknown in other countries. An enterprise that produces both compressors and refrigerated containers, a transport enterprise and a supermarket chain have been identified for the project. |

| **MFS comments** | **UNIDO response** |
|---|---|
| a) Target a complete conversion of a specific transport class in a certain area, including facilities for maintenance, service, charging (in case of cryogenic systems)<br><br>b) Undertake the conversion of a manufacturing plant for refrigeration system for containers (only the compressors or the complete system?) (Exclusively for long distance transportation in refrigerated containers? Intermodal?) | a) For the cryogenic aspect, it will include a preliminary cost/benefits assessment, selection of technology and prototype design, manufacturing and testing of the prototype, and design the most promising scheme for charging, maintaining and servicing<br><br>b) It includes the design of the complete system for refrigerated containers including Intermodal |
| Will the proposal address only new equipment or also existing equipment? | It will address the technical and economic feasibility of new equipment using low-GPW technologies in transport refrigeration |
| In addition to Snowkey and one supermarket chain, is there any role in the demonstration for installers in containers and truck, transport enterprises, clients? | To achieve the highest demonstration objectives, the technology design will be done in cooperation with Snowkey (the manufacturer of refrigerated containers), a supermarket chain and a refrigerated truck manufacturer |
| a) In the case of cryogenic refrigeration, the production process of liquid $N_2$ to load the transport unit is energy intensive, making it inefficient to condition spaces to | a) In cryogenic systems, the project will assess the advantages and opportunities of both $N_2$ and $CO_2$ |

[1] Use of materials at very low temperatures (below −150 °C).

[*] Remaining HCFC consumption in transport and large size refrigeration: 36 ODP tonnes (648 mt) in China (the portion used in transport is not available; however, the proposal indicates a consumption of 95 mt in 2014.

| MFS comments | UNIDO response |
|---|---|
| moderate temperatures (-40 to +10 $^{o}$C)<br>b) Would the project focus on ultralow temperatures, or would the project take advantage of available liquid $N_2$ coming as a by-product of another process such as liquid oxygen production?<br>c) In the case of HC/$CO_2$/$NH_3$, would the project attempt to address current flammability/efficiency/ toxicity concerns for the use of these technologies in transport refrigeration? | b) Consideration will be given to the availability of liquid material at the lowest cost possible, including consideration of local availability of $N_2$ and $CO_2$ as by-products<br>c) All technologies (including $N_2$) will be assessed in terms of their potential risks and will be designed to achieve the highest efficiency at the lowest cost possible. Actions to mitigate their potential toxicity/flammability/explosion will be designed |
| ODP to be phased-out? | ODP phase-out, if any, will be properly calculated during project preparation |

| **Project Number** | **RAC 5** |
|---|---|
| Country | **Egypt** |
| Agency | **UNDP/Japan** |
| Project title | Demonstration of HCFC-free low-GWP technology performance in the commercial refrigeration sector |
| Sector/subsector | Central AC |
| Alternative(s) | $CO_2$ and $NH_3$ |
| ODP to be phased out* | 0 |
| Preparatory Budget | US $20,000 plus agency support costs of US $1,400 |
| Estimated Project Budget | US $400,000 plus agency support costs of US $28,000 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Use of $CO_2$ and $NH_3$ in central air-conditioning systems for commercial users (hotels/hospitals) in high ambient temperature environments |
| Assessment:<br>The target application is central AC. Demonstration of $NH_3$ and $CO_2$ performance in central AC in high ambient temperature will increase the know-how in the country. The issues to be addressed are the efficiency of $CO_2$ and the safety use of $NH_3$. If successfully demonstrated, they could be replicated in several Article 5 countries. However, the equipment that will be used and the location of the installation have not been identified yet |

| **MFS comments** | **UNDP responses** |
|---|---|
| It is not possible to provide comments as the proposal has not provided technical details. Clarify if there is a specific proposal in terms of technology that will be tested; and specific applications where the technology will be tested | $CO_2$ and ammonia (or HFC free)-based refrigeration technologies for industrial class applications will be tested. Discussions with the Government focused on selecting a recipient via a tender procedure from either an industrial sector (hotel chain enterprises) or the public sector (hospitals), to fully demonstrate the operation of the equipment under high ambient temperature conditions, and understand the full cycle of cost implications, while at the same time achieving better energy efficiencies. The choice of application is the centralized AC sector. Further, the choice of a recipient will be limited to availability of additional business or state-funded interest in replicating the technology installation in other sites. All this will be supported by awareness-raising to spread this knowledge in the country and in the region |
| Why can this project not be done as part of the HPMP implementation? What makes this a priority for demonstration? | There is currently no knowledge and practical experience in natural refrigerant technologies in the country, and more broadly in the region, for this type of applications. The main factor preventing the use of these technologies is the unprepared business/public sector and equipment maintenance firms in piloting this technology to yield field test results due to its new technical nature, and perceived capital and operating costs. If this trend line continues as a business as usual scenario, the HCFC phase-out processes would be limited to other more readily available alternatives based mostly on HFCs and their blends. The issue of |

* Remaining HCFC consumption in AC manufacturing subsector: 190 ODP tonnes (3,447 mt) in Egypt; 7,405 ODP tonnes (134,674 mt) in all Article 5 countries.

| MFS comments | UNDP responses |
|---|---|
| | national standard compatibility with natural refrigerant technologies would be also looked at to understand current constraints and opportunities for improvement. This project cannot be done as part of the HPMP considering that stage II will be submitted only in 2017. Since the industrial size applications require much higher capital investment in technologies, it would be hard to include such costs in the overarching strategy in the servicing sector, as the funding there would also be needed for re-tooling and complementary training of the servicing sector. An additional advantage of the demo project is minimizing attention to the higher-GWP technologies, and spread information on natural refrigerant technologies |
| Replicability has to be clearly described | The project will look into opportunities for business- or state-funded replication at the national level. The choice of a recipient will be geared towards such a sustainability approach. Local technical maintenance capacity (as well as assembly/commissioning) will be created to handle such technology in future upon requests from private or public clientele. Sector consumption for after-sale servicing and other general servicing and maintenance for 2010 comprised 855 mt and 139 mt of HCFC-22, respectively |
| ODP to be phased-out? | This is not an enterprise-based technology conversion, and therefore no ODP can be reported as phased out |

| **Project Number** | **RAC 6** |
|---|---|
| Country | **Kuwait** |
| Agency | **UNDP** |
| Project title | Project preparation for demonstration of HCFC-free low-GWP technology performance in air-conditioning applications |
| Sector/subsector | AC |
| Alternative(s) | HFC-32, HC-290 |
| ODP to be phased out* | Not provided |
| Preparatory Budget | US $20,000 plus agency support costs of US $1,400 |
| Estimated Project Budget | US $300,000 plus agency support costs of US $21,000 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Compare performance of different residential ACs (HFC-32, HC-290 and a few blends to be determined) through field test runs in a high ambient temperature environment. Equipment will be installed by equipment suppliers. Measurements include performance, energy consumption and safety requirements |
| Assessment:<br>The project intends to evaluate the performance and suitability (field testing and servicing) of AC equipment using different refrigerants in high ambient temperature (it ties into the UNEP/UNIDO PRAHA project[2]). Further consideration may be required on whether the performance should be evaluated in a more controlled environment (such as a laboratory). The project will increase the know-how at the country level and is highly replicable given the number of AC systems required for high ambient temperature conditions |

| **MFS comments** | **UNDP's responses** |
|---|---|
| a) The concept appears to describe testing several equipment with different technologies. Confirm if this is so, as it also appears that only one specific technology will be selected | a) Several equipment with different technologies will be tested with respect to technical feasibility, safety and performance data. The study may conclude with suggestions on suitability of the tested equipment for the Kuwaiti market |
| b) If several equipment and technologies are to be tested, who will be responsible for each? Will individual technology providers be responsible for their own equipment and technology? | b) The technology provider (or providers) will be responsible for installing equipment as per the required specifications. The technology provider will be periodically updated with the readings obtained from the data logger that will be connected to his equipment(s) in order to increase confidence in the measurements and allow equipment modification. Details will be presented in the comprehensive report |
| c) Would it use only equipment in the baseline or will new equipment be developed? If product development is to be done, what will be done? | c) Existing and new developments will be allowed. Furthermore, modifications will also be allowed during the first phase of testing. The idea is to collaboratively confirm the performance claimed by the equipment provider on typical sites |
| d) How will parameters be standardized for testing (i.e., simulate laboratory conditions in the field while ensuring that the same circumstances are measured in the same way?) | d) The aim of the project is to measure the eligibility of equipment in typical high ambient temperature. For example, it is important to know the refrigerant temperature in the condenser when the used refrigerant has low critical temperature, such as R-410A. Another example is to examine the readiness of the local market |

* Remaining HCFC consumption in the AC manufacturing subsector: 19 ODP tonnes (339 mt) in Kuwait; 7,405 ODP tonnes (134,674 mt) in all Article 5 countries.

[2] "Promoting low-GWP refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia (PRAHA)" approved at the 69th meeting.

| MFS comments | UNDP's responses |
|---|---|
| e) Will this demonstration project only be for domestic AC equipment?<br>f) What overall time frame of implementation would be sufficient to get data on the specified parameters that would influence the use of the identified technologies? (i.e., 12 months? 24 months?) | to deal with moderately flammable refrigerants<br>e) Yes, it will only include domestically available equipment suitable for air conditioning houses<br>f) 24 months (minimum) |
| Why can this project not be done as part of stage I of the HPMP, taking into account that the technologies and equipment under consideration are already commercially available (i.e., HC-290 and HFC-32 equipment and blends), where each technology provider would have an interest in undertaking testing so that this can be commercialized in the region? What makes this a priority for demonstration, and why was Kuwait selected as the country where this can be implemented? | Kuwait expressed interest in the project it will test performance of equipment using low GWP refrigerants under high ambient temperature conditions. Because its envelope has lower thermal mass and thermal resistance, A/C equipment is more dynamically linked to the outside ambient temperature compared to buildings. Therefore, it is important for Kuwait (and GCC countries) to comprehensively assess the performance of A/C equipment onsite in severe conditions (i.e., > 48 $^{o}$C) In order to avoid conflict of interest the measurements should be supervised and performed by a neutral side. This will assist decision-making during stage II and beyond in the country, besides policy inputs on how to provide direction to the AC industry when high ambient temperature conditions are encountered. Thus this will be complementary and aid in making informed choices during HPMP implementation |
| Will the proposal address regulatory issues related to the use of flammable refrigerants (most of the suggested ones are moderately flammable at the least) How? | The project will support implementation and enforcement, besides providing inputs for capacity building of the service sector. Since the capacity of AC equipment is high, unless safety standards allow, highly flammable refrigerants are not likely to qualify for testing under this demonstration project. Based on the findings of testing mildly flammable refrigerants, suggestions on future testing of flammable refrigerants may be presented in the final report |
| Replicability has to be clearly described. Results may be useful in the country if regulatory challenges are resolved, but may not necessarily work in other countries with different domestic policies | Project results can be used for countries in similar operating conditions. The results would drive policy direction for the AC industry in these markets e.g., safety standards, certification of technicians, capacity-building initiatives. Currently, there are extensive efforts to unify HVAC-related legislation within the Gulf Cooperation Council |
| ODP to be phased out? | To be confirmed |

| **Project Number** | **RAC 7** |
|---|---|
| Country | **Philippines** |
| Agency | **Germany** |
| Project title | Converting commercial AC products and associated production line from HCFC-22 to HC-290 at Koppel Inc. |
| Sector/subsector | AC/split units |
| Alternative(s) | HC-290 |
| ODP to be phased out* | Approximately.1.1 ODP tonnes |
| Preparatory Budget | US $50,000 plus agency support costs of US $6,500 |
| Estimated Project Budget | US $500,000 plus agency support costs of US $65,000 |
| Endorsement letter | No |

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|---|
| Demonstration components:<br>Safe application of HC refrigerants to several commercial air-conditioning applications by converting associated production line from HCFC-22 to HC-290. It will include redesign of products to ensure safety and efficiency, changes in the production line for safe charging of HC, upgrade of laboratory for safe testing of HC products and interventions to after-sales infrastructure to maintain a high level of safety in installation, operation, service and maintenance and end of life of AC units. Training will be provided to technicians and staff |
| Assessment:<br>The project will demonstrate the introduction of HC in larger residential AC equipment, which is an advance in technology. It will also address applicability of related standards and safety issues. The project has potential for energy savings given the efficiency of HCs. An AC manufacturer has been identified. Information generated on the design and engineering will be made available, which will benefit small-scale producers of commercial units located in several Article 5 countries. Replicability would depend on the regulations and standards on the use of flammables in other countries |

| **MFS comments** | **Germany response** |
|---|---|
| HC-290 is a known technology for air-conditioning units for small-sized systems. Given that large-sized systems are likely to need more than 1 kg of HC-290, which raises safety issues, how will the project address those limitations? | There are already products that are available which use up to 2 kg of HC. Various measures will be integrated into the design of the units, i.e., leak detection, dispersion of a leak by integral ventilation, use of pump-down in off-cycle mode and system parameter fault detection. The effectiveness of the measures will be tested and proved for each model. The development of the products will be accompanied by a comprehensive (flammability) safety assessment proving, for example, that concentrations within the room do not exceed a fraction of the LFL in the case of multiple faults. The standard EN 1127-1 will be used for the risk assessment. Part of this will include modification of the system design for charge size minimization (primarily using smaller diameter evaporator and condenser tubes). For handling of flammability matters compliance with the European ATEX directive (Directive 94/9/EC concerning equipment and protective systems intended for use in potentially explosive atmospheres) will be achieved for each model |
| How will the project address regulatory issues related to the use of flammable refrigerants? | It appears that there are no regulatory restrictions on the application of flammable refrigerants in the Philippines. In the absence of national rules, European regulations will be complied with. A national code of practice will be developed |
| The endorsement letter from the Government of | The endorsement letter is expected to be received shortly |

* Remaining HCFC consumption in AC manufacturing subsector: 603 ODP tonnes (10,955 mt) in 125 HCFC consuming countries (excluding 15 largest consumers); 7,405 ODP tonnes (134,674 mt) in all Article 5 countries.

