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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-fourth Meeting
Montreal, 16-20 December 2019

REPORTS ON PROJECTS WITH SPECIFIC REPORTING REQUIREMENTS

1. The present document represents a follow-up to the issues raised in projects and activities for which specific reports were requested in previous meetings.

Organization of the document

2. This document contains mandatory reports on different types of projects (e.g., low-global warming potential (GWP) alternatives demonstration projects, ODS waste disposal, HPMPs) addressing a wide range of matters (e.g., temporary use of a high-GWP technology, change of implementing agency, low levels of implementation, and results of demonstration projects), for which funding is not being requested.

3. In reviewing each report on projects with specific reporting requirements, the Secretariat follows the same rigorous approach as when it reviews projects for which funding is being requested. Accordingly, each report contains a brief background/project description, progress/results; the Secretariat's comments; and a recommendation for consideration by the Executive Committee.

4. The Secretariat notes that, for a large number of reports on projects with specific reporting requirements, all issues have been satisfactorily addressed or there are no issues; in these cases, the Executive Committee could proceed with adopting all the recommendations associated with these reports without the need to consider them individually at the meeting. However, the Executive Committee might wish to request further clarification on any of these reports, in which case it would be considered individually. This approach would allow the Executive Committee to have more time to discuss other agenda items, *inter alia,* those related to policy matters.

5. Accordingly, the Secretariat has organized the present document in the following two sections and two addenda.

Section I: Includes reports on projects with specific reporting requirements for which there are no outstanding policy, cost or other issues, for which the Executive Committee

may wish to take decision on the basis of the Secretariat's recommendations without further discussion ("blanket approval"). The report of the meeting of the Executive Committee will present each report contained in this section individually, together with the decision adopted by the Committee

Section II Includes reports on projects with specific reporting requirements for individual consideration by the Executive Committee

Addendum 1 Consists of reports related to China[1]

Addendum 2 Consists of the study on the production of CTC in China and its use for feedstock applications (received by the Secretariat on 21 October 2019)[2]

6. Table 1 lists the reports on projects with specific reporting requirements submitted to the 84th meeting recommended for blanket approval.

Table 1. Reports on projects with specific reporting requirements recommended for blanket approval

Country	Project title	Paragraphs
ODS waste disposal projects		
Brazil	Pilot demonstration project on ODS waste management and disposal: Progress report	8-12
Temporary use of a high-GWP technology in approved projects		
Cuba	HPMP (stage I): Report on the status of conversion of enterprises FRIARC and IDA	13-20
Lebanon	HPMP (stage II): Report on the status of the conversion of the of the remaining beneficiary enterprises in both the foam and air-conditioning manufacturing sectors	21-29
Reports related to HPMPs		
Bahamas	HPMP (stage I): Updated final report on the findings of the study to explore best available options for the pilot project to assess, monitor and retrofit two air-conditioning systems	30-35
Brazil	HPMP (stage I): Report on the temporary use of high-GWP technologies at U Tech systems house and 2018/2019 progress report	36-58
Brazil	HPMP (stage II): Status of implementation of the projects in the room air-conditioning manufacturing sector and at the enterprise Freeart Seral Brasil Metalurgica Ltda. in the commercial refrigeration manufacturing sector and change of three small- and medium-sized enterprises (SMEs) in technical assistance	59-68
Equatorial Guinea	HPMP (stage I): Progress report on HCFC consumption trends and progress made in ensuring an operational licensing and quota system, and in addressing the recommendations of the verification report, and assistance provided by UNEP CAP	69-74
Honduras	HPMP (stage I): Progress report on implementation of all the activities under the UNEP components	75-84
India	HPMP (stage II): Update on assessment on continuous-foam-panel-manufacturing enterprises regarding adherence to the ban and list of enterprises in the polyurethane foam manufacturing sector	85-97
Libya	HPMP (stage I): Progress report	98-111
Maldives	HPMP (stage I) and demonstration project for HCFC-free low-GWP alternatives in refrigeration in the fisheries sector: Progress report	112-121
Mexico	HPMP (stage I): Progress report	122-136
Qatar	HPMP (stage I): Final progress report	137-140
Uruguay	HPMP (stage II): Report on progress in implementation of the conversion of the foam enterprises	141-147
Demonstration projects for low-GWP alternatives to HCFCs and feasibility studies for district cooling		
Egypt	Demonstration of low-cost options for the conversion to non-ODS technologies in polyurethane foams at very small users: Final report	148-160 (Report annexed)

[1] UNEP/OzL.Pro/ExCom/84/22/Add.1.
[2] UNEP/OzL.Pro/ExCom/84/22/Add.2.

Country	Project title	Paragraphs
Morocco	Demonstration of the use of low cost pentane foaming technology for the conversion to non-ODS technologies in polyurethane foams at small and medium-sized enteprises: Final report	161-179 (Report annexed)
Saudi Arabia	Demonstration projects for the phase-out of HCFCs by using HFO as foam-blowing agent in the spray foam applications in high-ambient temperatures	180-183
West Asia	Promoting alternative refrigerants in air-conditioning for high ambient countries in West Asia (PRAHA-II): Final report	184-187
Global	Demonstration project on refrigerant quality, containment and introduction of low-GWP alternatives (Eastern Africa and Caribbean regions): Progress report	188-200
Methyl bromide		
Argentina	Critical use exemptions	201-203
Change of lead implementing agency		
Senegal	HPMP (stage I): Request for change of lead implementing agency	204-208
Requests for extension of enabling activities		209-211

7. Table 2 lists the reports on projects with specific reporting requirements submitted to the 84th meeting for individual consideration and brief explanations of related issues.

Table 2: Reports on projects with specific reporting requirements for individual consideration

Country	Project title	Issue	Paragraphs
Temporary use of a high-GWP technology in approved projects			
Trinidad and Tobago	HPMP (stage I): Report on temporary use of a high-GWP technology	Proposed withdrawal of an enterprise on account of use of high-GWP foam blowing agent	212-217
Reports related to HPMPs			
Indonesia	HPMP (stage I): Progress report and status report on the conversion of the refrigeration and air-conditioning (RAC) enterprises and polyurethane (PU) foam conversion	Update on status of conversion, proposed withdrawal of some enterprises, and proposed extension of stage I	218-241

SECTION I: REPORTS ON PROJECTS WITH SPECIFIC REPORTING REQUIREMENTS RECOMMENDED FOR BLANKET APPROVAL

ODS waste disposal projects

Brazil: Pilot demonstration project on ODS waste management and disposal (progress report) (UNDP)

Background

8. UNDP, as designated implementing agency, submitted the progress report on the implementation of the pilot demonstration project on ODS waste management and disposal in Brazil, in line with decision 79/18(c)(iii).[3]

Progress report

9. In the report submitted to the 82nd meeting, UNDP indicated that the reclaim centres for servicing sector had been provided with equipment that will allow for the collection and storage of waste refrigerants for storage of collected gases, as well as laboratory equipment for testing. The installation of the laboratory equipment had been completed in some centres and staff had been trained on Air-Conditioning, Heating and Refrigeration Institute (AHRI) procedures for testing, good practices, occupational safety, standards

[3] To request UNDP to submit annual progress reports for the pilot ODS disposal projects in Brazil and Colombia as "projects with specific reporting requirements" until the projects had been completed.

and legislation. Staff of three other reclaim centres that received gas chromatography equipment were also trained on the use of this; one more centre is expecting similar equipment to be installed before the end of 2019 after which training will be conducted.

10. After completing the activities and protocols for the environmental requirements of the test burn methods, the incineration facility (Essencis), finalized the process adjustments for the ODS incineration, performed pre-burn tests (September 2019) and completed the official burn test (October 2019), which were supervised by CETESB[4]. Preliminary results indicate compliance with atmospheric emissions standards with the expectation that further tests would demonstrate its compliance with the destruction efficiency level recommended by the Brazilian legislation. This would allow the facility to receive final authorization from CETESB for ODS destruction. The operating license for Essencis to be an authorized facility for destruction of ODS is expected to be issued in the first quarter of 2020.

Secretariat's comments

11. The Secretariat noted that the pilot demonstration project is progressing. Upon a request for clarification, UNDP explained that by mid-2020, the destruction facility should be fully operational and the proposed business model for the sustainable management of ODS waste in Brazil would be completed. A full report containing an assessment of the ODS waste management and disposal would be provided to the Executive Committee at the completion of the project.

Recommendation

12. The Executive Committee may wish to note the progress report on the pilot demonstration project on ODS waste management and disposal in Brazil, submitted by UNDP, contained in document UNEP/Ozl.Pro/ExCom/84/22.

Temporary use of a high-global-warming-potential technology in approved projects

Cuba: HCFC phase-out management plan (stage I - report on the status of conversion of enterprises FRIARC and IDA) (UNDP)

Background

13. At its 77th meeting, the Government of Cuba submitted a request for approval of the third tranche of stage I of its HPMP,[5] indicating that, although two polyurethane (PU) foam enterprises (namely Friarc and IDA) had received assistance to convert to water-blown technology (a low-global-warming-potential GWP technology), they were using on a temporary basis, a blend of HFC-365mfc and HFC-227ea (a high-GWP technology) because the technology initially selected was not available and did not provide the required insulation performance.

14. Upon consideration of the issue, the Executive Committee requested UNDP to continue assisting the Government in securing the supply of low-GWP technology and to report on the status of the use of the interim technology at each meeting until the technology originally selected or another low-GWP technology had been fully introduced and the enterprises had been converted (decision 77/50(b)), along with a detailed analysis of the incremental capital and operational costs in the event of use of a technology other than that selected when the project was approved, as well as an update from the suppliers on the progress made towards ensuring that the selected technologies, including associated components, were available in the country on a commercial basis (decision 81/10(b)).