| MFS comments | Germany response |
|---|---|
| Philippines is missing. | |
| ODP to be phased out? What are other products that will not be converted to HC-290 (10% of the production)? What will they be converted to? | Phase-out of ODP by converting HCFC-based products to HC (62 mt). The purpose is to adapt all models to use HC-290. However, initial assessment indicates that one class of model could be problematic (a 26 kW floor standing unit); if the activities to minimize the charge size are not practicable, then use of a blend (probably R444B, GWP = 310) will be considered |

| **Project Number** | **RAC 8** |
|---|---|
| Country | **Saudi Arabia** |
| Agency | **UNIDO** |
| Project title | Preparation of a demonstration project on promoting HFO-based low-GWP refrigerants for air-conditioning sector in high-ambient temperature |
| Sector/subsector | AC/window and split units |
| Alternative(s) | HFO/HFC blends (L-20 L-41, DR-3) or HFC-32 |
| ODP to be phased out* | Potentially 11 ODP tonnes of HCFC-22 |
| Preparatory Budget | US $30,000 plus agency support costs of US $2,100 |
| Estimated Project Budget | US $1,800,000 plus agency support costs of US $126,000 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Convert a manufacturing line of air-conditioning equipment to an HFO alternative (choosing from L-20 L-41, DR-3 or HFC-32), based on the results of the demonstration project "Promoting low-global warming potential refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia (PRAHA)" approved at the 69th meeting |
| Assessment:<br>The demonstration addresses new technologies that have never been demonstrated in the field in a high ambient temperature environment. A manufacturing enterprise has been identified. Most suitable technologies will be selected from the results of the UNEP/UNIDO PRAHA project[3] under implementation. Standards and guidelines for A2L refrigerants[4] will be reviewed. It can be seen as a second step after PRAHA to implement the technology on a larger scale in the manufacturing process. Given the remaining HCFC consumption in several AC applications, there is potential for replicability |

| **MFS comments** | **UNIDO response** |
|---|---|
| The project does not seem to address the availability of compressors. Will the project include compressor modifications? Are there compressors already available for use of L-20 and L-41? | Compressors are not produced at Alessa but purchased. As part of the PRAHA project, compressors for Alessa are purchased from China (Highly and GMCC) for three HFO/HFC blends (L-20, DR-3 and L-41) suitable for high ambient temperature conditions (T3). While the compressors received are made specifically for PRAHA, it is assumed that larger quantities can be available upon request |
| With reference to the PRAHA project, will the project address prototypes already developed under PRAHA, and focus on the selection of alternative refrigerants that may be used in high ambient temperatures? | The results of the PRAHA project will form the basis for selection of most appropriate alternative refrigerant for high ambient temperature |
| Will the project also include field testing (so that the behaviour in high ambient temperature conditions can be evaluated)? Please describe how | PRAHA prototypes will form the basis for further development/improvement of the products. The exact scope of product testing prior to commercialization will follow Alessa's internal procedures. They will be elaborated further during project preparation |
| How will the project address regulatory issues related to the use of flammable refrigerants (the suggested ones have a flammability classification of A2L)? | As part of the project, existing standards and guidelines for A2L refrigerants will be reviewed and assessed against national regulations |

* Remaining HCFC consumption in AC and refrigeration manufacturing sector: 440 ODP tonnes (8,000 mt) in Saudi Arabia; 5,573 ODP tonnes (101,324 mt) in all Article 5 countries.

[3] " Promoting low-GWP refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia (PRAHA)" approved at the 69th meeting.

[4] ASHRAE classification A2L and B2L correspond to lower flammability refrigerants with a maximum burning velocity of ≤ 10 cm/s.

| MFS comments | UNIDO response |
|---|---|
| There is no, or little, commercialization for the chosen alternatives. There are a number of candidates similar to R-444B available in the market. How will this project address the issue with commercialization? | The blends contain typically: HFO-1234yf or HFO-1234ze and HFC-125/152a/32 + smaller quantities of other available substances. The bottleneck for commercialization (from a technical point of view) is the availability of HFOs; and both have current markets in other sectors (automotive/XPS foam); so it's assumed that whenever the market demands a certain blend, chemical industries can also supply. The ASHRAE R-designation could possibly also be a guide for selection (currently only Honeywell has obtained this). |
| What is the justification for the overall project cost, taking into account scale of production, and noting that it appears that only adjustments to designs of prototypes will be undertaken? | The project will – in addition to improving/adjusting the design of prototypes - also convert existing assembly line(s) to HFO/HFC blend; including all safety-related issues. The overall cost is indicative (based on ongoing conversion projects into flammable alternatives) and will be detailed during project preparation. |
| ODP to be phased out? | Potentially app. 200 mt of HCFC-22 can be phased out. |

| **Project Number** | **RAC 9** |
|---|---|
| Country | **Trinidad and Tobago** |
| Agency | **UNDP** |
| Project title | Demonstration project for the production of HC refrigerants for refrigeration and air conditioning applications in Latin America and the Caribbean |
| Sector/subsector | Domestic and commercial refrigeration manufacturing and servicing |
| Alternative(s) | HC |
| ODP to be phased out | 0 |
| Preparatory Budget | US $40,000 plus agency support costs of US $2,800 |
| Estimated Project Budget | US $520,000 plus agency support costs of US $36,400 |
| Endorsement letter | Yes |

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|---|
| Demonstration components:<br>The project will demonstrate the bottling, distribution and use of HC refrigerants. |
| Assessment:<br>The country has a refinery facility to produce refrigerant quality HC. With the demonstration setting up bottling and distribution of HC refrigerant, the country will be able to supply the HC refrigerants to the region. A similar demonstration project had been approved for Nigeria under its HPMP[5]. Before bottled HC- refrigerants could be distributed, regulations and standards for the use of flammable refrigerants should be adopted and barriers to the operation of HC-based refrigeration equipment should be removed |

| **MFS comments** | **UNDP response** |
|---|---|
| The technology for the production of HC refrigerant has been demonstrated in Pamaque Hydrocarbon Distillation Facility in Irelu, Nigeria as part of its HPMP. What is the added value of this demonstration project? | Although both projects may have identical objectives (i.e., ensure a secure supply of pure-grade HC refrigerants to RAC applications), the concepts are different in their development and replicability. The Pamaque project required the setting up of a distillation facility so LPG could the purified at the required standards. In Trinidad and Tobago there is no need for tower; the project will use the LPG feedstock to achieve better purity, thus lowering the capital costs in comparison to the Nigeria project. This is a key issue since many Article 5 countries that already produce LPG under the same conditions could benefit from the lessons learnt from the project and replicate it in their countries, assuring local supply at a very competitive price |
| How would the demonstration address the lack of regulation and standards for the use of HC and the safety-related issues in distribution, storage and handling of HCs? How would the lack of regulations affect the replication of the technology in other countries? | Issues related to standards and regulation on HCs is more a “multi-dimensional barrier”, since it can be divided into production, transportation and use of such substances. The initial focus will be on standards required to produce refrigerants, as well as the transport (bulk and cylinders) and storage (bulk and cylinders) of refrigerants. The other dimension is related to the use and applications of HCs in equipment and the issues related to the storage and transportation of charged equipment. The project may suggest ways to overcome these barriers using international experiences (e.g., standards related to R-600a use in domestic refrigerators); but it is believed that such a component is already being addressed within the HPMPs of many countries |

[5] Document UNEP/OzL.Pro/ExCom/62/43; Executive Committee decision 62/58.

| MFS comments | UNDP response |
|---|---|
| Will HCFC-22-based equipment be retrofitted to HC and used for demonstration? If not, who would supply the HC-based commercial refrigeration equipment? How will the lack of equipment supply affect the commercial application of the technology? | The project will not promote retrofit of equipment not designed to use HCs. It will focus on the supply of refrigerants for equipment designed for that purpose. In the Trinidad and Tobago case there are already R-600a domestic refrigeration being imported and commercialized, therefore, the local market is already experiencing barriers in servicing when refrigerants are needed. It is difficult to find a steady and low cost supply (which is the case in some Caribbean countries too). Recently, through the HPMP HC-290a AC were purchased for training purposes. It was a long and difficult process due to lack of international standards, expertise, and insurance issues linked to the transportation of charged equipment, despite of the good will of the supplier. The solution was to import equipment without charge. However, if was also difficult to encounter a source of propane for the equipment (even on an experimental basis). Currently, the cost of HC refrigerant is similar to HFC refrigerant and there is no incentive to look for low-GWP solutions when procuring new equipment. It is expected that easy and reliable access to low cost HC refrigerant would promote the import of equipment that is designed to use HC, thereby reducing future servicing demands for HCFCs and HFCs. This will enable the country and other countries to adopt low-GWP-based equipment |
| Replicability has to be clearly described | As a main output, the Project Implementation Report will be prepared and submitted to the ExCom for appraisal. UNDP plans to launch publications on this case study (printed and virtual). These findings are expected to be initially shared with LAC countries using the regional network meeting structure, through presentations and case studies held by the Government and UNDP. The results are also to be put at the disposal of all agencies and other regions. Finally, this knowledge-sharing exercise is expected to generate enough data so that other LPG-producer countries can take informed decisions on pursing HC refrigerant production, basing themselves on market trends and issues, investment and payback, and additional enabling activities required (regulations, standards, barriers, challenges and opportunities). This will enlarge the supply market of HC refrigerants to Article 5 countries |

**Low GWP demonstration project proposals in the refrigeration and air-conditioning assembly and installation sector**

4. The demonstration projects on ODS alternatives in the refrigeration and air-conditioning assembly and installation sector are listed in Table 2.

**Table 2. Low GWP demonstration project proposals in the refrigeration and air-conditioning assembly and installation sector**

| Project Number | Country | Agency | Title |
|---|---|---|---|
| ASMB 1 | Costa-Rica | UNDP | Demonstration project for the transition of HCFC-22 based refrigerant unit to $NH_3$ cascade system in refrigeration applications |
| ASMB 2 | Global (Tunisia, Argentina) | UNIDO | Concept on demonstration project in the refrigeration assembly sector |
| ASMB 3 | Uruguay | UNDP | Assessment of unsaturated HFC (HFO) in air conditioning and refrigeration applications in a small non-LVC country |

| **Project Number** | **ASMB 1** |
|---|---|
| Country | **Costa Rica** |
| Agency | **UNDP** |
| Project title | Demonstration project for the transition of HCFC-22-based refrigerant unit to $NH_3$ cascade system in refrigeration applications |
| Sector/subsector | Assembly* |
| Alternative(s) | $NH_3$ |
| ODP to be phased out* | To be determined |
| Preparatory Budget | US $40,000 plus agency support costs of US $2,800 |
| Estimated Project Budget | US $590,000 plus agency support costs of US $41,300 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Demonstrate the installation and servicing of a $NH_3$ cascade system in commercial refrigeration. An HCFC-22 cold chamber will be converted and information will be collected on operational cost of the system, energy consumption, direct emissions of refrigerants (measured in $CO_2$ equivalent tonnes) and environmental and hygienic controlling systems and procedures |
| Assessment:<br>The project aims to introduce $NH_3$ in a cold storage facility (where an end-user has been identified), and address safety-related barriers. Indirect $NH_3$ in small cold storage facilities is well established in non-Article 5 countries. However, in Costa Rica (and in the majority of Article 5 countries) the use of $NH_3$ is limited to larger industrial refrigeration systems. The initial higher capital costs as compared to HFC-based systems, could be partially compensated with lower operational costs due to an increased in energy efficiency. If proven technically feasible and economically viable, it could be replicated in all/most of Article 5 countries |

| **MFS comments** | **UNDP response** |
|---|---|
| Direct or indirect $NH_3$ systems in cold storage are established technologies in non-Article 5 countries. Is there already infrastructure in Costa Rica to operate $NH_3$-based systems that could be used as a basis for the project (probably in larger systems) or will the demonstration project assist in establishing ways to address issues such as local permissions and regulations, safety systems, trained operators, and trained technicians for servicing this type of equipment? | There are a few $NH_3$ systems being used in large industrial applications in Costa Rica. Aware of this situation, through the HPMP the Government is revising the vocational school curricula on RAC to include $NH_3$ subjects as part of the training classes. The objective of the project is to address the challenges and barriers that exist in implementing $NH_3$-based systems in the commercial refrigeration sector (i.e., a small scale system, usually located inside city boundaries with mixed zoning use). The knowledge in $NH_3$ that already exists in Costa Rica (being expanded with the opening of the International Institute of Ammonia Refrigeration hub for Central America) can be used as a starting point for capacity building. A series of specific issues will also need to be addressed *inter alia*: permissions; regulations; standards; training in installation, operation and maintenance of medium to small equipment; availability of parts and systems; safety protocols; and supply chain issues. The project will take advantage of co-funding provided by a national retail company that will upgrade its HCFC-22-based system to an $NH_3$ system and, in the course, address the above mentioned issues |

* Remaining HCFC consumption in the refrigeration servicing sector: 6.8 ODP tonnes (123 mt) in Costa Rica; 8,022 ODP tonnes (145,106 mt) in all Article 5 countries. It is estimated that the use of HCFC in assembly and installation could be 20 per cent of the HCFC used in the refrigeration servicing sector (UNEP/OzL.Pro/ExCom/74/49).

| MFS comments | UNDP response |
|---|---|
| Will the end-user identified (PINOVA) implement the application of the technology on its own (in-house expertise) or will a third party (specialized contractor) be identified for this? | There will be a mixed-implementation solution. Since the $NH_3$ system in this application is new in Costa Rica, the project is expected to obtain expertise from a third party (parts and technology provider), that will transfer this technology to local companies (PINOVA, rack and cabinet manufacturers, installers, operators and servicing technicians). |
| Will the demonstration include performance and operational cost measurements for a determined period of time? What overall time frame of implementation would be sufficient to get relevant data? (i.e., 12 months? 24 months)? | The project is expected to obtain such data in the 12-month timeframe of operation. |
| Replicability has to be clearly described | The project implementation report will be prepared and submitted to the Committee. UNDP plans to launch publications on this case study (print and virtual). These findings are expected to be shared initially with countries in the region using the regional network meeting structure, through presentations and case studies held by the Government of Costa Rica, UNDP and PINOVA. The results are also to be put at the disposal of all agencies and other regions. This knowledge-sharing exercise is expected to generate enough data and confidence in other countries so that similar "enabling activities" can be included in their HPMPs for coming stages. Information, data, reports and materials are also expected to be used by the private sector as a "mind changer" in terms of technical guidance in the decision-making process related to technology change. |

| **Project Number** | **ASMB 2** |
|---|---|
| Country | **Global (Tunisia, Argentina)** |
| Agency | **UNIDO** |
| Project title | Concept on a demonstration project in the refrigeration assembly sector |
| Sector/subsector | Assembly* |
| Alternative(s) | $CO_2$ |
| ODP to be phased out* | To be defined, potentially 2-4 mt of HCFC-22 |
| Preparatory Budget | US $60,000 plus agency support costs of US $4,200 |
| Estimated Project Budget | US $1,000,000 plus agency support costs of US $70,000 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Address the issue of the non-availability of components to low-GWP alternatives as well as related know-how in the assembly sector. In particular, it will validate the technical, economic and environmental viability of trans-critical $CO_2$ and/or $CO_2$/low-GWP cascade systems in supermarkets under various conditions in two countries (Tunisia and Argentina). It will take into consideration reduction of electricity needs in peak hours by heat recovery or thermal storage, potentially in combination with renewable energy sources during the operation of the systems |
| Assessment:<br>$CO_2$ refrigeration-based technology for supermarkets is available in several non-Article 5 countries. However, its introduction in Article 5 countries would be a significant technological advancement. As refrigeration systems in supermarkets are usually assembled by installers or owners, there is potential replicability of the technology in several Article 5 countries. Small-scale demonstration projects have been included in a few stage I of HPMPs (e.g., Chile[6]); however, no relevant information is yet available |

| **Comments** | **UNIDO's responses** |
|---|---|
| What additional benefit would this project bring to Article 5 countries in comparison to similar initiatives currently being undertaken as part of ongoing HPMPs? (i.e., Chile is assisting 5 supermarkets to convert their installations to $CO_2$ and address issues linked to lack of expertise and the availability of components needed) | The objective is not only to demonstrate the low-GWP technology, but also to identify barriers, and means to overcome these, for the assembly sector. In addition, demonstrating the feasibility and applicability in different climate and market conditions will enable greater replication |
| Potential ODP to be phased out based on scale of supermarkets to be assisted and the amount of HCFC used in maintenance | To be defined during project preparation, but potentially 2-4 mt of HCFC-22 (initial charge) plus annual leakages |

* Remaining HCFC consumption in the refrigeration servicing sector: 192 ODP tonnes (3,429 mt) in Argentina; 29.75 ODP tonnes (541 mt) in Tunisia; and 8,022 ODP tonnes (145,106 mt) in all Article 5 countries. It is estimated that the use of HCFC in assembly and installation could be 20 per cent of the HCFC used in the refrigeration servicing sector (UNEP/OzL.Pro/ExCom/74/49).

[6] UNEP/OzL.Pro/ExCom/63/25.

| **Project Number** | **ASMB 3** |
|---|---|
| Country | **Uruguay** |
| Agency | **UNDP** |
| Project title | Assessment of unsaturated HFC (HFO) in air conditioning and refrigeration applications in a small non-LVC country |
| Sector/subsector | Assembly* |
| Alternative(s) | HFO |
| ODP to be phased out* | n/a |
| Preparatory Budget | US $40,000 plus agency support costs of US $2,800 |
| Estimated Project Budget | US $320,000 plus agency support costs of US $22,400 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Conduct a laboratory evaluation of the performance of HFO refrigerants (using retrofitted equipment) in low to medium charge applications (domestic and commercial refrigeration such as cold rooms and refrigerated transport), determine whether HFOs are a valid option for the retrofit of existing equipment on the market, and identify technical and safety requirements to achieve the optimum conditions for retrofits |
| Assessment:<br>The demonstration intends to address the barrier of lack of knowledge on technical, economic and safety issues on the use of HFOs for AC and refrigeration applications in non-LVC countries with small HCFC consumption. A laboratory to undertake performance tests has been identified; however, the HFOs to be assessed have not yet been selected. As HFOs usually have a flammability of A2L[7] and are developed for use in new equipment, their use as retrofit candidates is not generally accepted given the complexity of the conversion and the potential inheriting risks |

| **MFS comments** | **UNDP response** |
|---|---|
| What is the specific application that the demonstration project relates to? Proposal not very clear about this, it refers only to "refrigeration manufacturing and servicing applications of RAC equipment" | The project will focus on the evaluation of HFO in low to medium charge refrigeration and AC applications, such as domestic AC units, bottle coolers, milk tanks, cold rooms and refrigerated transport. The actual extent of the evaluation (number of pieces of equipment and refrigerant charges covered) will be determined once the full-size project is prepared |
| Provide better technical description of the concept, as the current proposal does not provide technical details, therefore it is not possible to undertake a review | There is limited knowledge regarding technical requirements, performance, security measures and costs associated with the use of HFOs in smaller Article 5 countries. With this project, Uruguay and UNDP seek to determine whether HFOs are a valid option for the retrofit of existing equipment on the market and to establish the technical and safety requirements to achieve the optimum conditions for its implementation. It will evaluate the technical requirements for using HFOs and their energy performance in refrigeration and AC of small and medium size, which make up the bulk of the equipment installed in Uruguay. In addition, it will conduct a review of the safety measures required to work with them in the light of current regulations. As a result, the country will be able to understand the technical requirements and performance of HFOs and those safety requirements that a small non-LCV country should adopt |

* Remaining HCFC consumption in the refrigeration servicing sector: 22.2 ODP tonnes (403 mt) in Uruguay; 8,022 ODP tonnes (145,106 mt) in all Article 5 countries.

[7] ASHRAE classification A2L and B2L correspond to lower flammability refrigerants with a maximum burning velocity of ≤ 10 cm/s.

| MFS comments | UNDP response |
|---|---|
| | to determine whether HFOs are an alternative that can be used to phase out its HCFC use and consumption |
| Replicability has to be clearly described. | The equipment used and the technical level of technicians and engineers in Uruguay are similar to those in other countries in the region, so the findings of the project could easily replicate in other countries. The project implementation report will be submitted to the Committee. UNDP plans to launch publications regarding this case study (printed and virtual). These findings are expected to be initially shared with countries in the region using the regional network meeting structure, through presentations and case studies held by the Government of Uruguay and UNDP. The results are also to be put at disposal of all agencies and other regions. This knowledge-sharing exercise is expected to generate enough data and confidence in other countries so that HFO technology can be considered as a reliable and available option for HCFC phase-out in the next stages of HPMPs. |
| ODP to be phased out? | It could be not determined in this phase, as calculation will be part of the project preparation. The direct phase-out of the demonstration project is expected to be limited, as it will be based on testing. However, the long-term effect could be substantial. |

## Low GWP demonstration project proposals in the foam sector

5. The demonstration projects on ODS alternatives in the foam sector are listed in Table 3.

**Table 3. Low GWP demonstration project proposals in the foam sector**

| Project Number | Country | Agency | Project title |
|---|---|---|---|
| FOAM 1 | Colombia | UNDP | Demonstration project to validate the use of HFO for discontinuous panels and spray in Article 5 parties through the development of cost effective formulations |
| FOAM 2 | Egypt | UNDP | Demonstration of low cost options for the conversion to non-ODS technologies in PU foams at very small users |
| FOAM 3 | India | UNDP | Proposal for demonstration project for development and evaluation of polyol systems for foam products using HFOs as blowing agent |
| FOAM 4 | India | UNDP | Proposal for development and evaluation of spray foam polyols systems for buildings using HFOs as blowing agent |
| FOAM 5 | Morocco | UNIDO /Italy | Demonstration project on the use of compact high-pressure foaming equipment for the safe introduction of pentane technology to SMEs |
| FOAM 6 | Saudi Arabia | UNIDO | Preparation of a demonstration project for the Phase-out of HCFCs by using HFO as foam blowing agent in the spray foam applications in high ambient temperatures |
| FOAM 7 | South Africa | UNIDO /Italy | Demonstration project on the technical and economic advantages of the vacuum assisted injection in discontinuous panel's plant retrofitted from 141b to pentane |
| FOAM 8 | Thailand | World Bank | Project preparation for demonstration project on Low-GWP alternatives for foam system house in Thailand |
| FOAM 9 | Turkey | UNIDO | Preparation of demonstration project for the phase-out of HCFCs by means of using HFOs as foam blowing agent in the manufacture of reefers and truck trailer bodies. |

| **Project Number** | **FOAM 1** |
|---|---|
| Country | **Colombia** |
| Agency | **UNDP** |
| Project title | Demonstration project to validate the use of hydrofluoroolefins (HFO) for discontinuous panels and spray in Article 5 parties through the development of cost-effective formulations |
| Sector/subsector | Rigid PU foam/discontinuous panels and spray foam |
| Alternative(s) | Reduced HFO-1233zd(E) and HFO-1336maam(z) |
| ODP to be phased-out* | 0.44 ODP tonnes |
| Preparatory Budget | n/a |
| Estimated Project Budget | US $459,450 plus agency support costs of US $32,197 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Validate reduced HFOs PU formulations (namely HFO-1233zd(E) and HFO-1336maam(z)) for discontinuous panels and spray foam applications; optimise the cost/performance balance to achieve a similar thermal performance to HCFC-141b-based formulations; and make a cost analysis of the different HFO/$CO_2$ formulations versus HCFC-141b-based system |
| Assessment:<br>The project increases know-how in the use of HFOs in discontinuous panels and spray foam in SMEs. The HFO/$CO_2$ mixture, if technically feasible, could increase performance of using only $CO_2$ and also help reduce operational cost of using only HFOs. Given the potential increase in performance and reduction in costs, the technology could be replicated in several Article 5 countries. A systems house and a downstream user have been identified. The systems houses selected already participated successfully in a demonstration project for supercritical $CO_2$ in spray foam |

| **MFS comments** | **UNDP response** |
|---|---|
| What is the justification for the selection of the country for this demonstration project, considering that a demonstration project in the foam sector has already taken place in Colombia in the same systems house? | This project is required for its development of good technical capabilities and laboratory facilities (reliable high-pressure machine, Brett mould, appropriate testing facilities for foam properties such as compression strength and thermal conductivity at several temperatures). Espumlatex fulfils these requirements, along with long experience in the development of polyurethane formulations. Colombia has a proven track record in the implementation of demonstration projects. UNDP therefore believes that Colombia would be an excellent candidate for this demonstration project |
| Clarify the need for friability tests and a tester, given that UNDP has not considered this test in previous demonstration projects for discontinuous panels and spray foam applications (i.e., methyl formate and supercritical $CO_2$) | Friability is a foam characteristic directly related to the adhesion to various substrates. It is affected by the water content in the polyurethane formulation that defines the level of poly-urea presented in the polymer. As different formulations of HFOs and water (co-blown) will be assessed to find the optimum formulation to achieve the best cost/performance balance, friability is one of the key properties to follow up. Since there is no facility that can perform the test according to the ASTM[8] standard, this equipment is included in the proposal |

* Remaining HCFC consumption in rigid and spray foam: 94 ODP tonnes (856 mt) in Colombia; 4,834 ODP tonnes (44,030 mt) in all Article 5 countries.

[8] ASTM International, formerly known as the American Society for Testing and Materials (ASTM), is a globally recognized leader in the development and delivery of international voluntary consensus standards. Some 12,000

| MFS comments | UNDP response |
|---|---|
| Given that this project is submitted pursuant to decision 72/40, at this point the Secretariat's comments are focused on the concept and the guidelines. The Secretariat is not including comments on costs | Noted |

ASTM standards are currently used worldwide to improve product quality, enhance safety, facilitate market access and trade, and build consumer confidence.

| **Project Number** | **FOAM 2** |
|---|---|
| Country | **Egypt** |
| Agency | **UNDP** |
| Project title | Demonstration of low-cost options for the conversion to non-ODS technologies in PU foams at very small users |
| Sector/subsector | Rigid PU foam/pour in place and spray foam |
| Alternative(s) | Methyl formate |
| ODP to be phased out* | Not provided |
| Preparatory Budget | n/a |
| Estimated Project Budget | US $340,000 plus agency support costs of US $23,800 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Develop, optimize, validate and disseminate easy to use pre-packaged PU foam systems and low-cost foam dispensers for very small users in the manufacture of PU rigid insulation and integral skin foams. It will provide very small users access to foam dispensers ensuring safer operation; develop a low-cost foam dispensing unit for pour-in-place applications, or alternatively explore options for reducing the cost of foam dispensers available on the market |
| Assessment:<br>The project will facilitate the use of methyl formate pre-blended polyol systems for pour in place applications by very small foam users with no baseline equipment. If successful, it could be replicated given the large number of these foam users in several Article 5 countries. The only concern is the fact that the implementation of another demonstration project in the country[9] approved at the 58th meeting extended over a long period of time and is still ongoing |

| **MFS comments** | **UNDP response** |
|---|---|
| A project to demonstrate low-cost options for the use of HCs in foam manufacturing in Egypt was approved at the 58th meeting. UNDP submitted to the 73rd meeting an interim report indicating difficulties in optimizing the foam equipment. The Committee requested a final report to the 74th meeting but at this meeting the issues do not seem to have been resolved. Accordingly: How does the present proposal relate to the above project? The optimization of equipment in the above project ended up being longer and more complex than initially expected. As a result, valuable information could not be produced on time for stage I of the HPMPs. How would these issues be addressed in this new project that also involves production of low-cost equipment? | The present proposal does not relate to the HC pilot project, as it addresses foam applications at the level of very-small users which are not in a position to utilize basic foaming equipment due to its cost. The previous HC project done at Dow-MidEast with SAIP as a technology provider was aimed more at reducing the equipment costs via direct injection and stabilizing pre-blended and drummed HC polyols for medium-size PU companies receiving those from system houses, and with consumption range of 1-50 tonnes/year of polyols which did not allow to cover full costs of pentane-based technology in the event of technology conversion. The delays in implementation of the HC project approved at the 66th meeting were due to external factors (unrest in the country as well as reorganizations at Dow, both in Italy at headquarters and in Cairo). Payments have been made and Dow is committed to a final report |

* Remaining HCFC consumption in rigid and spray foam: 57 ODP tonnes (518 mt) in Egypt; 4,834 ODP tonnes (44,030 mt) in all Article 5 countries.