[4] Companhia Ambiental do Estado de São Paulo, an environmental institution that monitors and grants licenses in the state to projects, considered potentially polluting activities; this is the NOU of Brazil.
[5] UNEP/OzL.Pro/ExCom/77/39

15. In line with decisions 77/50(b) and 81/10(b) UNDP reported that further to the initial trials in November 2018 with the HFO-based systems, the enterprises undertook a second set of trials with the assistance of the regional supplier. In both enterprises the trials were unsuccessful due to the degradation of the system's catalyst after four months in the system. In the case of Friarc, the enterprise decided to procure the foam injection unit included in the project and to explore again the possibility of using water-based systems, i.e. the technology approved for the project.

16. In order to address the degradation of the system caused by the catalyst, the supplier is studying the possibility of supplying the polyol without premixing the catalyst, and only adding the catalyst once the foam is produced at the foam enterprise. UNDP also requested samples of HFO-based systems and water-based systems from other systems houses in the region that offer shorter delivery periods, but external political factors have prevented some suppliers from commercializing their products in Cuba.

17. In the meantime, the enterprises continue to use a high-GWP blowing agent.

Secretariat's comments

18. The Secretariat notes the efforts by UNDP to continue assisting the two enterprises in Cuba to secure a supply of low-GWP foam blowing agents. While the Secretariat notes that the degradation of the system due to the catalyst has not been reported in other projects testing HFOs (e.g., demonstration projects of HFO in PU foam in Saudi Arabia and Thailand), UNDP indicated that this issue has been identified by other systems houses and the report of the HFO demonstration project in Colombia also indicates that some amine-based catalysts currently used in the industry may interact with HFO, causing a deterioration of system reactivity (longer gel times). In other countries this may not be an issue because the time required to import and use the systems may be shorter than in Cuba.

19. It was also clarified that Friarc's decision to procure a new injection machine was due to the poor performance of the baseline equipment, rather than the need for new injection equipment to operate with HFO-based technology. UNDP does not envisage any need to extend the duration of stage I of the HPMP for Cuba (i.e., December 2021), as the procurement of the new injection unit by Friarc is well advanced. UNDP will continue assisting the two enterprises and working with the potential systems suppliers to adopt low-GWP alternatives.

Recommendation

20. The Executive Committee may wish:

(a) To note with appreciation, the report provided by UNDP and the efforts made to facilitate the supply of technology with low global-warming potential (GWP) to the enterprises Friarc and IDA, funded under stage I of the HCFC phase-out management plan for Cuba, contained in document UNEP/Ozl.Pro/ExCom/84/22; and

(b) To request UNDP to continue assisting the Government of Cuba in securing the supply of low-GWP alternative technology and to provide, to the 85th meeting, a report on the status of the conversion of the two enterprises mentioned in sub-paragraph (a) above, including, in the event of use of a technology other than that selected when the project was approved, detailed analysis of the incremental capital and operating costs, along with an update from the suppliers on the progress made towards ensuring that the selected technologies, including associated components, were available in the country on a commercial basis.

Lebanon: HCFC phase-out management plan (stage II - Report on the status of the conversion of the of the remaining beneficiary enterprises in both the foam and air-conditioning manufacturing sectors) (UNDP)

Background

21. On behalf of the Government of Lebanon, UNDP as designated implementing agency has submitted a progress report on the implementation of conversions of enterprises in the foam and air-conditioning (AC) manufacturing sectors, along with an update from the suppliers on the progress made towards ensuring that the selected technologies, including associated components, were available in the country on a commercial basis, in the context of stage II of the HPMP, in line with decision 83/14(b).[6]

Progress report

22. UNDP reported that two enterprises in the AC manufacturing sector (Iceberg and Frigo Liban) had completed conversions resulting in the phase-out of 1.61 ODP tonnes of HCFC-22 and 1.54 ODP tonnes of HCFC-141b while for another enterprise (UNIC), the conversion to HFC-32 technology is expected to be completed by December 2019. The two remaining enterprises (CGI Halawany and ICR) are still considering whether they would use HFC-32 as refrigerant, or whether they would opt for other options like R-466A and R-454b which are currently being studied; these enterprises are working closely with the national ozone unit (NOU) and would make a final selection before the end of 2019.

23. Despite these delays in the final selection of alternatives, the conversions will be completed based on the revised funding approved for those enterprises. The Government of Lebanon and UNDP continues to monitor the cost-effective conversion of the whole sector within the agreed overall funding approved, any funding remaining at the end of the conversions will be returned to the Multilateral Fund.

24. With regard to the foam sector, which included technical assistance for the conversion of 11 small and medium-sized enterprises (SMEs) using 37.9 mt (4.17 ODP tonnes) of HCFC-141b for insulation in the production of solar and electric water heaters, UNDP reiterated that the availability of HFOs continues to be a challenge. The NOU has therefore decided to work closely with foam systems supplier to explore possible options of other low-GWP alternatives not only for the small enterprises but also for the two remaining foam manufacturing enterprises (SPEC and Prometal). After consultation with different chemical suppliers, methyl formate and/or methylal are being considered as they could be made available in the local market.

25. UNDP further reported that the terms of reference (TOR) for a technical foam consultant had been prepared, and trials will be made on-site at few selected enterprises to ensure acceptability and feasibility of the alternatives. Results of these trials would be made available to the 85th meeting.

Secretariat's comments

26. The Secretariat noted that the ban on HCFC-141b will become effective in January 2020 underscoring the importance to complete these testing and trials in time. According to UNDP, the move to further examine methyl formate and methylal was driven by cost, as the NOU was concerned that when pre-blended HFO systems became available, these might be too expensive for the SMEs. There was also a

[6] To request UNDP to continue assisting the Government of Lebanon in securing the supply of low-GWP alternative technology and to report to the 84th meeting on the status of the conversion of the remaining beneficiary enterprises in both the foam and AC manufacturing sectors, including the small foam enterprises, and at each meeting thereafter until the technology originally selected or another technology with low-GWP had been fully introduced, along with an update from the suppliers on the progress made towards ensuring that the selected technologies, including associated components, were available in the country on a commercial basis.

possibility that because of these continued challenges, the Government might consider a delay in the implementation of the ban on HCFC-141b to mid-2020 instead of the beginning of the year.

27. The Secretariat also noted the efforts taken by UNDP to assist the remaining foam enterprises to complete their conversions to non-ODS alternatives including having finalized the TOR for testing the two alternatives (methyl formate and methylal) which is expected to be completed before the 85th meeting.

28. The Secretariat also noted that the two remaining enterprises (CGI Halawany and ICR) continue to have difficulties in importing HFC-32 refrigerants and compressors and asked UNDP whether they would be able to complete their conversions by end of 2020 as indicated at the 83rd meeting. According to UNDP, the Government is confident that a choice for a refrigerant will be made on the alternative by the end of 2019, which would allow completion of the conversion in 2020.

Recommendation

29. The Executive Committee may wish:

(a) To note the report provided by UNDP and the Government of Lebanon, contained in document UNEP/OzL.Pro/ExCom/84/22, describing the continued challenges being faced by the Government in sourcing commercially available alternatives with low-global-warming potential (GWP) alternatives, such as HFOs, and the efforts made by the Government and UNDP to facilitate the supply of technology with low-GWP to the enterprises funded under stage II of the HCFC phase-out management plan for Lebanon; and,

(b) To request UNDP to continue assisting the Government of Lebanon in securing the supply of low-GWP alternative technology, and to report to the 85th meeting on the results of the testing of two alternatives in the foam sector, the status of the conversion of the remaining beneficiary enterprises for foam manufacturing (SPEC and Prometal) including the small foam enterprises; and for air-conditioning manufacturing (CGI Halawany and ICR), at each meeting thereafter until the technology originally selected or another technology with low-GWP had been fully introduced.

Reports related to HPMPs[7]

Bahamas: HCFC phase-out management plan (stage I – updated final report on the findings of the study to explore best available options for the pilot project to assess, monitor and retrofit two air-conditioning systems) (UNEP)

Background

30. At its 80th meeting, the Executive Committee considered the request for the third tranche of stage I of the HPMP for the Bahamas. In its review, the Secretariat had drawn attention to safety concerns associated with the use of R-22a, a flammable refrigerant, for the retrofitting of appliances using HCFC-22, and informed that UNEP would conduct a study to explore the best available options for such retrofits. In light of this, the Executive Committee requested UNEP to provide an update on the findings of the study to explore the best available options for the pilot project to assess, monitor and retrofit two AC systems (decisions 80/62(b) and 83/16).[8]

[7] Reports related to HPMPs of those countries that have submitted a project proposal to this meeting are included in related project proposal documents (UNEP/OzL.Pro/ExCom/84/42, UNEP/OzL.Pro/ExCom/84/49, UNEP/OzL.Pro/ExCom/84/51, and UNEP/OzL.Pro/ExCom/84/53).

[8] The report was not submitted to either the 82nd or the 83rd meeting.