[9] UNEP/OzL.Pro/ExCom/58/33 and decision 58/31

| MFS comments | UNDP response |
|---|---|
| Justify the selection of the country for this demonstration project, considering that a demonstration project in the foam sector has already taken place in Egypt | Egypt has been chosen because there is a proven need in the country for such low-cost equipment at the very-small user level. Other choices would have been Mexico, which had also already had its share of pilot projects); or Nigeria, where the infrastructure is more challenging to have a successful project in a shorter timeframe |
| ODP to be phased out? | This is not an enterprise-related project. |
| Given that this project is submitted pursuant to decision 72/40, at this point the Secretariat's comments are focused on the concept and the guidelines. The Secretariat is not including comments on costs | Noted |

**Note:** Since both demonstration projects below have the same objective and use the same alternative (HFO-1233ze) to develop a new technology for foam blowing, albeit for different products (rigid and spray foams), the Secretariat's assessment and comments below refer to both proposals.

| **Project Number** | **FOAM 3** |
|---|---|
| Country | **India** |
| Agency | **UNDP** |
| Project title | Proposal for demonstration project for development and evaluation of polyol systems for foam products using HFOs as blowing agent |
| Sector/subsector | PU foam/rigid foam |
| Alternative(s) | HFO-1233zd(E) |
| ODP to be phased out* | Not provided |
| Preparatory Budget | US $30,000 plus agency support costs of US $2,100 |
| Estimated Project Budget | US $2,900,000 plus agency support costs of US $203,000 |
| Endorsement letter | Yes |

| **Project Number** | **FOAM 4** |
|---|---|
| Country | **India** |
| Agency | **UNDP** |
| Project title | Proposal for development and evaluation of spray foam polyol systems for buildings using HFOs as blowing agent |
| Sector/subsector | Rigid PU/spray foam |
| Alternative(s) | HFO-1233zd(E) |
| ODP to be phased out | Not provided |
| Preparatory Budget | US $30,000 plus agency support costs of US $2,100 |
| Estimated Project Budget | US $2,300,000 plus agency support costs of US $161,000 |
| Endorsement letter | Yes |

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| Demonstration components: (Rigid PU foam applications)<br>Develop polyol formulations using HFO-1233zd(E) for several PU applications and spray foam in high ambient temperature conditions for small and medium size enterprises (SMEs); evaluate thermo-physical and structural properties of the HFO-based formulations; undertake trials at the manufacturing enterprises and field trials of spray foam in new and existing buildings; train downstream user enterprises and convert a manufacturing facility from HCFC-141b to HFO-based technology. It will provide SMEs options for converting their operations, with little or minimal investment cost |
| Assessment:<br>The projects will increase the know-how on the use of HFO-1233zd(E) technology in rigid PU foam applications by SMEs. If the technology is technical viable and commercially available, their replicability would depend on the final operational cost. Stage I of the HPMP for India[10] included technical assistance for 15 systems houses (US $4.3 million) for customizing, evaluating and validating formulations using emerging low-GWP alternatives, including HFOs. Technical assistance for at least 30 downstream foam users was also included |

| **MFS comments** | **UNDP response** |
|---|---|
| Stage I of the HPMP for India includes a technical assistance component (US $4,296,500) for customizing formulations using low-GWP alternatives (including several HFOs), through 15 local systems houses. Each systems house received between US $100,000 and US $600,000 in equipment and technical assistance. | The systems houses have been developing polyol systems with some of the low-GWP blowing agents like methyl formate and methylal. The work carried out under stage I of the HPMP would form the background to the proposed two demonstration projects, which are the next step to what would be achieved during stage I. |

*Remaining HCFC consumption: 533 ODP tonnes (4,925 mt) in rigid foam and 50 ODP tonnes (453 mt) in spray foam in India; 3,329 ODP tonnes (30,356 mt) in rigid foam 1,505 ODP tonnes (13,674 mt) in spray foam in all Article 5 countries.

[10] UNEP/OzL.Pro/ExCom/66/38

| MFS comments | UNDP response |
|---|---|
| The project would accelerate the introduction of low-GWP alternatives by three years; each systems house would have at least one low-GWP formulation by 1 January 2014 and would demonstrate the application of the new formulation in at least two downstream users (this would account for at minimum 30 downstream users). A commitment was reached on no further assistance from the Fund to be provided to systems houses in India (decision 66/45(d)). Accordingly, the proposals seem to be duplicating the technical assistance already provided under stage I of the HPMP | These projects are proposed recognizing the ongoing discussion on phase-down of HFCs, with the following objectives: a focused and comprehensive development of new technology using HFO-1233zd(E) which has recently been commercially produced; conversion of downstream rigid and spray foams manufacturing facilities in the micro, small and medium enterprises. |
| ODP to be phased out? | To be confirmed |

| **Project Number** | **FOAM 5** |
|---|---|
| Country | **Morocco** |
| Agency | **UNIDO/Italy** |
| Project title | Demonstration project on the use of compact high-pressure foaming equipment for the safe introduction of pentane technology to SMEs |
| Sector/subsector | Rigid PU foam |
| Alternative(s) | Pentane |
| ODP to be phased-out* | Not provided |
| Preparatory Budget | US $40,000 plus agency support costs of US $2,800 |
| Estimated Project Budget | US $250,000 plus agency support costs of US $22,500 |
| Endorsement letter | No |

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| Demonstration components:<br>Reduce the initial investment cost of a high pressure (HP) foam dispenser by designing a compact system for use with HC pre-blended polyols. The dispenser will be tested for pentane formulation to demonstrate safe applicability of the technology and replicability by SMEs. It is expected that HC technology could be introduced to SMEs with this new equipment, which may reduce capital and operational costs |
| Assessment:<br>The project increases know-how on the use of HC-based polyols in PU foam SMEs to be addressed in stage II of HPMPs. Given the large number of SMEs in several Article 5 countries, it has potential for replication. However, uncertainty on the technical feasibility of the proposal remains as a prototype of the foam machine has not yet been developed. No amount of ODS phase-out has been associated with the proposal. If fully developed, the project should include detailed information on the safety use and handle of HC-based systems by downstream foam users |

| **MFS comments** | **UNIDO/Italy response** |
|---|---|
| Provide more information on the profile of foam manufacturers that could benefit from this project (applications, minimal annual use of HCFC and baseline HCFC equipment). | The application will be extremely interesting for all those SMEs actually using HCFC-141b in pre-blended polyol systems |
| Is there any preliminary idea or expectation of the level of savings that the compact HP dispenser could bring? (e.g., reducing capital cost on dispenser and safety by x %) | The compact unit is expected to bring savings of around 20 to 40 per cent; however, it be assessed during project design. One of the outcomes of the project is to identify the break-even point of the eligible consumption to make the technology sustainable. |
| Has an equipment-manufacturing partner been identified? | UNIDO is exploring all main international foam dispenser manufacturing companies. However, it is envisaged that the final selection of the technology provider will be done at the stage of project implementation, through open competitive bidding. |
| ODP to be phased out? | Since the technology does not exist so far and a prototype needs to be developed and adapted to local conditions, there is no ODP phase-out associated with the project activities so far. However, ODP phase-out may be identified during project preparation. |

* Remaining HCFC consumption in rigid PU foam (excluding spray): 341 ODP tonnes (3,106 mt) in 125 HCFC consuming countries (excluding 15 largest consumers); 3,329 ODP tonnes (30,356 mt) in all Article 5 countries.

| **Project Number** | **FOAM 6** |
|---|---|
| Country | **Saudi Arabia** |
| Agency | **UNIDO** |
| Project title | Preparation of a demonstration project for the phase-out of HCFCs by using HFO as foam blowing agent in spray foam applications in high-ambient temperatures |
| Sector/subsector | Rigid PU/Spray foam |
| Alternative(s) | HFO-1233mzz(Z), HFO-1336zd(E) |
| ODP to be phased out* | 7.74 ODP tonnes / No remaining eligible consumption in Saudi Arabia |
| Preparatory Budget | US $30,000 plus agency support costs of US $2,100 |
| Estimated Project Budget | US $240,000 plus agency support costs of US $21,600 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Demonstrate that HFOs (namely HFO-1233mzz(Z) and HFO-1336zd(E)) will be able to meet similar high functional foam requirements as obtained with HCFC-141b and HFC-245fa in spray foam, and provide an improvement in energy efficiency in buildings. Demonstration will test results of applying HFOs in spray foam applications, produce field data on performance and prepare guidelines for the use of HFO in spray foam |
| Assessment:<br>The project offers an increase of know-how in the use of HFOs in spray foam in Article 5 countries and, has potential for replicability in countries with similar climatic conditions. It is noted that all eligible HCFC-141b consumption has already been addressed as stage I of the HPMP for Saudi Arabia[11] had included the entire conversion of the rigid PU foam industry and all locally-owned systems houses had received assistance to develop and supply non-HCFC-based polyols to downstream foam users |

| **MFS comments** | **UNIDO response** |
|---|---|
| All eligible HCFC-141b consumption has already been addressed in Saudi Arabia. Under stage I of the HPMP, Jundi Polyurethane Systems and Saptex have already received assistance to convert to HCFC alternatives and supply HCFC-free polyols to downstream users in all applications. Please further justify the selection of the country and systems houses. | The selection of the country is justified by the decision 68/37(h) that requested UNIDO "not to implement any conversion to HFC-245fa in the spray foam subsector prior to 1 January 2016 and to actively pursue establishing low-GWP alternatives for that subsector prior to this date." The assistance in stage I to systems houses is for the supply of HCFC-free polyols for already established technologies. The demonstration project specifically addresses the spray foam users for whom the only proven non-HCFC technology is HFCs. It is not possible to use flammable blowing agents (such as HCs) for spraying at a building site. The HFOs are practically the only available non-flammable low-GWP option. The ultimate beneficiaries of the demonstration projects will be the spray foam companies. In the case of Jundi Polyurethane Systems, the spray foam client is the Saudi Factory for Pipes that produces thick layer insulation of 0.7-1.0 m diameter pipes. Although this enterprise spray at the factory, it is not possible to use to cyclopentane, as the area required would be too large and the whole pipe would have to be installed inside the spraying booth. Therefore, the spray foam operation has to be converted into a non-flammable technology that can be used in similar situations on the production site and in all situations at building sites where there is no possibility of establishing a zone 0 (gas or vapour is present all of the time). |

* Remaining Eligible Consumption in rigid PU foam: Zero in Saudi Arabia; 3,329 ODP tonnes (30,356 mt) in all Article 5 countries.

[11] UNEP/OzL.Pro/ExCom/68/39 and UNEP/OzL.Pro/ExCom/72/34.

| MFS comments | UNIDO response |
|---|---|
| UNIDO, Saudi Arabia and Honeywell planned to complete testing of Solstice LBA in spray foam by November 2014 as part of the HPMP. What would be the added value of this demonstration? | The testing of Solstice LBA could not be performed as planned because the systems houses declared they were not ready for conversion before their clients converted to non-HCFC technologies. Almost all eligible systems houses indicated that they wanted to continue delivery of HCFC-141b-based systems to their clients and undergo the conversion to non-HCFC at a later date. In December 2014, Jundi Polyurethane Systems indicated they were ready for the conversion; therefore it was selected to participate in the demonstration project. However, the ultimate beneficiary of the project will be the spray foam client Saudi Factory for Pipes. |
| Will the demonstration test both pre-blended systems and mix-on-site scenarios? | The demonstration project will test both approaches because of an issue with the shelf life of pre-blended HFO-based systems, hence the mix-on-site approach will also be included in the project. |
| ODP to be phased out? | The average consumption of HCFC-141b at the Saudi Factory for Pipes is 70.4 mt. |

| **Project Number** | **FOAM 7** |
|---|---|
| Country | **South Africa** |
| Agency | **UNIDO/Italy** |
| Project title | Demonstration project on the technical and economic advantages of the vacuum assisted injection in a discontinuous panels plant retrofitted from HCFC-141b to pentane |
| Sector/subsector | PU Foam |
| Alternative(s) | Pentane |
| ODP to be phased out* | Not provided/No remaining eligible consumption in South Africa |
| Preparatory Budget | US $40,000 plus agency support costs of US $2,800 |
| Estimated Project Budget | US $400,000 plus agency support costs of US $28,000 |
| Endorsement letter | No |

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| Demonstration components:<br>Insulation benefits of applying vacuum-assisted injection in discontinuous panels produced with pentane as the blowing agent, the easy applicability of the technology and its replicability |
| Assessment:<br>The use of vacuum-assisted injection increases know-how in the use of pentane in discontinuous panels by improving insulation properties of the foam. An equipment provider has been identified and the actual concept is already developed so it seems to be ready for testing. If successful, it could be applied to several panel producers that can use a flammable blowing agent; however, the approach focuses on optimizing an already consolidated technology in enterprises that can already introduce HC, rather than on removing barriers for other enterprises (for example SMEs) to access the technology. While it could potentially reduce operational cost it may increase capital cost. It is noted that there is no remaining eligible consumption for South Africa as stage I of the HPMP[12] had included the entire conversion of the rigid PU foam industry and all locally-owned systems houses had received assistance to develop and supply non-HCFC-based polyols to downstream foam users |

| **MFS comments** | **UNIDO/Italy response** |
|---|---|
| Justify the selection of the country, as there is no remaining eligible consumption in South Africa (all HCFC-141b addressed in stage I). | The vacuum technology brings technical advantages in terms of better insulation properties (the technology can be used with all blowing agents available in the market). The insulation properties of pentane-based formulations are poorer than the HCFC formulations, being compensated by increasing the foam thicknesses. This represents a problem in those markets, such as the transportation sector, where the containment of the weights and thickness of the final product is a must. In those cases the use of pentane plus vacuum technology could represent a technical solution that can enlarge the scope of adoption of HCs and generate substantial environmental co-benefits (energy saving). The selection of South Africa for this project is because several manufacturers of panels exist in the country and are in an advanced stage of conversion to several technologies. Therefore, knowledge is available locally to get the best results from the technology, focusing on the improvement of the quality of panels manufactured with alternatives to HCFCs, in particular with HCs. |

* Remaining HCFC consumption in rigid PU foam (excluding spray): Zero in South Africa; 3,329 ODP tonnes (30,356 mt) in all Article 5 countries.

[12] UNEP/OzL.Pro/ExCom/67/29.

| MFS comments | UNIDO/Italy response |
|---|---|
| Has an equipment-manufacturing partner been identified? | The vacuum-assisted technology has been patented by Afros-Cannon. The project will be designed based on the experiences gained by the technology provider, and will include a robust portion of co-financing from the supplier. Details will be further elaborated during project design |
| Project is addressed to plants already using pentane. Clarify contribution of the demonstration in addressing remaining HCFC consumption. (e.g., removal of existing barriers for adoption of pentane such as capital cost or handling of flammable blowing agent). | The project will be addressed to companies producing panels (discontinuous), in sectors where insulation properties are necessary in the final product characteristics. However, experience may be replicated in other sectors, such as appliance manufacturing. That will enlarge the scope of application to several remaining eligible companies; and will also generate experiences and information to be available to those companies already converted during stage I |
| ODP to be phased out? | A potential beneficiary has already been identified. The company has decided to adopt HC for panel manufacturing (transport refrigeration), but its conversion is still ongoing. The demonstration project will be carried out in parallel with the implementation of the HCFC-141b phase-out, hence generating an overall cost saving for the Fund. More details will be provided during project design |

| **Project Number** | **FOAM 8** |
|---|---|
| Country | **Thailand** |
| Agency | **World Bank** |
| Project title | Demonstration project on low-GWP alternatives for foam systems houses |
| Sector/subsector | Rigid PU/spray foam |
| Alternative(s) | Reduced HFO-1233zd(E) and HFO-1336mzzz(Z), pre-blended HC, reduced HFC-245fa |
| ODP to be phased out* | |
| Preparatory Budget | US $30,000 plus agency support cost of US $2,100 |
| Estimated Project Budget | US $1,046,000 plus agency support cost of US $73,220 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Increase technical capacity in local systems houses to formulate, test and produce low-GWP pre-blended polyols in order to make them cost-effective and commercially available. Technologies considered are reduced formulations of HFO-1233zd(E) and HFO-1336mzzz(Z), pre-blended HC, and reduced formulations of HFC-245fa. It will also demonstrate the effectiveness and cost of low-GWP alternatives in several PU foam applications including spray foam, with focus on SMEs. System houses will be given equipment, technical assistance and funds for developing new formulation and raw materials for trial production and testing at their customers' facilities |
| Assessment:<br>The project increases know-how in the use of reduced HFO- and HC-pre-blended polyol systems used by SMEs in several applications including spray foam (large number of SMEs in Thailand will be converted to HFC-245fa-based polyol systems). Reduced formulations of HFOs, if technically feasible, could increase performance of using only $CO_2$, reduce operational cost of using only HFO, and avoid the use of HFC-245fa. Therefore, HFC-245fa should be removed from the project. Three systems house developing a wide set of formulations have been identified. Stage I of the HPMP[13] included a technical assistance programme for systems houses (US $88,003) to get acquainted with emerging low-GWP alternatives; however, this demonstration project is broader in scope |

| **MFS comments** | **World Bank response** |
|---|---|
| What specific technology (ies) will be demonstrated? What parameters will be measured in the project to determine effectiveness of the technology being demonstrated? | Technologies to be demonstrated are: pre-blended HC; reduced HFC-245fa formulations; reduced formulations for HFOs (HFO-1233zd and/or HFO-1336mzzz). Key parameters are e.g., thermal insulation, cost competitiveness in comparison to HCFC-141b |
| Several elements of the project seem to overlap with the technical assistance project approved to assist 53 microenterprises under stage I of the HPMP, to introduce polyols for reduced formulations of HFC-245fa and will provide information to systems houses on low-GWP alternatives, so these can be introduced when it is technically and economically feasible. What differentiates this demonstration project from the foam technical assistance project under stage I? | There are two technical assistance components on the approved project: one is for system houses to familiarize themselves with new and emerging low-GWP alternatives and to further develop formulations (US $88,000); and the other is for one polyol supplier to provide technical assistance to 53 micro enterprises to convert to HFC-245fa and water-blown technology (US$141,000). However, funds are not provided for actual testing for different applications, nor for pilot- or commercial-scale production to supply 132 foam SMEs. Moreover, the scope of the demonstration project is to provide low-GWP solutions to the spray foam sub-sectors. These include, among others, roof insulation, pre-fabricated insulated steel sheet (for roofing). During |

* Remaining HCFC consumption in spray foam: 32.6 ODP tonnes (296 mt) in Thailand. However, enterprises in other applications under stage I that are converting to reduced HFC-245fa formulation in PU application could benefit from this demonstration project (more than 100 mt of HCFC-141b could potentially converted to low-GWP alternatives instead of HFC-245fa).

[13] UNEP/OzL.Pro/ExCom/68/41.

| MFS comments | World Bank response |
|---|---|
| | the preparation of the project, specific applications will be determined on the basis of their shares of the remaining HCFC-141b consumption |
| Taking into consideration that this is a demonstration project rather than a sector plan, would be World Bank consider involving only one systems house? This would reduce the capital cost to one third. What are the advantages of working with three systems houses? | Given that the objective is to enable all foam applications to adopt low-GWP alternatives, there will be a number of applications for which formulations would have to be developed. Not all applications are covered by one systems house. Inclusion of three systems houses would allow sufficient coverage of foam applications and shorten the time required for development to pilot/commercial scale production. It is important to note that there are 8-10 systems houses and suppliers in Thailand |
| ODP to be phased out? (taking into consideration that the only remaining eligible consumption of HCFC-141b in Thailand is in the spray foam subsector as all other sectors were addressed in stage I). | The actual ODP phase-out and funding requirement will be determined during project preparation. While the three systems houses do not fully cover all the remaining eligible HCFC-141b consumption (about 625 mt), it is expected that phase-out associated with the customers of the three systems houses will represent a sizeable percentage of the remaining eligible consumption |

| **Project Number** | **FOAM 9** |
|---|---|
| Country | **Turkey** |
| Agency | **UNIDO** |
| Project title | Preparation of demonstration project for the phase-out of HCFCs by means of using HFOs as foam blowing agent in the manufacture of reefers and truck trailer bodies |
| Sector/subsector | PU foam/rigid foam |
| Alternative(s) | HFO-1233zd or HFO-1336mzz(Z) |
| ODP to be phased out* | 1.6 ODP tonnes. No remaining eligible consumption in Turkey |
| Preparatory Budget | US$30,000 plus agency support costs of US $2,100 |
| Estimated Project Budget | US$300,000 plus agency support costs of US $21,000 |
| Endorsement letter | Yes |

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| Demonstration components:<br>Use of HFO-1233zd or HFO-1336mzz(Z) in manufacturing sandwich panels for trailer truck bodies with the objective of maintaining comparable performance and physical properties of HCFC-141b panels. The HFO will be used either as drop-in in the polyol at the systems house, or by adding a pre-mixer to the manufacturing process at the downstream user facility. A comparison of standard performance parameters using HFO and HCFC-141b will be done |
| Assessment:<br>The project increases know-how in the application of HFO-1233zd or HFO-1336mzz(Z) in panels for trailer trucks. Potential manufacturers of refrigerated trucks have been identified. If viable, this technology could be replicated in the manufacturing of panels with high insulation requirements in several Article 5 countries. It is noted that there is no remaining eligible consumption for Turkey as stage I of the HPMP[14] had included the entire conversion of the rigid PU foam industry, and all locally-owned systems houses had received assistance to develop and supply non-HCFC-based polyols to downstream foam users |

| **MFS comments** | **UNIDO response** |
|---|---|
| All eligible HCFC-141b consumption has already been addressed in Turkey. Please provide further justification in the selection of the country. | All eligible HCFC-141b consumption in Turkey is addressed. However, 42.9 per cent phase-out from the consumption baseline plus 31.53 ODP tonnes of HCFC-141b contained in polyols would be phased out with counterpart contribution (in line with decision 68/40). The phase-out of HCFC 141b at the systems houses and their distribution chains is implemented under an overall concept, limited from a financial point of view, by which end-user enterprises are addressed exclusively through the polyol suppliers. This project will be an integrated part of the overall phase-out programme, aimed at widening the range of alternative technologies in the sectors where minimal heat transfer at minimal thickness of insulating walls for selected/specific applications are "critical" requirements. The consumption of the host company in the project (1.6 ODP tonnes) will be deductible from the aggregate HCFC consumption in the country. Turkey has been selected because the need for "critical" applications has been clearly formulated by relevant industries in the country, thereby also calling for a broader range of possible alternatives to be available in Turkey |

* Remaining HCFC consumption in rigid PU foam (excluding spray): Zero in Turkey; 3,329 ODP tonnes (30,356 mt) in all Article 5 countries.

[14] UNEP/OzL.Pro/ExCom/68/42.

| MFS comments | UNIDO response |
|---|---|
| Will the demonstration include an analysis of standard insulation foam performance parameters of the new technology in comparison with HCFC-141b? What would be the main outputs of the demonstration? | The demonstration will include an analysis of standard insulation foam performance parameters of the new technology in comparison with HCFC-141b. It is envisaged that the following will be comparatively tested: thermal insulation (λ); dimensional stability; compression and tensile strength; foam fire characteristics; and some technological foaming parameters. Estimated financial comparisons have already been included in the concept note. Physical properties and their comparison with HCFC-141b-blown grades shall be the main output/result used to judge techno-economic parameters |
| Provide more information on the potential for replication of applying this technology to replace HCFC-141b in Turkey and in other Article 5 countries. | Based only on technical grounds, there is an unlimited potential for replication by applying this technology to replace HCFC-141b in Turkey and in other Article 5 countries. The point is to evaluate technical potential against economic effectiveness with regard to the above-mentioned requirements for minimal heat transfer at minimal thickness of the insulation wall |
| ODP to be phased out? | 1.584 ODP tonnes of HCFC-141b/year |

**Low GWP demonstration project proposals in the refrigeration servicing sector**

6. The demonstration projects on ODS alternatives in the refrigeration and air-conditioning assembly and installation sector are listed in Table 4.

**Table 4. Low GWP demonstration project proposals in the refrigeration**

| Project Number | Country | Agency | Title |
|---|---|---|---|
| SERV 1 | China | UNIDO | Preparation of a demonstration project on leakage reduction of large/industrial refrigerating appliances |
| SERV 2 | Maldives | UNDP | Project preparation request for demonstration project for HCFC free low GWP alternatives in refrigeration in fisheries sector |
| SERV 3 | Region: Africa | UNIDO | Demonstration project to ensure safety standards and market availability of high quality refrigerants (Kenya, Rwanda, Uganda, Tanzania and Zambia) |
| SERV 4 | Region: Latin America/ Caribbean | UNIDO | Demonstration project on refrigeration and air-conditioning servicing sector activities, with focus on low-GWP flammable refrigerants (Bahamas, Grenada, Saint Lucia, Saint Vincent and the Grenadines, Suriname) |
| SERV 5 | Region: West Asia | UNIDO | Preparation of a demonstration project on refrigerant containment and refrigerant leakage prevention in high ambient temperatures (Egypt and Gulf countries) |

| **Project Number** | **SERV 1** |
|---|---|
| Country | **China** |
| Agency | **UNIDO** |
| Project title | Preparation of a demonstration project on leakage reduction for large/industrial refrigerating appliances |
| Sector/subsector | Servicing |
| Alternative(s) | n/a |
| ODP to be phased out | Estimated 1-5 mt HCFC-22 annually |
| Preparatory Budget | US $50,000 plus agency support costs of US $3,500 |
| Estimated Project Budget | US $450,000 plus agency support costs of US $31,500 |
| Endorsement letter | Yes |