31. In line with the decisions, UNEP, after consultation with the NOU, had submitted to the 84th meeting, a detailed desk study on the technology options for retrofit of HCFC-22-based AC systems, noting that the pilot project for retrofit of two HCFC-22-based equipment was approved as a part of stage I of the HPMP, and safety issues associated with the use of R-22a for the retrofitting of appliances using HCFC-22 was highlighted by the Executive Committee at its 80th meeting. The desk study was undertaken, instead of a pilot retrofit of the HCFC-22-based equipment, as the two AC units to be retrofitted were no longer available. The main conclusions of the study indicated that some high-GWP non-flammable refrigerants that were commercially available (e.g., R-407C, R-427A, R-422D, R-438A, R-453A) could be used as retrofit options; low-global-warming potential (GWP) refrigerants that could also be used to retrofit HCFC-22-based equipment were flammable, and sourcing such low-GWP refrigerants in the country was challenging.

32. Furthermore, UNEP confirmed that the Government of the Bahamas does not propose to undertake retrofit of any HCFC-22 refrigeration equipment as originally proposed in stage I of the HPMP, in light of the findings of this study.

Secretariat's comments

33. Upon request for clarification on the next steps, UNEP indicated that the Government does not intend to undertake any retrofit under this project component and proposes to focus efforts on good practices in refrigeration, refrigerant containment, recovery and recycling and to replace, rather than to retrofit, the AC systems at the end of their life with units based on low-GWP refrigerants.

34. UNEP also informed that there is no import or sales of R-22a in the Bahamas. To ensure safety aspects relating to possible use of flammable refrigerants, the NOU in collaboration with UNIDO (as the cooperating agency of the HPMP) conducted a workshop on safe use of alternative refrigerants for refrigeration technicians in August 2019; and the NOU will organize further training sessions through vocational schools.

Recommendation

35. The Executive Committee may wish:

(a) To note:

(i) The report on the desk study, submitted by UNEP on behalf of the Government of the Bahamas, on the technology options for retrofit of HCFC-22-based air-conditioning systems under stage I of the HCFC phase-out management plan (HPMP) for the Bahamas, contained in document UNEP/OzL.Pro/ExCom/84/22;

(ii) That the Government of the Bahamas decided not to retrofit two HCFC-22-based air-conditioning systems to hydrocarbon-based technology; and

(b) To request UNEP to submit a revised plan of action for stage I of the HPMP, noting that the retrofit component that was originally approved as part of stage I would not be implemented together with the request for the fourth funding tranche of the HPMP.

Brazil: HCFC phase-out management plan (stage I – report on the temporary use of high-GWP technologies at U Tech systems house and 2018/2019 progress report) (UNDP and the Government of Germany)

Background

36. On behalf of the Government of Brazil, UNDP as the lead implementing agency, has submitted to the 84th meeting[9] the annual progress report on the implementation of the work programme associated with the fifth tranche of stage I of the HPMP,[10,] in line with decision 75/53(b).[11]

37. At its 80th meeting, the Executive Committee approved the extension of the completion date of stage I of the HPMP to 31 December 2019, on the understanding that no further extension of project implementation would be requested (decision 80/12(b)).

HCFC consumption

38. The Government of Brazil reported a consumption of 826.26 ODP tonnes of HCFC in 2018, which is 38 per cent below the HCFC baseline for compliance. The Government also reported HCFC sector consumption data under the 2018 country programme implementation report that is consistent with the data reported under Article 7 of the Protocol.

39. From 2017 to 2018, the consumption of HCFC-141b increased by 55 ODP tonnes, despite that a large number of foam enterprises were converted to alternative technologies. The increase in consumption was due to an increase in imports for stockpiling on the part of enterprises in anticipation of the ban on imports coming into effect on 1 January 2020, compounded by the fact that the price of HCFC-141b is currently very low.

Progress report on the implementation of the fifth tranche

Legal framework

40. The Government approved a regulation to strengthen environmental controls of potentially polluting activities related to ODS, updated the guidelines and coordinating actions related to the protection of the ozone layer, and updated the regulation that establishes import quotas between 2018 and 2021. The Government also continues to support the Brazilian Association of Technical Standards in developing specific standards for the handling, installation and maintenance of equipment using flammable refrigerants (e.g., security in refrigeration systems; installation of residential split and compact AC systems; and reverse production of refrigerators).

Polyurethane foam manufacturing sector

Conversion of 12 stand-alone PU foam enterprises (79.71 ODP tonnes)

41. Eleven enterprises (with consumption of 76.74 ODP tonnes of HCFC-141b) in the continuous panel and integral skin/flexible moulded applications had completed their conversions prior to the current

[9] As per the letter of 2 October 2019 from the Ministry of Environment of Brazil to UNDP.

[10] The fifth and final tranche of stage I of the HPMP was approved at the 75th meeting at a total cost of US $2,035,094, consisting of US $1,470,700, plus agency support costs of US $110,303 for UNDP, and US $409,091, plus agency support cost of US $45,000 for the Government of Germany.

[11] The Government of Brazil, UNDP and the Government of Germany were requested to submit progress reports on the implementation of the work programme associated with the fifth and final tranche on a yearly basis until the completion of the project, verification reports until approval of stage II of the HPMP, and the project completion report to the final meeting of the Executive Committee in 2018.

reporting period (three had opted for hydrocarbon (HC), three for methyl formate, three for methylal, one for methylene chloride and one for water-based technology).

42. The enterprise Panisol (3.0 ODP tonnes) withdrew from the HPMP as it was unable to obtain safety permits due to the location of the enterprise in an urban area. Out of the US $333,800 approved, US $32,104 was disbursed for tests and trials of formulations based on HFO and methyl formate; however, both resulted economically unfeasible and unsuitable due to the enterprise's location. The remaining US $301,695 will be returned to the Multilateral Fund.

Conversion of 11 systems houses with close to 380 downstream users (89.1 ODP tonnes)

43. Eight out of 11 systems houses have completed their conversions, and developed and introduced low-GWP formulations in 171 downstream foam users, phasing out 69.36 ODP tonnes of HCFC-141b.

Temporary use of high-GWP technology

44. At the 80th meeting, UNDP explained that two systems houses (Shimtek and U-Tech) had requested the temporary use of HFC-based polyol systems with high GWP-based blowing agents, as HFOs were not yet available on a commercial scale in the country. Both systems houses had signed a commitment to stop the temporary use of HFC blends once HFOs were commercially available and the systems had been developed and optimized, at no additional cost to the Multilateral Fund.

45. Accordingly, the Executive Committee requested UNDP to continue assisting Shimtek and U-Tech in securing the supply of the alternative technologies selected, on the understanding that incremental operational costs (IOCs) would not be paid until the alternative technology selected or another low GWP-based technology had been fully introduced. UNDP was also requested to report on the status of use of the interim technology until the technology originally selected or another low GWP-based technology had been fully introduced (decision 80/12(e)), along with an update from the suppliers on progress made toward ensuring that the selected technologies, including associated components, were available on a commercial basis in the country (decision 81/9). At the 83rd meeting, UNDP reported that Shimtek had opted for water-based technology to replace the use of HFOs for flexible foam production, using the systems house's own resources for the necessary adjustments made in the formulations, as the prices of HFOs in the market continued to be very high, disallowing the supply of systems at competitive prices. The enterprise is no longer using HFCs.

46. In line with decision 83/12(c), UNDP has reported that U-Tech is using HFC-134a temporarily to replace HCFC-22, which was previously used in the production of the froth system. The systems house is testing formulations with HFO (based on samples received at a price of US $22.00/kg) over a six-month period to evaluate the product's stability. Currently, the enterprise and the supplier (Honeywell) are discussing final arrangements for the supply of the blowing agent and associated chemical components; during the discussions U-Tech was verbally informed by the supplier that the final price of the HFO would be approximately US $19.75/kg. Based on this price, the final cost of the polyol systems will increase by 33 per cent, making its market share unfeasible. UNDP will continue reporting on any additional progress by U-Tech.

Refrigeration servicing sector

47. Activities in the refrigeration servicing sector continued to be focused on the implementation of the demonstration projects on better HCFC-22 containment in supermarkets and the awareness activities detailed in previous reports.

Project implementation and monitoring unit (PMU)

48. The PMU continued to support the NOU in implementing the HPMP activities.

Level of fund disbursement

49. As of July 2019, of the US $19,417,866 approved for stage I,[12] US $16,731,876 (86 per cent) had been disbursed (US $12,659,305 for UNDP and US $4,072,571 for the Government of Germany). The balance of US $2,685,990 will be disbursed in 2020 (Table 3).

Table 3: Financial report of stage I of the HPMP for Brazil

Agency	Funds approved (US $)	Funds disbursed		Balance (US $)
		(US $)	(%)	
UNDP	15,326,957	12,659,305	83	2,667,652
Government of Germany	4,090,909	4,072,571	99	18,338
Total	**19,417,866**	**16,731,876**	**86**	**2,685,990**

Completion of stage I

50. UNDP confirmed that all activities under stage I will be completed by December 2019, in line with decision 80/12(b).

Secretariat's comments

Regulations

51. In April 2019, the following two entities involved in the implementation of the Montreal Protocol were dissolved by decree:

(a) The Inter-Ministerial Committee for Ozone Layer Protection (PROZON), created in 1995 to develop guidelines and coordinate activities for the protection of the ozone layer; and

(b) The HCFC working group (GT-HCFC), created in 2010 out of private and public bodies to help implement ozone layer protection actions.

52. Upon on a request for clarification on the potential impact on the implementation of the phase-out activities in Brazil, UNDP explained that the new Government has decided that the Ministry of the Environment, with assistance from other Ministries as required, will be fully responsible for all matters related to the protection of the ozone layer, and there would be no negative impacts on the implementation of all the activities being funded under the Multilateral Fund, including the HPMP.