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|---|
| Demonstration components:<br>Case studies on three types of large refrigeration systems (industrial cooling, supermarket and central AC) and address service and maintenance issues as well as costs associated with leakage reduction measures. These would result in guidelines the dissemination of which will improve awareness about refrigerant containment and leakage reduction in China |
| Assessment:<br>The project does not directly demonstrate a new technology. Refrigerant containment actions are established practices in many parts of the world and being implemented under a large number of HPMPs |

| **MFS comments** | **UNIDO response** |
|---|---|
| The approach proposed (containment/retrofit/end-of-life replacement) has already been implemented in the refrigeration servicing sector. Several ongoing HPMPs include projects that measure leakage and propose guidelines for leakage reduction in large users. Clarify how the demonstration offers a significant increase in know-how on refrigerant containment. | This project will go beyond the good practice intentions and assess the cost impact as well as implement the leakage reduction measures in three different applications all known to have high leakage rates. It will also evaluate the overall cost effectiveness of such actions. The Fund doesn't directly support the end-user sector; and tools/arguments are needed to motivate this sector to undertake ODS phase-out without external financial support. |
| Numerous reports on reduced annual leakage rates through regular checks, training, use of proper recovery equipment, have already been produced. Given the large influence of local circumstances in the success of refrigerant containment approaches, specific practical guidelines tailored to local circumstances are generally developed by each country under the HPMP. Given the above, clarify the demonstration value for other countries. | This project will be based on the reports available, and will go one step further in analysing the finances behind leakage reduction (upfront investments vs savings in maintenance/energy); all documented through three leakage reduction exercises. Such guidelines will not be very country-specific, but rather applicable to most Article 5 countries. |
| ODP to be phased out? | To be determined during project preparation; expected to be 1-5 mt HCFC-22 annually. |

| **Project Number** | **SERV 2** |
|---|---|
| Country | **Maldives** |
| Agency | **UNDP** |
| Project title | Project preparation for a demonstration project for HCFC-free low-GWP alternatives in refrigeration in the fisheries sector |
| Sector/subsector | Servicing |
| Alternative(s) | n/a |
| ODP to be phased out | Estimated at 10.5 mt. No remaining eligible consumption in Maldives |
| Preparatory Budget | US $15,000 plus agency support costs of US $1,050 |
| Estimated Project Budget | US $200,000 plus agency support costs of US $18,000 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Identify and adopt low-GWP refrigerants as drop-in substitutes or those that may be used with minimum retrofit of existing refrigeration equipment in fishing vessels |
| Assessment:<br>The project does not demonstrate a new technology. Alternative refrigerants would need to be identified during project implementation. Non-flammable low-GWP refrigerants for retrofitting HCFC-22 systems are not available, while flammable refrigerants pose safety concerns, which is particularly important in fishing vessels. The HPMP for Maldives[15] had included the complete phase-out of HCFC consumption in the country |

| **MFS comments/Clarifications requested** | **UNDP's responses** |
|---|---|
| (a) What low-GWP alternatives are being considered for the project? | (a) Blends which are currently in use/under development in the market (e.g., R-444B, other low GWP HFO blends) are currently being considered. More details would be available during the project preparation stage; |
| (b) Will this involve both new equipment and retrofits? | (b) This will primarily focus on retrofit and also provide information on new equipment that can be installed in vessels; |
| (c) Will the focus be on transport refrigeration (ships) or on shore refrigeration? | (c) The focus will be on transport refrigeration in ships; |
| (d) If specific for fishing vessels, size and conditions should be described. Are these domestic vessels? | (d) In Maldives, there are 30 domestic vessels used inter atolls, with about 25 kg of HCFCs each. There are three registered international vessels with 2.5, 3 and 4 tonnes of HCFCs respectively |
| Based on HPMP submissions, there does not appear to be a low-GWP alternative for the fisheries sector, only HFCs are currently available. Will HFCs be tested? | Technical options available on the market now will be reviewed. While it is true that most of the options are HFCs, the project will focus on low-GWP blends that can be effectively and safely used in the vessel. |
| Why can't this be done under the HPMP? | The HPMP targets the phase-out of HCFCs and the use of low-GWP alternatives. However, there are no low-GWP alternatives available for fishing vessels. Thus, in order to achieve the target of phasing out HCFC by 2020, the retrofit programme for fishing vessels has selected HFCs. Non-availability of low-GWP alternatives together with the safety issues involved with alternatives that were low-GWP (e.g., HCs, ammonia) resulted in the inability of the fisheries sector to switch to substitutes. The remaining funding available from UNDP's component of the HPMP is not enough to showcase such a demonstration project. |

[15] UNEP/OzL.Pro/ExCom/60/33.

| MFS comments/Clarifications requested | UNDP's responses |
|---|---|
| This does not appear to strictly fall within the guidelines of the demonstration project in decision 72/40. Could you please provide a justification for why this should be considered a priority, taking into account the limited funds available, and the fact that the project will not demonstrate a new technology? | The project would demonstrate low-GWP options for fisheries applications. Currently, there is limited knowledge and information on this. This also poses a very significant challenge to achieving HCFC phase-out with low-GWP technologies and as such, without any focused efforts on such demonstration projects, the industry would move to HFC-based solutions. |
| ODP to be phased out? | Estimated at 10.5 mt. This does not include the land transport used for transporting food items/cold items. |

| **Project Number** | **SERV 3** |
|---|---|
| Country | **Regional: Kenya, Rwanda, Uganda, Tanzania and Zambia** |
| Agency | **UNIDO** |
| Project title | Demonstration project to ensure safety standards and market availability of high quality refrigerants |
| Sector/subsector | Servicing* |
| Alternative(s) | n/a |
| ODP to be phased out | 0 |
| Preparatory Budget | US $100,000 plus agency support costs of US $7,000 |
| Estimated Project Budget | US $750,000 plus agency support costs of US $52,500 |
| Endorsement letter | Missing for Rwanda and Tanzania |

| |
|---|
| Demonstration components:<br>Address the problem of poor refrigerant quality and the lack of standards for flammable refrigerants. The activities include a survey for market assessment to evaluate the current situation, and identify all stakeholders that may be involved and define the best strategy for project implementation |
| Assessment:<br>The project does not demonstrate a new technology. It proposes a strategy for addressing several issues to facilitate implementation of activities in the servicing sector included in stage I of HPMPs. It is not clear how it would fit into the framework defined in decision 72/40 |

| **MFS comments** | **UNIDO response** |
|---|---|
| Not clear what is being demonstrated, and how this fits with the criteria set out in decision 72/40. Activity appears to be more strategy development rather than demonstration of new technology | The project is to demonstrate the poor quality of (HCFC) refrigerant entering into the countries (this can be recovered refrigerant, and in most cases mixtures of HCFC-22, HFC-134a and others labelled as HCFC-22); and to assess whether countries are ready for the use of the new alternatives slowly becoming available in the market (i.e., assess needs for the new technologies). Without such needs assessment, the implementation of the HPMPs will be more difficult, ultimately forcing countries to return to HCFCs. It has been demonstrated by UNIDO that the quality of refrigerants available in many East African countries results in higher consumption and that new technologies cannot be adopted without standards |
| Standard-setting in countries is often a domestic activity that relates to national plans, therefore not clear on replicability. More technical assistance rather than demonstration | The technologies available in the countries are the same; the idea is to develop a basic standard that can then be adapted to the needs of every country. The project aims to demonstrate that the phase-out of ODS is facilitated through this standard, which can be implemented as technical assistance in stage II depending on the results of this project |
| Ensuring refrigerant quality starts with the source of the refrigerants, and is linked to the implementation of national import/export licensing systems, which are already part of HPMPs, and customs training (e.g., inspection using refrigerant identifiers). No demonstration potential, as this can be implemented with servicing sector activities in the country, through the enforcement component of the HPMP | Licensing systems ensure the quantities of refrigerant to be imported, but not their quality. Customs officers do not have the right to refuse imports of refrigerants because of the quality, as long as they don't contain banned substances. UNIDO has discussed the subject in different fora and workshops. Customs officers verify with the refrigerant identifiers that there is no CFC, or if it is HCFC, that the importer has permission to import. The customs officers have not been trained to verify the quality of refrigerants. Approved servicing sector |

| MFS comments | UNIDO response |
|---|---|
| | activities are addressing the sector through training in good practices, the provision of tools, but the quality of the refrigerant is usually not within the scope of the activity |
| Proposal also quite unclear on whether "ensuring high quality refrigerants" means HCFCs or alternatives. It appears that it is to make sure that the HCFCs that enter the country are of high quality. | The proposal aims to ensure the quality of HCFCs, as a low quality refrigerant likely ends up being vented, thus generating more consumption. While the focus is on HCFCs; the principle can and will also be applied to the importation of alternatives. The new generation of refrigerants are in general better quality since they are not recovered in big quantities and subsequently re-exported |
| Lacking endorsement letters from Rwanda and Tanzania | The endorsement letters were requested for both countries and are expected to be received during the present week |
| Proposal very clearly linked to servicing sector, therefore not a priority as it does not demonstrate a new technology. Provide a justification for why this should be funded over and above other projects that strictly meet criteria under decision 72/40 | Response of this comment is provided in previous comments |

| **Project Number** | **SERV 4** |
|---|---|
| Country | **Regional: Bahamas, Grenada, Saint Lucia, Saint Vincent and the Grenadines, Suriname** |
| Agency | **UNIDO** |
| Project title | Demonstration project on refrigeration and air-conditioning servicing sector activities, with focus on low-GWP flammable refrigerants |
| Sector/subsector | Servicing |
| Alternative(s) | n/a |
| ODP to be phased out | 0 |
| Preparatory Budget | US $60,000 plus agency support costs of US $4,200 |
| Estimated Project Budget | US $613,000 plus agency support costs of US $42,910 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Facilitate the introduction and use of flammable refrigerants in the servicing sector, and identify barriers in their adoption, through technical workshops and the provision of equipment |
| Assessment:<br>The project does not demonstrate a new technology. Activities proposed are being implemented in stage I of HPMPs for several Article 5 countries. It is not clear how it would fit into the framework defined in decision 72/40 |

| **MFS comments** | **UNIDO response** |
|---|---|
| Proposal appears to be more training rather than clear demonstration. Why can't these activities be part of the HPMP implementation (as proposal suggests that these are linked to the HPMPs of participating countries)? Most of the activities proposed are already included in the HPMPs of many countries, and does not see why it requires another regional project | Though elements of flammable low-GWP refrigerants are addressed in the HPMPs, these activities are largely limited in scope and the funding levels cannot cater to the needed activities. The project aims to tackle the flammability issue, characteristic to the majority of low-GWP refrigerant alternatives, in an integrated approach, through: upgrade of training of technicians and trainers; upgrade of training curricula at vocational training centres; upgrade of equipment at centres, purchase of HC-specific training equipment; upgrade of technicians' toolkits, purchase of HC-specific tools. The project will demonstrate how the introduction of flammable low-GWP alternatives, (i.e. HCs, R-32 and HFOs) can be facilitated, and how barriers can be overcome in a sustainable and effective manner. The project will also assess the cost impact of preparing countries for flammables, and consequently enable to replicate the approach in other countries |
| Can these activities be implemented as part of stage II of the HPMP when better technology options for retrofits would be available? | Retrofits are already being performed, in many cases, with safety considerations neglected. The project foresees bringing the servicing sector up to standard on safety issues prior to the implementation of stage II of the HPMP, as the use of low-GWP flammable refrigerants is expected to increase. The outcomes and lessons learnt from the demo project can be used to focus stage II activities |
| Regional workshops can be done within the purview of regional network meetings | The regional workshop proposed is highly technical, wherein trainers from all five countries will be trained. It will be an intensive event which cannot be slotted into the already tight agenda of regional network meetings. Moreover, having the training alone, independent of the other activities relating to upgrading |

| MFS comments | UNIDO response |
|---|---|
| | of centres, curricula and toolkits would not have the desired outcome |
| Proposal very clearly linked to servicing sector, therefore not a priority as it does not demonstrate a new technology. Provide a justification for why this should be funded over and above other projects that strictly meet criteria under decision 72/40 | The majority of low-GWP refrigerant alternatives are flammable, with their use expected to increase rapidly in the near future, as HCFCs are being phased out. Therefore, it is imperative that the servicing sector be prepared when it comes to handling and using these new refrigerants in a safe manner. The project aims to complement the respective HPMPs, through the integrated approach described above, by building on stage I activities; and using its outcomes and lessons learnt to focus and tailor effective stage II activities |

| **Project Number** | **SERV 5** |
|---|---|
| Country | **Egypt and GCC region** |
| Agency | **UNIDO** |
| Project title | Preparation of a demonstration project on refrigerant containment and refrigerant leakage prevention in high ambient temperature |
| Sector/subsector | Servicing |
| Alternative(s) | n/a |
| ODP to be phased out | Not available |
| Preparatory Budget | US $50,000 plus agency support costs of US $3,500 |
| Estimated Project Budget | US $150,000 plus agency support costs of US $13,500 |
| Endorsement letter | Yes |

| |
|---|
| Demonstration components:<br>Implement preventive measures to improve refrigerant containment in large commercial and industrial installations in a high ambient temperature environment, and evaluate the impact and overall costs of such actions. It will increase the understanding of refrigerant containment and the cost/benefit of such actions |
| Assessment:<br>The project does not demonstrate a new technology. Refrigerant containment activities are established practices and have been implemented in all/most of stage I of HPMPs |

| **MFS comments** | **UNIDO response** |
|---|---|
| Why is it that leak prevention and reduction cannot be undertaken as part of the HPMP, and why is there a need for a demonstration project? The training in good practices and refrigeration already includes elements of the proposal, and would require additional training days or modules without need for demonstration | The project is expected to provide information about potential quantitative benefits in terms of reducing amounts of virgin HCFC for re-charging industrial and commercial RAC equipment. Approved assistance under HPMPs, such as training in good practices, is expected to result in some reduction of HCFC use but it is uncertain how big an impact the assistance will have in quantitative terms. The demonstration project will provide quantitative data about the impact of refrigerant containment and leakage prevention in industrial and commercial installations. The demonstrated approach will be easily replicable in stage II of HPMPs in high-ambient-temperature countries and will also give them a tool to estimate the quantitative reduction impact of refrigerant containment and leakage prevention |
| REAL Zero is a specific initiative that has already developed tools, materials and training booklets and guides, and can therefore be easily adapted by countries wishing to use these tools as part of their good practices training programme. No clear reason why demonstration is needed | REAL Zero has been tested so far in non-Article 5 countries and in mild climates, hence information on how this methodology could work in high-ambient-temperature countries is not available and it is desirable to test it before it is widely used in all countries |
| Is there a technology that needs to be demonstrated? | The project is expected to demonstrate the quantitative impact of a new approach on refrigerant containment and leakage prevention, not a new technology. As no proven alternative to HCFCs in RAC is available for high-ambient-temperature countries, the tools for reductions of HCFC consumption in this sector will have to include new approaches for reducing the use of virgin HCFC refrigerants |

| MFS comments | UNIDO response |
|---|---|
| ODP to be phased out? | The aim of the project is to demonstrate the quantitative impact of reduction in HCFC consumption including the associated financial impact and information on reduced carbon emissions from the reduction of refrigerant leakages |
| Proposal very clearly linked to servicing sector, therefore not a priority as it does not demonstrate a new technology. Please provide a justification for why this should be funded over and above other projects that strictly meet the criteria under decision 72/40 | The refrigerant containment and leakage reduction approach will provide quantitative information on achievable reductions in HCFC use that will be useful for every Article 5 country for a better quantification of the impact of actions in the servicing sector of major industrial and commercial RAC equipment |

## Feasibility studies on district cooling

7. The feasibility studies for district cooling are listed in Table 5.

**Table 5. Feasibility studies for on district cooling**

| Project Number | Country | Agency | Title |
|---|---|---|---|
| DC 1 | Dominican Republic | UNDP | Feasibility study for district cooling in Punta Cana |
| DC 2 | Egypt | UNIDO (lead), UNEP | Feasibility study addressing district cooling |
| DC 3 | Kuwait | UNIDO (lead), UNEP | Feasibility study addressing district cooling |

| **Project Number** | **DC 1** |
|---|---|
| Country | **Dominican Republic** |
| Agency | **UNDP** |
| Project title | Feasibility study for district cooling in Punta Cana |
| Technology | Absorption cooling (waste heat) and deep sea water |
| ODP to be phased-out | 0 |
| Budget | US $100,000 |
| Endorsement letter | Yes |