PU foam sector

Issues identified in the group projects

53. Following submission of the previous progress report, UNDP was requested to include in the list of downstream foam enterprises assisted under stage I which is updated every year, the enterprises that phase-out consumption of HCFC-141b without Multilateral Fund assistance, as well as the enterprises that were not eligible for funding together with their associated HCFC-141b consumption.

[12] Excluding US $179,300, plus agency support cost of US $13,448, returned to the Fund that was associated with a non-eligible enterprise.

54. The Secretariat noted with appreciation the thorough work carried out by the Government of Brazil and UNDP to verify the eligibility of a large number of small and medium-sized foam enterprises included in stage I. However, given the large number of foam enterprises in the country and due to time constraints, the Government was unable to submit a final list of enterprises at this meeting. Based on the preliminary information so far provided, the following observations are relevant:

(a) A total of 171 downstream foam users have completed their conversions; an additional large number of very small foam enterprises are implementing their conversions with assistance from the systems houses. By the end of 2019, at least 27 additional downstream users would be converted (noting that this number could change);

(b) Approximately 130 foam enterprises with very small consumption of HCFC-141b, would be phased out with technical assistance resources from the systems houses;

(c) The previous report identified 12 enterprises, with a total consumption of 1.62 ODP tonnes of HCFC-141b, that were funded from the Multilateral Fund, but appeared not to fulfill all the funding eligibility requirements (e.g., date of establishment, foreign ownership). It has been confirmed that these enterprises are ineligible; therefore, the associated funding will be returned to the Fund;

(d) One systems house (Polisystem) decided not to participate in the HPMP. The balance of the funds approved for this enterprise, estimated at US $100,000, will be returned to the Fund, and the downstream foam users that are associated with Polisystem could be assisted through other systems houses; and

(e) UNDP indicated that the funding associated with enterprises that were not eligible for funding and enterprises that did not participate in stage I would be returned to the Fund upon financial completion of stage I (after December 2020). Noting that stage I has already been extended twice, and that the project completion report will be submitted to the 85th meeting, the Secretariat proposes that the balances are returned at the 86th meeting.

55. During the implementation of the last funding tranche, UNDP introduced a new modality of implementation in the form of signing long-term agreements (LTAs) with systems houses. In explaining this implementation modality, UNDP indicated that LTAs allowed for the downstream foam user to select its preferred systems house, among those included in the HPMP, to assist in its conversion; to implement its conversion, the foam enterprise signs a statement of acceptance with the systems house it has selected. Under previous service contracts, the name of the foam enterprise to be converted by the systems house had to be included in the contract; if the enterprise decided to change systems houses, resources for conversion had to be migrated to another service contract, making contract implementation slow and time-consuming.

56. LTAs have been designed as flexible arrangements, with the possibility of being extended for up to three years, and will allow to continue implementation of projects with the same system houses in downstream foam users funded under stage II.

Completion of the project and return of balances

57. Noting that under stage I the Executive Committee approved funding to convert close to 380 downstream foam enterprises and not all of them might be converted, the Secretariat emphasized that the funding associated to enterprises that do not convert under stage I or are found not to be eligible would need to be returned to the Fund. In concluding discussions with the Secretariat, UNDP confirmed that all contracts and purchase orders for all foam enterprises included in stage I would be signed before the end of 2019, thus making the project operationally completed despite some pending final payments to be made in

2020. UNDP will also report to the 85th meeting on the total number of foam enterprises assisted under stage I, included those converted with their own resources, and their associated consumption of HCFC-141b; and submit a financial statement with total funding disbursed and balances to be returned to the Multilateral Fund.

Recommendation

58. The Executive Committee may wish:

(a) To note:

(i) The 2018 progress report on the implementation of the HCFC phase-out management plan (HPMP) (stage I) for Brazil, submitted by UNDP, contained in document UNEP/OzL.Pro/ExCom/84/22;

(ii) That the enterprise Panisol will not participate in stage I of the HPMP and the fund balance of US $301,695, plus agency support costs of US $22,627, will be returned to the Multilateral Fund at the end of stage I of the HPMP;

(iii) That the systems house Polisystem has decided to withdraw from stage I of the HPMP and the funds allocated to Polisystem will be returned to the Multilateral Fund at the end of stage I of the HPMP;

(iv) That 12 downstream polyurethane foam enterprises that were found to be ineligible for funding during project implementation, and that the funds allocated to those enterprises will be returned to the Multilateral Fund at the end of stage I of the HPMP;

(b) To request UNDP, with the Government of Brazil:

(i) To submit, together with the Government of Germany, a final report on the implementation of the work programme associated with stage I of the HPMP until the completion of the project, and the project completion report to the 85th meeting;

(ii) To include in the final report referred to in sub-paragraph (b)(i), a list consisting of:

a. All downstream foam enterprises assisted by the Multilateral Fund under stage I, along with their HCFC-141b consumption phased out, sub-sector, baseline equipment and technology adopted;

b. Foam enterprises that phased out HCFC-141b without Multilateral Fund assistance or withdrew from stage I along with their associated consumption;

c. Foam enterprises that were found to be ineligible for funding by the Multilateral Fund and their associated HCFC-141b consumption; and

d. Additional foam enterprises identified as eligible for funding under the Multilateral Fund but that have not been addressed under stage I or stage II of the HPMP;

e. The balances associated with funding that have been approved for conversion of enterprises that decided to withdraw from stage I of the

HPMP, or were found to be ineligible for receiving assistance from the Multilateral Fund;

(iii) To return balances from stage I of the HPMP no later than the 86th meeting;

(iv) To continue assisting the Government of Brazil in securing the supply of low-global-warming-potential (GWP) alternative technologies to the systems house U-Tech, on the understanding that any incremental operating costs would not be paid until the technology originally selected or another technology with a low GWP has been fully introduced, and to provide to each meeting a report on the status of their conversion until the technology originally selected or another technology with a low GWP has been fully introduced, along with an update from the suppliers on the progress made towards ensuring that the selected technologies, including associated components, are available on a commercial basis in the country.

Brazil: HCFC phase-out management plan (stage II – status of implementation of the projects in the room air-conditioning manufacturing sector and at the enterprise Freeart Seral Brasil Metalurgica Ltda. in the commercial refrigeration manufacturing sector and change of three SMEs in technical assistance) (UNIDO, UNDP, Governments of Germany and Italy)

Background

59. At the 82nd meeting, the Government of Brazil and UNIDO informed the Executive Committee that the three room AC enterprises included in stage II of the HPMP, had not started their conversions to R-290 due to the uncertainty about the regulations on the use of flammable refrigerants, market acceptance of those refrigerants, fear of higher prices of the converted AC units, and the potential unavailability of AC components on the market. The Committee was also informed that one commercial refrigeration enterprise (Freeart Seral Brasil Metalurgica Ltda.) included in stage II, had not yet indicated whether it would participate in the project. Accordingly, in approving the third tranche of stage II, the Executive Committee requested UNIDO to report at the 84th meeting on the status of implementation of the projects in the room AC manufacturing sector and at the commercial refrigeration manufacturing enterprise (decision 82/62(c)).

Progress report

60. In response to decision 82/62(c), UNIDO reported as follows:

(a) To address the concerns of the room AC enterprises regarding the introduction of the R-290 technology, in March 2019, UNIDO organized a workshop for over 60 representatives of the AC sector on the use of alternative refrigerants in residential AC equipment; a second workshop for representatives from enterprises already working on equipment that have been converted, will be held at the end of 2019. UNIDO expects that these activities will contribute to facilitating progress in the industrial conversion activities in 2020. Furthermore, in coordination with the Ministry of Environment, UNIDO will undertake a market study addressing *inter alia* market acceptability, consumer perception assessment, evaluation of existing safety standards, cost and availability of components, and possible obstacles. The study will be completed in September; and

(b) The enterprise Freeart Seral Brasil Metalurgica Ltda. was sold and its activities related to the manufacturing of commercial refrigeration equipment have been discontinued; therefore, the consumption of 17 mt (0.93 ODP tonnes) of HCFC-22 had been phased out. Since this information was made available, UNIDO has identified HCFC-22 commercial refrigeration enterprises that are eligible for funding and that could be converted with the

funds originally allocated to Freeart Seral Brasil Metalurgica Ltda. A final report on this process will be submitted at the 86th meeting.

Request for flexibility in replacing enterprises in the technical assistance component of commercial refrigeration

61. UNIDO informed the Secretariat that three enterprises included in the technical assistance component of stage II for SMEs in the commercial refrigeration sector would not participate in the project, and identified three other enterprises eligible for funding that could be assisted. Information on the estimated level of HCFC-22 consumption (based on data reported in 2013 as the reference year for stage II of the HPMP) by the six enterprises is presented in Table 4.

Table 4: Estimated consumption of HCFC-22 by enterprise

Withdrawn			New		
Enterprise	**mt**	**ODP tonnes**	**Enterprise**	**mt**	**ODP tonnes**
CMR Refrigeration	0.66	0.04	Refriac	1.22	0.07
Fermara	0.81	0.04	Auden	0.74	0.04
Polifrio	0.59	0.03	Ingecold	2.20	0.12
Total	2.06	0.11	Total	4.16	0.23

62. The total funding approved for the three enterprises amounted to US $198,000, and included a refrigerant handling package at US $50,000 for each; safety measures at US $10,000 for each, and contingencies at US $6,000 each.