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|---|
| Study components:<br>The study will assess feasibility of developing a district cooling in a specific recreational complex in Punta Cana owned by Grupo Puntacana. Free cooling from the bottom of the ocean in combination with recycling of waste heat as source for absorption chillers is being assessed |
| Assessment:<br>The proposal is well designed and clearly describes the assessment methodology (both technical and financial). It has an established business model. If study shows feasibility of district cooling, Grupo Puntacana will fund the project. The project if implemented, would lead to a potential early retirement of HCFCs in the servicing sector and greenhouse gas (GHG) emissions reductions |

| **MFS comments** | **UNDP responses** |
|---|---|
| What is the current use of refrigerants in the hotel/airport complex owned by the Grupo Puntacana (HCFCs, HFCs)? How much HCFCs is expected to be phased out? | The refrigerant in the current setup is all HCFC and HFC. UNDP is trying to determine the current charge. The feasibility study will in itself not lead to any phase-out. However, should the full project be implemented, all HCFC consumption in the complex be phased-out |
| Which cooling technique will be used (water/air, lithium bromide/water, ammonia/water…)? | The most suitable technique will be based on relevant local sourcing conditions. Free cooling from the bottom ocean in combination with recycling of waste heat as source for absorption chillers are interesting opportunities. Other technologies might occur depending of quality demands from end users. The proposed feasibility study will cover these topics |
| How representative is the project in the context of the whole country? (The project states that "medium scale comparison to the real issues large cities are facing", any precise data?) | It is difficult to assess how big the impact will be on the country base but this can be the first step to replace traditional cooling for all non-domestic buildings, since electricity costs for cooling can be up to 50 per cent of the total operational cost for a hotel; this will be a sufficient cut in fossil fuel based electricity production and at the same time a total phase out of HCFC for these buildings |
| The project proposal mentions that commercial and logistical information on the results of the study will not be provided to MFS, can we have more details on exactly what information will be shared, and what will not be shared? | The intention is to disclose as much information as possible, so that the results of the feasibility study can be of value to others and serve to promote the use of district cooling within the Dominican Republic, the Caribbean and globally. UNDP has stipulated (and Puntacana Ecological Foundation has agreed to) offer the results on the technical feasibility study to all interested parties in good standing, (with the exception of commercial and logistic information owned by Grupo Puntacana). Technical information regarding the applicability study and financial schemes for district cooling systems that is developed during the project implementation with Fund assistance will be public knowledge and will be disclosed. |

| | |
|---|---|
| Will Grupo Puntacana co-finance the project after the study, if successful? | Grupo Puntacana is a financially strong group that has a proven track record in funding and implementing large investment projects (e.g., in 2104, the new airport terminal was constructed in a period of 11 months by the Group). The Group is interested in conducting the feasibility study because they see it as an important option, and would co-finance the project after the study, if successful (technically, financially, operational) |

**Note:** Since the initial proposals for the two studies in Kuwait and Egypt had a similar structure, the Secretariat's comments referred to both proposals with some specific requests for clarifications per country.

| **Project Number** | **DC 2** |
|---|---|
| Country | **Egypt** |
| Agency | **UNIDO/UNEP** |
| Project title | Feasibility study addressing district cooling |
| Technology | Hybrid solar and gas thermal driven absorption chiller |
| ODP to be phased-out | 0 |
| Budget | US $100,000 |
| Endorsement letter | Yes |

| |
|---|
| Study components:<br>Assess a hybrid solar and natural gas absorption chiller technology for a district in Cairo through research and model simulation. The cooling technique in the chiller will be either lithium bromide/water or ammonia/water. The study will be disseminated to both Government authorities and private investors |
| Assessment:<br>The proposal contains limited information on the business model. It also lacks details on the targeted district. The co-financing opportunities are not yet identified. However, modelling and testing district cooling technology in Egypt per se could potentially be useful, since the country depends heavily on fossil fuel and electricity is highly subsidized. What should be carefully measured is the impact of the hybrid model in terms of natural gas uses and emissions. |

| **Project Number** | **DC 3** |
|---|---|
| Country | **Kuwait** |
| Agency | **UNIDO/UNEP** |
| Project title | Feasibility study addressing district cooling |
| Technology | Deep sea water, absorption chiller (waste heat and solar) |
| ODP to be phased-out | 0 |
| Budget | US $100,000 |
| Endorsement letter | Yes |

| |
|---|
| Study components:<br>An analysis of three district cooling technologies, namely, deep sea water cooling, waste heat absorption and solar assisted absorption systems, through a literature review and assessment. The study will be disseminated to both government authorities and private investors |
| Assessment:<br>The proposal does not identify a particular area or district. The business model is not presented and co-financing opportunities are not identified. It seems more of a desk study. However, such study might help to identify possible financial and environmentally benefits of introducing district cooling in the country that depends heavily on fossil fuel and has highly subsidized electricity |

| **MFS comments** | **UNIDO response** |
|---|---|
| The project concepts contain very little information on the overall design of the study, can you provide more information on: methodology; expected outputs; details on how technical and financial feasibility will be measured; details on how infrastructure and regulatory framework will be assessed; and work plan with milestones | The project documents have been revised to reflect the Secretariat's comments. The two projects do not have the same objective: In Egypt, the study will be focused on hybrid solar and gas thermal driven absorption chiller in the New Capital (Cairo); in Kuwait the study will be focused on identifying the most suitable technology to be applied in the country, i.e., deep sea water free cooling, waste heat absorption and solar assisted chilled water absorption systems |

| MFS comments | UNIDO response |
|---|---|
| What is the target of the study: specific city? Residential compound? | In Egypt the feasibility study will focus on one district of the new capital, which will have a span 700 $km^2$ with 21 residential districts and 25 dedicated districts. Within the new capital there will be 663 hospitals and clinics, 1.1 million homes hosting at least 5 million residents, and one international airport. The new capital will foster the relocation of parliament, governmental ministries and foreign embassies.<br>In Kuwait, the feasibility study will identify the most suitable technology for the country, noting that there are several ongoing construct projects. However, the study will focus on residential compound |
| (a) Egypt: what type of renewable energy will be assessed? (solar, waste heat?)<br>(b) Egypt, clarify the sentence: "The technology chosen to be most suitable to the demand in Egypt is in fact district cooling by absorption chiller using traditional vapour compression" (It is the Secretariat understanding that the traditional vapour compression uses refrigerants such as HCFCs/HFCs as opposite to the absorption chillers)<br>(c) Cooling technique to be used in the absorption chiller (water/air, lithium bromide/water, ammonia/ water?)<br>(d) ODP to be phased out? | (a) Hybrid solar and gas thermal driven absorption chiller<br>(b) The sentence should be “the technology chosen to be most suitable to the demand in Egypt is in fact district cooling by absorption chiller versus using traditional vapour compression”<br>(c) Either lithium bromide/water, ammonia/water<br>(d) Since this is a feasibility study, there will be no direct ODP reduction targets. However, it is expected the study will result in estimating amount of ODS and high-GWP alternatives that can be potentially avoided when implementing the outcomes of the study |
| Any potential partner? How will the study address different needs and interests of the government vs business/private investors since it targets both? | The studies intend to involve key governmental, research and industry partners in both countries, in order to ensure that input from all stakeholders are incorporated and that the outcomes will be implementable.<br>For Egypt, the following stakeholders are considered for direct and indirect involvement in the project: Ministry of Planning; General Authority for Investment; Housing and Building National Research Centre; New and Renewable Energy Authority; Energy Research Centre at Cairo University; Egyptian Organization For standardization and Quality; Egypt ASHRAE Chapter.<br>For Kuwait, the list of stakeholders includes: General Secretariat of the Supreme Council for Planning and Development; Kuwait Institute for Scientific Research; Kuwait Foundation for the Advancement of Science (KFAS); Kuwait University; Kuwait ASHRAE Chapter |
| The projects concepts contain a table on the benefits of district cooling: What is it based on? (Which technology, any specific project?) | The table is part of a presentation undertaken by an expert in this field, and provides an overview of the differences between district cooling compared to current cooling applications. The presentation did not refer to a specific project or to a specific district cooling technology |