Secretariat's comments

Room AC

63. The Secretariat notes the efforts being undertaken by the Government of Brazil and UNIDO to assist the room AC enterprises in selecting the technology for their conversion, in particular the market study that will be completed in September 2020. Once the final document is available, UNIDO will share it with the Secretariat. The Secretariat recommends that the Government and UNIDO submit a progress on the status of the selection of the technologies by the room AC enterprises to the 85th meeting, and that no funding should be disbursed on items related to the conversion until the Executive Committee has considered a response from the enterprises regarding the selected technology.

Commercial refrigeration (Freeart Seral Brasil Metalurgica Ltda. and changes of enterprises)

64. Since the 83rd meeting UNIDO has identified an enterprise eligible for funding that could be assisted with the funding that was allocated to Freeart Seral Brasil. UNIDO has also indicated that it would submit to the 86th meeting, a detailed project proposal for the enterprise that it has identified along with the next tranche request for consideration by the Executive Committee.

65. With regard to the technical assistance component related to the SMEs in the commercial refrigeration, UNIDO confirmed that all enterprises that were listed were invited to participate at workshops and meetings implemented within the scope of the project. So far, five enterprises (i.e., JJ Instalações Comerciais; Refrimate; Chopeiras CCITTI; KLIMA Refrigeração Ltda; and Kitfrigor) have started the conversion of their assembly lines and are at different stages of implementation. Except Kitfrigor, which opted for an HFO, all enterprises are converting to R-290.

66. In the last two progress reports, four of the SMEs that were originally included on the technical assistance component, have been withdrawn and replaced by other SMEs that were not identified at the time of submission of stage II of the HPMP. Upon a request for an explanation on these changes, UNIDO

explained that the enterprises using HCFC-22 were identified through a survey conducted in 2014, while project implementation started only in 2019; as these enterprises categorized as SMEs are more vulnerable to economic and political changes than larger manufacturing enterprises. For various reasons, including financial crises with major impact on the economy of Brazil, some SMEs closed down, while other grew, shifting to different market segments and modifying their HCFC-22 consumption pattern. In the process of searching for possible substitutes for enterprises that had closed down or were no longer interested in the project, UNIDO identified manufacturers of commercial refrigeration equipment that fulfilled the Multilateral Fund eligibility criteria (e.g., date of establishment and HCFC-22 consumption prior to 2007, 100 per cent national ownership).

67. The Secretariat acknowledges that projects addressing SMEs require flexibility, and appreciates the effort of the Government of Brazil and UNIDO to report these changes in advance for consideration by the Executive Committee. The Secretariat suggests continuing advance reporting, as part of the tranche progress reports, of any change in the enterprises being assisted.

Secretariat's recommendation

68. The Executive Committee may wish:

(a) To note:

(i) The report, submitted by UNIDO, on the status of implementation of the projects in the room air-conditioning manufacturing sector and at the enterprise Freeart Seral Brasil Metalurgica Ltda. in the commercial refrigeration manufacturing sector (decision 82/62(c)), contained in document UNEP/OzL.Pro/ExCom/84/22;

(ii) That the enterprise Freeart Seral Brasil is no longer manufacturing commercial refrigeration equipment and has withdrawn from stage II of the HCFC phase-out management plan (HPMP); that its associated consumption of 17.00 metric tonnes (mt)(0.93 ODP tonnes) of HCFC-22 had been phased out without assistance from the Multilateral Fund; and that the funds associated with the enterprise would be returned to the Fund, unless UNIDO identified additional enterprises eligible for funding that had not been assisted under stage I or stage II of the HPMP to which those funds could be reallocated; and that any reallocation of funds would be reported to the Executive Committee for its consideration at the 86th meeting;

(iii) That the enterprises CMR Refrigeration, Fermara and Polifrio, consuming 2.06 mt (0.11 ODP tonnes) of HCFC-22, have withdrawn from stage II of the HPMP, and that the enterprises Refriac, Auden, and Ingecold, with a total consumption of 4.16 mt (0.23 ODP tonnes) of HCFC-22, have been included in stage II, at no additional cost to the Multilateral Fund;

(b) To approve the reallocation of US $198,000 from the enterprises CMR Refrigeration, Fermara, and Polifrio to the enterprises Refriac, Auden, and Ingecold, as indicated in sub-paragraph (a)(iii) above; and

(c) To request UNIDO to report at the 85th meeting on the status of implementation of the projects in the room air-conditioning manufacturing sector.

Equatorial Guinea: HCFC phase-out management plan (stage I – progress report on HCFC consumption trends and progress made in ensuring an operational licensing and quota system, and in addressing the recommendations of the verification report, and assistance provided by UNEP CAP) (UNEP)

Background

69. At its 82nd meeting, the Executive Committee, *inter alia*, approved a combined third and fourth tranche of stage I of the HPMP for Equatorial Guinea, on the understanding that the Government would submit, at the second meeting in 2019, a progress report on HCFC consumption trends and progress made in ensuring an operational licensing and quota system, and in addressing the recommendations of the verification report, including the need to improve the HCFC data-reporting and monitoring capacity of the NOU. The Committee also noted that UNEP would provide assistance to support the implementation of stage I of the HPMP through its Compliance Assistance Programme (CAP), and to submit a report, on the assistance provided (decision 82/73(b)(ii) and (c)(ii)).

70. In line with the decision, the Government of Equatorial Guinea, through UNEP, reported that for 2018, their HCFC consumption was 21.86 mt (1.20 ODP tonnes), which is lower than the maximum allowable consumption of 123.75 mt (2.25 ODP tonnes) for that year as contained in the Agreement. The annual quotas for 2019 and 2020 were also revised to be consistent with the maximum allowable consumption for 2019 (2.25 ODP tonnes) and 2020 (1.63 ODP tonnes).

71. The actions taken to address the recommendations of the verification report included the following:

(a) Trained 22 customs officers on the control and identification of ODS and ODS-based equipment; trained two trainers on data collection, analysis and reporting, as well as on HS codes;

(b) Provided refrigerant identifiers to customs officers located at each of the four main entry ports/airports in the country;

(c) Initiated computerization of the import/export licensing system which is expected to be completed by the end of 2019;

(d) Continued the strict enforcement of the sub-regional regulation for the Commission of the Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC) that harmonizes the management of controlled substances in the sub-region;

(e) Conducted high-level meeting with the Environment Minister, Custom and Trade General Directorates, together with UNEP, to strengthen the coordination between these two institutions to ensure the enforcement of the ODS licensing system; and

(f) Completed awareness raising activities highlighting information regarding illegal ODS trade and how this can be mitigated, with specific sessions for importers to encourage compliance with the provisions of the quota system and the use of environmentally-friendly alternatives, and for members of Parliament to promote the use of incentives for alternative technologies.

72. Assistance provided by UNEP CAP during this period included the following:

(a) High level meetings held with the Environment Minister, Custom and Trade General Directorates, to seek their support in ensuring the effective enforcement of the import/export licensing and quota systems to support implementation of the HPMP, and to

encourage the enforcement of the Ministerial order number 3/2017, setting import quotas until 2020;

(b) Assisted the NOU to identify a resource person to assist in strengthening the licensing and quota systems, and in the conduct of training programmes for custom officers and for RAC technicians;

(c) Trained the NOU in the use of on-line CAP tools (i.e., GWP-ODP calculator; What gas? and other OzonAction eDocs); and

(d) Encouraged the participation of the NOU and a customs representative in the pilot NOU and Customs Twinning Workshop and the back to back parallel Border Dialogues for selected countries from the French-speaking Africa region in October 2019.

Secretariat's comments

73. The Secretariat noted the efforts by the Government of Equatorial Guinea and UNEP to avoid further delay in the implementation of the activities under the HPMP. The activities being implemented in addressing the recommendations of the verification report will further strengthen the import/export licensing and quota systems in place, and UNEP CAP assistance contributed to ensuring the Government's commitment at a high level to enforce the licensing and quota systems, and assuring the country's compliance with its Montreal Protocol targets.

Recommendation

74. The Executive Committee may wish to note that the Government of Equatorial Guinea and UNEP provided a detailed progress report, contained in document UNEP/OzL.Pro/ExCom/84/22, ensuring that operational licensing and quota systems are in place; that the recommendations of the verification report were addressed which demonstrated the increased capacity of the National Ozone Unit (NOU) to ensure effective HCFC data-reporting and monitoring; and that the assistance provided by UNEP Compliance Assistance Programme continues to support implementation of stage I of the HPMP for Equatorial Guinea.

Honduras: HCFC phase-out management plan (stage I – progress report on implementation of all the activities under the UNEP components) (UNEP)

Background

75. At its 81st meeting, the Executive Committee approved (under the list of projects for blanket approval) the fourth tranche of stage I of the HPMP for Honduras, and the corresponding 2018-2020 tranche implementation plan on the understanding:

(a) That UNEP and the Government of Honduras would intensify efforts to implement the training activities for refrigeration technicians associated with stage I of the HPMP;

(b) That UNEP would submit a progress report to each meeting on the implementation of activities under UNEP's components associated with stage I of the HPMP, including disbursements achieved, until the submission of the fifth and final tranche of stage I of the HPMP; and

(c) That the disbursement targets for the total amount of funds approved for the UNEP components of the first, second and third tranches of stage I of the HPMP for Honduras were 50 per cent by 30 September 2018, 80 per cent by 31 March 2019, and 100 per cent by December 2019, and that the disbursement targets for the UNEP component of the

fourth tranche were 20 per cent disbursement by 31 March 2019 and 50 per cent disbursement by December 2019.

76. In line with the above request, UNEP has submitted to the 84th meeting a progress and financial report on the implementation of UNEP's activities under stage I.

Progress report

77. The following activities have been implemented since the 83rd meeting:

(a) Training provided to 48 customs agents on the control of imports of HCFC and HCFC-based equipment;

(b) The Labour Competition Standard of Honduras on good practices in RAC was approved and training was provided to instructors and evaluators on assessing the competency of technicians applying for certification in the RAC servicing sector. Twelve trainers and three members of the NOU are being certified in Colombia; and

(c) Additional workshops to train a total of 134 RAC technicians and 114 RAC students in good refrigeration practices and safe handling of flammable refrigerants.

Level of fund disbursement

78. As at 30 September 2019, of the total amount of US $175,000 of funds approved for the first three tranches for UNEP, US $141,301 (81 per cent) had been disbursed, and of the total amount of US $50,000 of funds approved for the fourth tranche for UNEP, US $5,607 (11 per cent) had been disbursed. Including funds advanced by UNEP to Honduras (but not recorded yet in Umoja),[13] the amount of funds disbursed and advanced from the first three tranches is US $149,253 (85 per cent) and the amount of funds disbursed from the fourth tranche is US $18,107 (36 per cent), as shown in Table 5.

Table 5: Financial report of stage I of the HPMP for Honduras

Tranche	Approved (US $)	Disbursements recorded in Umoja (US $)			Target disbursement rate (%)	Advances (US $)	Disbursements and advances (US $)
		As at 25/4/2019	From 25/4/2019 to 30/9/2019	Total			
First	75,000	67,047	0	67,047		7,952	74,999
Second	50,000	39,412	9,482	48,894		0	48,894
Third	50,000	12,061	13,299	25,360		0	25,360
Sub-total	**175,000**	**118,520**	**22,781**	**141,301**		**7,952**	**149,253**
Disbursement rate (%)				**81**	**80**		**85**
Fourth	50,000	0	5,607	5,607		12,500	18,107
Disbursement rate (%)				**11**	**20**		**36**

Update on the implementation plan for stage I of the HPMP

79. The following activities are planned for the period from November 2019 to May 2020:

(a) Training of customs and enforcement officers, covering 31 customs entry points, on the

[13] The enterprise resource planning software used by UNEP.

control of imports of HCFC and HCFC-based equipment;

(b) Finalization of the electronic system for registration of importers, suppliers and end-users, and development of online learning modules;

(c) Continued reformulation of the certification scheme for refrigeration technicians and promotion of its application; revision of the technical standards, including safety measures for flammable refrigerants; and updating of the technical and public awareness information material;

(d) Training workshops for 100 refrigeration technicians on good practices and safe handling of ODS alternatives; and

(e) Establishing an end-user programme to promote refrigerant containment to reduce electricity consumption through leak reduction and good refrigeration practices, and providing technical updates to the recovery and recycling centre.

Secretariat's comments

80. Efforts continued to be intensified in the establishment of a certification scheme and in the training of refrigeration technicians. However, other activities did not progress as expected, including the training of customs and enforcement officers covering 31 customs entry points; the establishment of an electronic system for registration of importers, suppliers and end-users; and the revision of the technical standards, including safety measures for flammable refrigerants. UNEP explained that the customs training programme was postponed because the customs department was undergoing a re-engineering of its organizational structure. The customs training and the ODS monitoring database will start in January 2020, and the activity involving the standard is expected to be completed during the second quarter of 2020.

81. Regarding disbursement, Honduras achieved the disbursement target for the first three tranches (80 per cent by 31 March 2019) but did not reach the target for the fourth tranche (20 per cent by 31 March 2019). UNEP attributed this to external factors out of the control of the NOU, and reassured the Secretariat that the NOU was committed to reaching 50 per cent disbursement by March 2020 (instead of December 2019, as agreed in decision 81/34) and 100 per cent disbursement by December 2020.

82. Noting that some progress has been achieved but that there are still commitments that require further action, the Secretariat proposed that the fifth and final tranche, due at the 85th meeting, only be submitted once the training of customs and enforcement officers has been completed; the electronic system for registration of importers, suppliers and end-users is in place; substantive progress in the revision of the technical standards is reported; and 100 per cent disbursement for the first, second and third tranches and 70 per cent disbursement for the fourth tranche by UNEP has been achieved.

83. The Government of Honduras and UNEP agreed with the proposal made by the Secretariat. In the event that the fifth tranche is not submitted at the 85th meeting, in line with decision 81/34, UNEP will continue reporting on progress until the submission of the fifth tranche.

Recommendation

84. The Executive Committee may wish:

(a) To note the progress report on the implementation of activities within the UNEP components of stage I of the HCFC phase-out management plan (HPMP) for Honduras, submitted by UNEP and contained in document UNEP/Ozl.Pro/ExCom/84/22;

(b) To note that the fifth and final tranche of stage I of the HPMP could only be submitted when the following conditions have been fulfilled:

(i) Completion of the training of customs and enforcement officers, covering 31 customs entry points, on the control of imports of HCFC and HCFC-based equipment; completion of the electronic system for registration of importers, suppliers and end-users; and substantive progress in the revision of technical standards, including safety measures for flammable refrigerants; and

(ii) A disbursement level of 100 per cent for the total amount of funds approved for the UNEP components of the first, second and third tranches; and a disbursement level of 70 per cent for the UNEP component of the fourth tranche; and

(c) To request UNEP to continue submitting at each meeting of the Executive Committee, until submission of the fifth and final tranche of stage I of the HPMP, a progress report on implementation of all the activities under the UNEP components of stage I of the HPMP, including the disbursements made.

India: HCFC phase-out management plan (stage II – update on assessment on continuous-foam-panel-manufacturing enterprises regarding adherence to the ban and list of enterprises in the polyurethane foam manufacturing sector) (UNDP, UNEP and the Government of Germany)

Background

List of polyurethane foam enterprises under stage II

85. At its 77th meeting, in approving stage II of the HPMP for India, the Executive Committee asked UNDP to include in the request for the second and future tranches an updated list of PU foam enterprises assisted, and to be assisted by the Multilateral Fund under stage II, including the HCFC-141b consumption to be phased out, the estimated incremental cost of conversion, the sub-sector, the baseline equipment where applicable, and the technology to be adopted. The Executive Committee further noted that if, during the implementation of the PU foam sector plan, the total tonnage to be phased out in enterprises eligible for funding was found to be less than the 3,166 metric tonnes (mt) of HCFC-141b approved for phase-out, funding for stage II would be reduced to account for that reduced tonnage, at a rate of US $7.58/kg.[14]

86. At the 82nd meeting, noting the limited time remaining until the implementation of the ban on HCFC-141b (1 January 2020), the Executive Committee decided to request the Government of India through UNDP to provide, to the 84th meeting, the list of enterprises in the PU foam sector, along with their consumption, including the enterprises that had been found eligible, those that had been found ineligible, and those with which Memoranda of Agreement (MOA) had been signed.[15]

87. Accordingly, UNDP provided a list consisting of 189 PU foam enterprises consuming 3,197 mt of HCFC-141b, whose eligibility was verified, out of which 113 had already signed MOA for conversion to low-global-warming-potential (GWP) alternatives (i.e., water, methyl formate, HC, HFO) as of 4 October 2019.

Update on continuous panels enterprises

88. The Government of India introduced a ban on the use of HCFCs, including HCFC-141b, pure and contained in pre-blended polyols, in the manufacturing of domestic refrigerators and continuous sandwich panels as of 1 January 2015. However, stage II of the HPMP included the conversion of three

[14] Decision 77/43(d).
[15] Decision 82/74(b)(ii).

continuous-sandwich-panel manufacturers, which were part of the first tranche. At the 82nd meeting, UNDP submitted, on behalf of the Government, the request for the second tranche of stage II, and reported that two continuous-sandwich-panel manufacturers had signed MOA with the Government. In view of that, UNDP clarified that the Government was assessing whether those enterprises complied with the ban.

89. Accordingly, the Executive Committee requested the Government of India, through UNDP, to provide at the 83rd meeting an update on the assessment by the Government of whether the continuous-foam-panel-manufacturing enterprises had adhered to the HCFC ban as of 1 January 2015, noting that if the Government of India were to determine that a continuous-foam-panel-manufacturing enterprise was not in compliance with said ban, the MOA with that enterprise would be terminated and any funding disbursed would be returned to the project, in line with decision 77/43(d)(ii). [16] The Committee also noted that no continuous-foam-panel-manufacturing enterprise would be included in stage II until its eligibility had been assessed by the Executive Committee.[17]

90. At the 83rd meeting, UNDP reported that the assessment in line with decision 82/74(b)(i) was still underway and that the status of adherence to the ban by the enterprises would be communicated as soon as it was determined. The Executive Committee decided to request the Government of India, through UNDP, to submit the assessment at the 84th meeting.[18]

91. At the 84th meeting, UNDP indicated that the assessment was still underway.

Secretariat's comments

List of PU foam enterprises under stage II

92. Noting the limited time available to complete a large number of conversions remaining before the ban on HCFC-141b of 1 January 2020, and noting that out of the 189 enterprises identified, 76 have still not signed MOA, the Secretariat asked UNDP about measures being taken to accelerate the conversion of these enterprises to low-GWP blowing agents.

93. UNDP explained that currently, the enterprises are being assisted by a national technical institute; and several workshops have been held on alternative low-GWP technologies, including hands-on training and trials on the application of polyol-blowing-agent formulations to SMEs. The MOA clearly describe the conversion process, the required safety measures, and the milestones to facilitate monitoring. Physical site verifications by an independent third party are being conducted to ensure timely and proper implementation.