| MFS comments | UNIDO response |
|---|---|
| How will the results of the study be presented and shared? | The results of the feasibility study will be presented in a three way approach: at a high-level coordination meeting with the ministries of urban planning, environment, energy, trade and finance; at a stakeholder coordination meeting, with project developers, energy suppliers, associations, and development banks; and the assessment will be published and circulated through the ministries of energy, environment and urban planning |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **AFGHANISTAN** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase VII: 12/2015-11/2017) | UNEP | | $150,000 | $0 | $150,000 | |
| **Total for Afghanistan** | | | **$150,000** | | **$150,000** | |
| **ANGOLA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase V: 7/2015-6/2017) | UNEP | | $134,400 | $0 | $134,400 | |
| **Total for Angola** | | | **$134,400** | | **$134,400** | |
| **ARGENTINA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) (refrigeration servicing sector) | UNIDO | 3.3 | $314,612 | $22,023 | $336,635 | |
| *Noted that the Agreement was updated to reflect the change in support costs owing to the new administrative cost regime. UNIDO was requested to report to the 77th meeting on the status of implementation of the conversion of the enterprises Audivic and Foxman included in the room air-conditioning manufacturing project, on the understanding that the remaining funds from the conversion of these two enterprises will be returned to the Multilateral Fund, in case they withdraw from the project.* | | | | | | |
| **Total for Argentina** | | **3.3** | **$314,612** | **$22,023** | **$336,635** | |
| **ARMENIA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, third tranche) | UNEP | | $7,485 | $973 | $8,458 | |
| *Noted the cancellation of the investment project in SAGA; that UNDP commits to return the balances to the Multilateral Fund upon completion of stage I; that HCFC consumption (0.83 ODP tonnes of HCFC-141b) associated with SAGA would continue to be deducted from the starting point; that the Agreement was updated based on the adjustment for the amount of the last tranche for UNDP due to project cancellation. Approved on the understanding that the approved funds would not be transferred to UNEP until the Secretariat had reviewed the verification report and confirmed that the Government of Armenia was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee. The Government of Armenia, UNDP and UNEP were requested to submit the project completion report to the first meeting of the Executive Committee in 2017.* | | | | | | |
| **Total for Armenia** | | | **$7,485** | **$973** | **$8,458** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **BANGLADESH** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) (refrigeration servicing sector) | UNEP | | $90,000 | $11,700 | $101,700 | |
| **Total for Bangladesh** | | | **$90,000** | **$11,700** | **$101,700** | |
| **BHUTAN** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase VI: 12/2015-11/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Bhutan** | | | **$60,000** | | **$60,000** | |
| **BRAZIL** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, fourth tranche) (foam sector plan) | UNDP | 32.9 | $3,000,000 | $225,000 | $3,225,000 | |
| *Approved on the understanding that the approved funds would not be transferred to UNDP until the Secretariat had reviewed the verification report and confirmed that the Government of Brazil was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee.* | | | | | | |
| **Total for Brazil** | | **32.9** | **$3,000,000** | **$225,000** | **$3,225,000** | |
| **BRUNEI DARUSSALAM** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | | $27,500 | $3,575 | $31,075 | |
| *Approved on the understanding that if Brunei Darussalam were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants, in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNDP | | $39,600 | $3,564 | $43,164 | |
| *Approved on the understanding that if Brunei Darussalam were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants, in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Brunei Darussalam** | | | **$67,100** | **$7,139** | **$74,239** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **BURKINA FASO** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase XI: 6/2015-5/2017) | UNEP | | $72,410 | $0 | $72,410 | |
| **Total for Burkina Faso** | | | **$72,410** | | **$72,410** | |
| **CAMBODIA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase VIII:1/2016-12/2017) | UNEP | | $112,667 | $0 | $112,667 | |
| **Total for Cambodia** | | | **$112,667** | | **$112,667** | |
| **CHILE** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase XI: 4/2015-3/2017) | UNDP | | $186,550 | $13,058 | $199,608 | |
| **Total for Chile** | | | **$186,550** | **$13,058** | **$199,608** | |
| **CHINA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, fourth tranche) (refrigeration servicing sector including enabling programme) | Japan | | $80,000 | $10,400 | $90,400 | |
| HCFC phase-out management plan (stage I, fourth tranche) (refrigeration servicing sector including enabling programme) | UNEP | | $1,173,000 | $131,269 | $1,304,269 | |
| **Total for China** | | | **$1,253,000** | **$141,669** | **$1,394,669** | |
| **COLOMBIA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase X: 11/2015-10/2017) | UNDP | | $275,600 | $19,292 | $294,892 | |
| **Total for Colombia** | | | **$275,600** | **$19,292** | **$294,892** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **COOK ISLANDS** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Cook Islands) | UNEP | | $39,850 | $5,181 | $45,031 | |
| *Approved on the understanding that if the Cook Islands was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, the Cook Islands would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Cook Islands** | | | **$39,850** | **$5,181** | **$45,031** | |
| **COSTA RICA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, third tranche) | UNDP | 1.4 | $62,000 | $4,650 | $66,650 | |
| *Approved on the understanding that if Costa Rica were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Costa Rica** | | **1.4** | **$62,000** | **$4,650** | **$66,650** | |
| **DJIBOUTI** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase VI: 6/2015-7/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Djibouti** | | | **$60,000** | | **$60,000** | |
| **EGYPT** | | | | | | |
| **FOAM** | | | | | | |
| **Preparation of project proposal** | | | | | | |
| Preparation for HCFC phase-out investment activities (stage II) (extruded polystyrene foam sector) | UNDP | | $20,000 | $1,400 | $21,400 | |
| **FUMIGANT** | | | | | | |
| **Methyl bromide** | | | | | | |
| Technical assistance on two alternatives to methyl bromide in the palm date sector | UNIDO | 6.0 | $282,480 | $19,774 | $302,254 | |
| *Approved on the understanding that no additional funding will be provided for Egypt for the phase-out of controlled uses of methyl bromide in the country; and that the Government of Egypt is committed to sustaining the complete phase-out of methyl bromide by fully implementing the ban on imports of MB which has been enforced since 1 January 2015.* | | | | | | |
| **Total for Egypt** | | **6.0** | **$302,480** | **$21,174** | **$323,654** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **EQUATORIAL GUINEA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | 0.3 | $30,000 | $3,900 | $33,900 | |
| *Approved on the understanding that in the event that Equatorial Guinea were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols* | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of the institutional strengthening project (phase II: 6/2015-5/2017) | UNEP | | $80,000 | $0 | $80,000 | |
| **Total for Equatorial Guinea** | | **0.3** | **$110,000** | **$3,900** | **$113,900** | |
| **GEORGIA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase IX: 7/2015-6/2017) | UNDP | | $60,667 | $4,247 | $64,914 | |
| **Total for Georgia** | | | **$60,667** | **$4,247** | **$64,914** | |
| **GUINEA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase IX: 7/2015-6/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Guinea** | | | **$60,000** | | **$60,000** | |
| **GUYANA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | | $7,000 | $910 | $7,910 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 1.8 ODP tonnes, calculated using actual consumption of 1.1 ODP tonnes and 2.4 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if Guyana were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols. The Government of Guyana, UNEP and UNDP were requested to submit the project completion report to the second meeting of the Executive Committee in 2017.* | | | | | | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase VI: 11/2015-10/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Guyana** | | | **$67,000** | **$910** | **$67,910** | |
| **IRAN** | | | | | | |
| **FOAM** | | | | | | |
| **Preparation of project proposal** | | | | | | |
| Preparation for HCFC phase-out investment activities (stage II) (rigid polyurethane foam sector) | UNIDO | | $75,000 | $5,250 | $80,250 | |
| **Total for Iran** | | | **$75,000** | **$5,250** | **$80,250** | |
| **KENYA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase X: 4/2015-3/2017) | UNEP | | $151,667 | $0 | $151,667 | |
| **Total for Kenya** | | | **$151,667** | | **$151,667** | |
| **KIRIBATI** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Kiribati) | UNEP | | $44,850 | $5,831 | $50,681 | |
| *Approved on the understanding that if Kiribati was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, Kiribati would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Kiribati** | | | **$44,850** | **$5,831** | **$50,681** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **LAO, PDR** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | 0.7 | $97,875 | $12,724 | $110,599 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance, revised funding level and the change of the Government monitoring agency; that the revised starting point for sustained aggregate reduction in HCFC consumption was 5.54 ODP tonnes, calculated using the actual consumption of 2.1 ODP tonnes and 2.5 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol, plus 3.24 ODP tonnes of HCFC-141b contained in imported pre blended polyol system; and that the revised funding level for stage I of the HPMP was US $280,000, plus agency support costs, in accordance with decision 60/44(f)(xii). Approved on the understanding that the approved funds would not be transferred to UNEP and the Government of France until the Secretariat had reviewed the verification report confirming that the Government of Lao People's Democratic Republic was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee in 2013 and 2014; and if the Lao People's Democratic Republic were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | France | 0.1 | $40,500 | $5,265 | $45,765 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance, revised funding level and the change of the Government monitoring agency; that the revised starting point for sustained aggregate reduction in HCFC consumption was 5.54 ODP tonnes, calculated using the actual consumption of 2.1 ODP tonnes and 2.5 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol, plus 3.24 ODP tonnes of HCFC-141b contained in imported pre blended polyol system; and that the revised funding level for stage I of the HPMP was US $280,000, plus agency support costs, in accordance with decision 60/44(f)(xii). Approved on the understanding that the approved funds would not be transferred to UNEP and the Government of France until the Secretariat had reviewed the verification report confirming that the Government of Lao People's Democratic Republic was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee in 2013 and 2014; and if the Lao People's Democratic Republic were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Lao, PDR** | | **0.8** | **$138,375** | **$17,989** | **$156,364** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **LIBERIA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | Germany | 1.4 | $126,000 | $16,380 | $142,380 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 5.3 ODP tonnes, calculated using actual consumption of 5.0 ODP tonnes and 5.5 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if Liberia were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Liberia** | | **1.4** | **$126,000** | **$16,380** | **$142,380** | |
| **MALI** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of the institutional strengthening project (phase VIII: 7/2015-6/2017) | UNEP | | $60,677 | $0 | $60,677 | |
| **Total for Mali** | | | **$60,677** | | **$60,677** | |
| **MARSHALL ISLANDS** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Marshall Islands) | UNEP | 0.1 | $47,700 | $6,201 | $53,901 | |
| *Approved on the understanding that if the Marshall Islands was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, the Marshall Islands would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Marshall Islands** | | **0.1** | **$47,700** | **$6,201** | **$53,901** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **MICRONESIA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Micronesia) | UNEP | 0.1 | $46,925 | $6,100 | $53,025 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 2.55 metric tonnes, calculated using actual consumption of 1.77 metric tonnes and 3.34 metric tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if the Federated States of Micronesia were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, the PICs would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Micronesia** | | **0.1** | **$46,925** | **$6,100** | **$53,025** | |
| **MONGOLIA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of the institutional strengthening project (phase IX: 1/2016-12/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Mongolia** | | | **$60,000** | | **$60,000** | |
| **NAURU** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Nauru) | UNEP | | $20,975 | $2,727 | $23,702 | |
| *Approved on the understanding that if Nauru was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air conditioning equipment originally designed for non flammable substances, Nauru would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Nauru** | | | **$20,975** | **$2,727** | **$23,702** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **NICARAGUA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | | $30,000 | $3,900 | $33,900 | |
| *Approved on the understanding that if Nicaragua were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols; and that the approved funds would not be transferred to UNEP and UNIDO until the Secretariat had reviewed the verification report and confirmed that the Government of Nicaragua was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee in 2013 and 2014.* | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNIDO | | $50,000 | $4,500 | $54,500 | |
| *Approved on the understanding that if Nicaragua were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols; and that the approved funds would not be transferred to UNEP and UNIDO until the Secretariat had reviewed the verification report and confirmed that the Government of Nicaragua was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee in 2013 and 2014.* | | | | | | |
| **Total for Nicaragua** | | | **$80,000** | **$8,400** | **$88,400** | |
| **NIUE** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Niue) | UNEP | | $20,075 | $2,610 | $22,685 | |
| *Approved on the understanding that if Niue was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, the PICs would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Niue** | | | **$20,075** | **$2,610** | **$22,685** | |
| **OMAN** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | | $20,000 | $2,600 | $22,600 | |
| *UNIDO was requested to continue assisting the Government of Oman in introducing a ban on HCFC-141b contained in imported pre-blended polyols as early as possible, and to report back to the Executive Committee in the annual progress and financial reporting document. The Government of Oman, UNIDO and UNEP were requested to submit the project completion report to the first meeting of the Executive Committee in 2017.* | | | | | | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| HCFC phase-out management plan (stage I, second tranche) | UNIDO | | $35,000 | $2,625 | $37,625 | |
| *UNIDO was requested to continue assisting the Government of Oman in introducing a ban on HCFC-141b contained in imported pre-blended polyols as early as possible, and to report back to the Executive Committee in the annual progress and financial reporting document. The Government of Oman, UNIDO and UNEP were requested to submit the project completion report to the first meeting of the Executive Committee in 2017.* | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of institutional strengthening support (phase VI: 12/2015-11/2017) | UNIDO | | $68,467 | $4,793 | $73,260 | |
| **Total for Oman** | | | **$123,467** | **$10,018** | **$133,485** | |
| **PALAU** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Palau) | UNEP | 0.1 | $45,625 | $5,931 | $51,556 | |
| *Approved on the understanding that if the Palau was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, Palau would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of institutional strengthening project (phase VI: 12/2015-11/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Palau** | | **0.1** | **$105,625** | **$5,931** | **$111,556** | |
| **PANAMA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, third tranche) | UNEP | | $8,400 | $1,092 | $9,492 | |
| *The Government of Panama, UNDP and UNEP were requested to submit the project completion report to the second meeting of the Executive Committee in 2017. Approved on the understanding that if Panama were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| HCFC phase-out management plan (stage I, third tranche) | UNDP | | $31,865 | $2,390 | $34,255 | |
| *The Government of Panama, UNDP and UNEP were requested to submit the project completion report to the second meeting of the Executive Committee in 2017. Approved on the understanding that if Panama were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Panama** | | | **$40,265** | **$3,482** | **$43,747** | |
| **PARAGUAY** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNDP | 2.1 | $131,500 | $9,862 | $141,362 | |
| *Approved on the understanding that if Paraguay were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols; and that the approved funds would not be transferred to UNDP and UNEP until the Secretariat had reviewed the verification report and confirmed that the Government of Paraguay was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee.* | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | 2.4 | $120,500 | $15,665 | $136,165 | |
| *Approved on the understanding that if Paraguay were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols; and that the approved funds would not be transferred to UNDP and UNEP until the Secretariat had reviewed the verification report and confirmed that the Government of Paraguay was in compliance with the Montreal Protocol and the Agreement between the Government and the Executive Committee.* | | | | | | |
| **Total for Paraguay** | | **4.5** | **$252,000** | **$25,527** | **$277,527** | |
| **PHILIPPINES** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase X: 1/2016-12/2017) | UNEP | | $181,133 | $0 | $181,133 | |
| **Total for Philippines** | | | **$181,133** | | **$181,133** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **SAINT KITTS AND NEVIS** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | 0.1 | $49,200 | $6,396 | $55,596 | |
| *Approved on the understanding that if Saint Kitts and Nevis were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Saint Kitts and Nevis** | | **0.1** | **$49,200** | **$6,396** | **$55,596** | |
| **SAMOA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Samoa) | UNEP | 0.1 | $57,400 | $7,462 | $64,862 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 4.6 metric tonnes, calculated using actual consumption of 3.5 metric tonnes and 5.7 metric tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if Samoa was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, Samoa would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase VIII: 11/2015-10/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Samoa** | | **0.1** | **$117,400** | **$7,462** | **$124,862** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **SOLOMON ISLANDS** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Solomon Islands) | UNEP | 0.7 | $65,250 | $8,483 | $73,733 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 35.05 metric tonnes, calculated using actual consumption of 29.09 metric tonnes and 41.00 metric tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if the Solomon Islands were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, the Solomon Islands would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of institutional strengthening project (phase VI: 12/2015-11/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Solomon Islands** | | **0.7** | **$125,250** | **$8,483** | **$133,733** | |
| **SURINAME** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan (stage I, second tranche) | UNEP | 0.1 | $28,500 | $3,705 | $32,205 | |
| *Approved on the understanding that if Suriname were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, it would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Suriname** | | **0.1** | **$28,500** | **$3,705** | **$32,205** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **TONGA** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Tonga) | UNEP | | $49,550 | $6,442 | $55,992 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 2.55 metric tonnes, calculated using actual consumption of 2.43 metric tonnes and 2.67 metric tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if Tonga was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, Tonga would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of institutional strengthening project (phase VI: 12/2015-11/2017) | UNEP | | $60,000 | $0 | $60,000 | |
| **Total for Tonga** | | | **$109,550** | **$6,442** | **$115,992** | |
| **TUNISIA** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase VIII: 4/2015-4/2017) | UNIDO | | $247,270 | $17,309 | $264,579 | |
| **Total for Tunisia** | | | **$247,270** | **$17,309** | **$264,579** | |
| **TURKEY** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| Preparation of a HCFC phase-out management plan (stage II) | UNIDO | | $90,000 | $6,300 | $96,300 | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Extension of institutional strengthening project (phase VII: 7/2015-6/2017) | UNIDO | | $260,000 | $18,200 | $278,200 | |
| **Total for Turkey** | | | **$350,000** | **$24,500** | **$374,500** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **TUVALU** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Tuvalu) | UNEP | | $34,925 | $4,540 | $39,465 | |
| *Approved on the understanding that if Tuvalu was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, Tuvalu would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Tuvalu** | | | **$34,925** | **$4,540** | **$39,465** | |
| **VANUATU** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche, Vanuatu) | UNEP | 0.1 | $57,400 | $7,462 | $64,862 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 5.11 metric tonnes, calculated using actual consumption of 1.89 metric tonnes and 8.33 metric tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if Vanuatu was to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, Vanuatu would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Vanuatu** | | **0.1** | **$57,400** | **$7,462** | **$64,862** | |
| **ZIMBABWE** | | | | | | |
| **SEVERAL** | | | | | | |
| **Ozone unit support** | | | | | | |
| Renewal of the institutional strengthening project (phase VIII: 4/2015-3/2017) | UNEP | | $148,242 | $0 | $148,242 | |
| **Total for Zimbabwe** | | | **$148,242** | | **$148,242** | |

| Project Title | Agency | ODP (tonnes) | Funds recommended (US$) Project | Support | Total | C.E. (US$/kg) |
|---|---|---|---|---|---|---|
| **REGION: ASP** | | | | | | |
| **PHASE-OUT PLAN** | | | | | | |
| **HCFC phase out plan** | | | | | | |
| HCFC phase-out management plan for PIC countries through regional approach (stage I, second tranche) | UNEP | | $106,000 | $13,780 | $119,780 | |
| *Noted that the Agreement was updated based on the established HCFC baseline for compliance; and that the revised starting point for sustained aggregate reduction in HCFC consumption was 60.62 metric tonnes, calculated using actual consumption of 47.70 metric tonnes and 74.04 metric tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol. Approved on the understanding that if the PICs were to decide to proceed with retrofits and associated servicing to flammable and toxic refrigerants in refrigeration and air-conditioning equipment originally designed for non-flammable substances, the PICs would do so assuming all associated responsibilities and risks and only in accordance with the relevant standards and protocols.* | | | | | | |
| **Total for Region: ASP** | | | **$106,000** | **$13,780** | **$119,780** | |
| **GRAND TOTAL** | | **52.1** | **$9,434,292** | **$697,441** | **$10,131,733** | |