94. On the potential temporary use of formulations based on high-GWP HFCs by enterprises that have not converted by 1 January 2020, UNDP indicated that the provisions in the MOA signed between the enterprise, the Ozone Cell and the Ministry of Environment, Forest and Climate Change established that the enterprise agreed to convert to a low-GWP alternative, and that it would not use HCFC-141b beyond 31 December 2019. In order to reduce the risk of illegal trade of HCFC-141b, instructions were sent in January 2019 to the relevant national authorities operating the licensing system, with reference to the HCFC-141b import ban effective as of 1 January 2020. The systems houses and foam manufacturing enterprises, both eligible and ineligible, have been informed in writing and through meetings of the upcoming ban.

95. The Secretariat appreciates the measures taken by UNDP to accelerate the conversions and to ensure a smooth transition to low-GWP alternatives, minimizing the risk of illegal trade of HCFC-141b. In the event of any temporary use of high-GWP HFC-based blowing agents by enterprises being assisted in

[16] Decision 82/74(b)(i).
[17] Decision 82/74(c).
[18] Decision 83/21.

the project, the Secretariat recommends that it is reported to the Executive Committee until the conversion to a low-GWP blowing agent is fully introduced.

Update on continuous panels enterprises

96. With regard to the assessment on whether the continuous panels enterprises complied with the ban on the use of HCFCs in the manufacturing of continuous sandwich panels as of 1 January 2015 that has not been completed yet, UNDP reiterated that the assessment was being undertaken, adding that the process involved coordination of a set of procedures to be followed by the multiple agencies involved, making it difficult to specify definite timelines. As agreed at the 82nd meeting, no further disbursement has been made to these enterprises, and the funds would be returned to the project should it be determined that the two continuous lines had breached the 1 January 2015 phase-out targets.

Recommendation

97. The Executive Committee may wish:

(a) To note the report submitted by UNDP containing the list of enterprises in the polyurethane (PU) foam manufacturing sector under stage II of the HCFC phase-out management plan (HPMP) for India, along with their consumption of HCFC-141b, including the enterprises that had been found eligible, those that had been found ineligible, and those with which Memoranda of Agreement had been signed;

(b) To request:

(i) UNDP to submit with the request for the third tranche of stage II of the HPMP an updated list of PU foam enterprises assisted, and to be assisted, along with information on the temporary use of high-GWP alternatives by any enterprise assisted, including the level of consumption; and

(ii) The Government of India, through UNDP, to provide by the 85th meeting, the assessment by the Government of whether the continuous-foam-panel-manufacturing enterprises had adhered to the ban, as of 1 January 2015, on the use of HCFC-141b, in line with decision 82/74(b) and (c).

Libya: HCFC phase-out management plan (stage I – progress report) (UNIDO)

Background

98. At its Twenty-seventh meeting, the Parties noted that the annual HCFC consumption of 144.0 ODP tonnes reported by Libya for 2013 and 122.4 ODP tonnes for 2014 exceeded the country's maximum allowable consumption of 118.38 ODP tonnes for those controlled substances for those years and that Libya was therefore in non-compliance with the consumption control measures under the Protocol for HCFCs. The Parties also noted with appreciation the submission by Libya of a plan of action to ensure its return to compliance with the Protocol's HCFC control measures under which Libya specifically committed itself to reducing HCFC consumption from 122.4 ODP tonnes in 2014 to no greater than:

(a) 122.3 ODP tonnes in 2015;

(b) 118.4 ODP tonnes in 2016 and 2017;

(c) 106.5 ODP tonnes in 2018 and 2019;

(d) 76.95 ODP tonnes in 2020 and 2021; and

(e) Levels allowed under the Montreal Protocol in 2022 and subsequent years.

99. Subsequently the Executive Committee approved stage I of the HPMP for Libya at the 75th meeting to facilitate its implementation of the plan of action to return to compliance. The control targets proposed in the plan of action were used as the Montreal Protocol control targets for stage I of the HPMP of Libya.

100. At the 82nd meeting, the Executive Committee noted the progress report of the first tranche of stage I of the HPMP, which indicated that Libya has been enforcing a licensing and quota system to control the import of HCFCs, and that the 2017 consumption was below the targets set in the plan of action. At the same meeting, the Committee approved the second and final tranche and requested the Government of Libya and UNIDO to submit a progress report on the implementation of the work programme associated with the final tranche and a verification report on consumption each year until the completion of stage I (decision 82/75).

101. On behalf of the Government of Libya, UNIDO as lead implementing agency has submitted the progress report on the implementation of the work programme associated with the second and final tranche of stage I of the HPMP in line with decision 82/75(c).

HCFC consumption

102. The Government of Libya reported a consumption of 76.75 ODP tonnes of HCFCs in 2018, which is 29.75 ODP tonnes lower than the control target set in the plan of action for that year. HCFC consumption has been decreasing since 2014 due to the implementation of the HPMP, particularly through the licensing and quota system, which limited imports of HCFCs into the country, and through the gradual introduction of non-HCFC equipment. The reduction in HCFC consumption is also due to the security and economic situation in the country.

Verification report

103. A consumption verification was conducted in 2018 and the report was submitted to the 82nd meeting. However, it is impossible to conduct another consumption verification due to the security situation in the country. Therefore, a verification report on consumption has not been submitted to the 84th meeting.

Progress report

104. The implementation of the HPMP in the country has been slow due to the circumstances prevailing during recent months. The NOU has made the best efforts to monitor imports and collect consumption data. The NOU informs the customs authorities and the importers on the established import quotas; import quotas were monitored quarterly. While efforts were made to collect data from all the regions, consumption is not verifiable in some regions due to security issues. The Environment General Authority (EGA) regional offices are striving to carry out their respective assignments and stay connected to the central office in Tripoli.

105. In view of the current situation, the NOU is exploring the feasibility of conducting the training of customs officers on HCFC import control, and the training of technicians in good servicing practices for refrigeration and AC equipment with the assistance of the NOU of Tunisia.

Level of fund disbursement

106. As at October 2019, of the US $970,417 of the first tranche,[19] US $661,459 (representing 68.2 per cent) has been disbursed; however, no funds have been disbursed from the, US $190,893 approved for the second tranche.

Secretariat's comments

107. Stage I of the HPMP included the conversion of three foam enterprises to cyclopentane. At the 82nd meeting, the conversion of one enterprise, Alyem, was cancelled as the enterprise was no longer in operation. Upon inquiry on the current status of the equipment manufactured for the other two enterprises, UNIDO reported that the equipment for one enterprise had been delivered to the beneficiary enterprise and is being kept in a safe place awaiting installation. The equipment for another enterprise is being kept at the manufacturer's premises. Due to the security situation, the supplier cannot carry out the installation and commissioning.

108. The work plan for the second tranche included training of 50 refrigeration and AC technicians on good servicing practices, and 25 customs officers on the control of HCFC imports and the prevention of illegal trade. Currently there are plans to train the trainers in Germany.

109. Upon an inquiry on the import quota issued, UNIDO confirmed that national import quotas were issued at 105.65 ODP tonnes for 2019, and 76.67 ODP tonnes for 2020, which is below the 35 per cent reduction target of 76.95 ODP tonnes under the Montreal Protocol for that year.

110. Noting the security situation in the country, the outstanding activities to be implemented and that the completion date for stage I of the HPMP is 31 December 2019, UNIDO has requested to extend the completion of stage I of the HPMP to 31 December 2021. This extension would help the country to complete the remaining activities.

Recommendation

111. The Executive Committee may wish:

(a) To note the progress report on the implementation of stage I of the HCFC phase-out management plan (HPMP) for Libya, submitted by UNIDO and contained in document UNEP/OzL.Pro/ExCom/84/22; and

(b) To consider the extension to 31 December 2021 of stage I of the HPMP, noting the challenging security situation in the country, on the understanding that a revised draft Agreement between the Government of Libya and the Executive Committee would be submitted along with the progress report on the implementation of the work programme, and a verification report to the 86th meeting.

Maldives: HCFC phase-out management plan (stage I and demonstration project for HCFC-free low-GWP alternatives in refrigeration in the fisheries sector – progress report) (UNEP and UNDP)

Background

112. At its 83rd meeting, UNDP provided a report on the demonstration project for HCFC-free, low-global-warning-potential (GWP) alternatives in refrigeration for the fisheries sector in the Maldives,

[19] The funding tranche was adjusted after deducting US $747,533 associated with the cancellation of the conversion of Alyem; these funds have been returned to the Multilateral Fund.

approved at the 76th meeting,[20] in the context of the implementation of the HPMP, based on which the Executive Committee requested UNDP to include a report on the status of the demonstration project in every progress report on the implementation of the HPMP for the Maldives in line with decisions 80/70(b) and 83/25(b).

Progress report

113. In response to the above mentioned decisions, UNEP reported that the implementation of the HPMP is progressing; the HCFC consumption reported by the Maldives in 2018 was 1.21 ODP tonnes (22 mt) which is the same as the maximum allowable consumption for the year under the Agreement with the Executive Committee and 3.39 ODP tonnes (61.63 mt) below the HCFC baseline for compliance (i.e., 4.6 ODP tonnes, 83.63 mt). The main activities completed between September 2018 to September 2019 included:

(a) Trained 30 customs and enforcement officers on implementing the ODS licensing system, developed customs codes and the database for HFC imports with the Customs office. Ten customs officers participated in a regional training for Container Control for the South Asia region, which included a session on environmental enforcement and illegal trade related to the Montreal Protocol organized by the United Nations Office on Drugs and Crime; and two customs officers participated in a workshop for Green Supply for Sustainable Cooling in Jakarta, Indonesia;

(b) Twelve service technicians received training on refrigerant driving licence (RDL) train-the-trainers' for small applications by the AHRI and UNEP; and one master trainer was trained in Guangzhou, China on safe use of flammable refrigerants in room AC; and

(c) Stakeholders from fisheries and energy efficiency sectors, and technical and vocational education and training centres, together with the NOU, attended workshops on policy for energy efficiency of the refrigeration and RAC equipment, and good service practice to build synergies with ongoing HPMP activities.

114. With regard to the investment activities implemented through UNDP, the following were completed:

(a) The recovery, recycling and reclamation centre was established at the Maldives Polytechnic; training was provided to two trainers to operate the centre, supported by awareness activities encouraging recovery and reclamation of ODS; and

(b) The equipment replacement incentive scheme was implemented jointly with the Maldives Industrial Fisheries Company (MIFCO), which procured and distributed 129 AC inverter-based units of different cooling capacities based on R-32 refrigerant to beneficiaries, which had resulted in approximately 15-18 per cent reduction in energy bills; additional equipment is currently being bought and expected to be installed by October 2020.

115. As of September 2019, three vessels retrofitted with R-448A are in operation. The technical challenges faced to retrofit vessels were due to the materials used for gaskets, seals, and the old water pump. After technical advice from the provider, special material has been ordered to replace these parts and, the results are expected by November 2019. UNDP would provide an update on how these technical issues were resolved after the change in materials.

116. UNDP also reported that R-448A is still not commercially available in the country, but that MIFCO has enough stocks for the use of the fishing vessels. MIFCO plans to retrofit a further 12 units with R-448A

[20] UNEP/OzL.Pro/ExCom/76/40.

in 2020 while waiting for other alternatives to be available. The desk study exploring new refrigerants under A1 (refrigerants with low toxicity and zero flammability) category and those with GWP lower than R-448A (with a GWP of 1,273) is still ongoing, and the consultant will update the Government and UNDP on the results of this study. As of today, no suitable alternative other than R-448A has been found for fishing vessels.

Financial report

117. As of September 2019, UNEP has reported a cumulative disbursement rate of 97 per cent for stage I of the HPMP for the Maldives, as summarized in Table 6.

Table 6: Financial report of stage I of the HPMP for the Maldives (US $)

Tranche		UNEP	UNDP	Total	Disbursement rate (%)
First tranche	Approved	355,940	400,000	755,940	99%
	Disbursed	355,940	393,324	749,264	
Second tranche	Approved	173,400	20,000	193,400	100%
	Disbursed	173,400	20,000	193,400	
Third tranche	Approved	100,660	n/a	100,660	100%
	Disbursed	100,660	n/a	100,660	
Fourth tranche	Approved	50,000	n/a	50,000	50%
	Disbursed	25,000*	n/a	25,000	
Total	Approved	680,000	420,000	1,100,000	97%
	Disbursed	655,000	413,324	1,068,324	

* Based on the NOU expenditure records, not yet registered in Umoja

Work plan for 2020

118. The work plan for the remaining activities to be undertaken in 2020 is summarized in Table 7.

Table 7: Work plan for HPMP for the Maldives

Year	Budget, US $
HCFC phase-out policies and enforcement	7,500
Law enforcement training for 15 officers on new regulations	
Plan for gradual reduction of HCFC consumption	5,000
Train-the-trainers workshop in good servicing practices for 15 participants	
Training conducted on servicing fishing vessels and in house for tourist resorts for 20 participants	
Investment component	
Procurement of required accessories for reclamation centre	6,676
Complete the installation of procured air-conditioners and monitor the equipment replacement incentive programme	Funding from previous tranche
Enhanced awareness and outreach	7,500
Awareness campaign	
Distribution of material (e.g. leaflets, pamphlets, and booklets, and translation of reference materials)	
Project coordination monitoring and management	5,000
Focus group discussions on HCFC phase-out and servicing requirements beyond 2020	
Preparation of project completion report and final financial report	**0**

Secretariat's comments

119. The Secretariat inquired about the continued consumption of HCFC-22 for servicing fishing vessels after 2020 in the fishery sector, noting that the Government had committed to reduce HCFC consumption by 97.5 per cent of the baseline by 2020. UNEP advised that while most of the existing fishing vessels were still using HCFC-22, the demand appears to be decreasing due to the import ban of HCFC-based equipment issued from 2016. The Government will use the HCFC-22 consumption associated with the 2.5 per cent per annum from 2021 to 2025 for the fisheries sector, and committed that by 2026, most fishing vessels would have been retrofitted to non-HCFC refrigerants. The Government is extensively exploring low-GWP alternatives to facilitate the complete phase-out of HCFCs. New fishing vessels and facilities established from 2020 will use low-GWP refrigerants, which will help the country achieve complete phase-out in 2025.

120. UNDP also reported that the funding approved for the demonstration project of US $141,000, has been fully disbursed, and that the project completion report will be submitted to the 85th meeting.

Recommendation

121. The Executive Committee may wish:

(a) To note the progress reports on the demonstration project for HCFC-free low-global-warning-potential (GWP) alternatives in refrigeration in the fisheries sector and on the implementation of stage I of the HCFC phase-out management plan (HPMP) for the Maldives submitted by UNEP and contained in document UNEP/OzL.Pro/ExCom/84/22;

(b) To request UNEP to continue submitting the annual progress report on the implementation of stage I of the HPMP for the Maldives until the completion of stage I in 31 December 2020, and to submit the project completion report (PCR) no later than the first meeting of the Executive Committee in 2021; and

(c) To further request UNDP to submit to the 85th meeting the PCR for the demonstration project for HCFC-free low-GWP alternatives in refrigeration in the fisheries sector in the Maldives.

Mexico: HCFC phase-out management plan (stage I - progress report) (UNIDO and UNDP)

Background

122. On behalf of the Government of Mexico, UNIDO as the lead implementing agency has submitted the annual progress report on the implementation of the work programme associated with the fifth and final tranche of the HPMP,[21] in line with decision 75/29(a).[22]

HCFC consumption

123. The Government of Mexico reported HCFC consumption of 321.07 ODP tonnes in 2018, which is 68 per cent below the 1,033.9 ODP tonnes for the same year in its Agreement with the Executive Committee, and 72 per cent below the HCFC baseline of 1,148.8 ODP tonnes. The Government also reported HCFC sector consumption data under the 2018 country programme implementation report that is consistent with the data reported under Article 7 of the Protocol.

[21] The fifth and final tranche of stage I of the HPMP was approved at the 75th meeting at a total cost of US $1,449,982, consisting of US $226,317 plus agency support costs of US $16,974 for UNIDO, and US $1,122,503 plus agency support costs of US $84,188 for UNDP.

[22] Provision reflected in Annex XII of document UNEP/OzL.Pro/ExCom/75/85.

124. The decreasing trend in HCFC consumption is attributed to the phase-out activities in the PU foam and refrigeration servicing sectors, the increasing prices of HCFCs and availability of affordable alternatives, the gradual reduction of HCFC import quotas, the reduced demand for AC in 2018 due to low ambient temperatures, and the shifting to HCFC-free air conditioners in line with the standards put in place. The Government considers that if no additional efforts are made in the refrigeration servicing and production sectors, the consumption of HCFC-22 will remain at similar levels for the next few years, until the installed equipment reaches end-of-life.

Activities in the aerosol manufacturing sector

125. Silimex (11.0 ODP tonnes of HCFC-141b): Project completed in December 2014.

Activities in the PU foam manufacturing sector

126. Domestic refrigeration (Mabe, 55.9 ODP tonnes of HCFCs): Conversion to HC-based foam blowing agent completed.

127. Commercial refrigeration (Fersa (7.3 ODP tonnes of HCFC-141b), Frigopanel (6.4 ODP tonnes), Metalfrio (9.2 ODP tonnes)): Conversion to HC-based technology completed.

128. Systems houses project: Nine systems houses and 285 downstream PU foam users have been converted to several low-GWP alternatives (i.e., pure and pre-blended HCs, methyl formate, methylal, water and HFOs).

Activities in the extruded polystyrene (XPS) foam sector

129. At the 79th meeting, the Executive Committee approved the reallocation of US $1,293,558 in savings from the implementation of the PU foam sector plan to convert two eligible enterprises in the XPS foam sector (Plasticos Espumados (3.38 ODP tonnes of HCFC-142b) and Termofoam Valladolid (6.63 ODP tonnes of HCFC-142b)), and to completely phase out the use of HCFC-142b in the country. Termofoam is currently undertaking trials in the converted plant and will finalize the conversion to HFO-1234ze in December 2019. Plasticos Espumados decided not to participate in the HPMP and instead used HFC-based blends.

Activities in the refrigeration servicing sector

130. The implementation of activities in the refrigeration servicing sector will be finalized in December 2019 with the training of the last 145 technicians. The results achieved so far include: the training in good practices in refrigeration of 38 trainers and 3,500 technicians in 11 training centres; training of 82 customs officers and distribution of refrigerant identifiers to 12 customs entry points; development and distribution of 4,000 copies of a training manual for refrigeration technicians; distribution of close to 300 servicing kits to technicians; and development or updates of standards on energy efficiency for window AC (NOM-021-ENER/SCFI EE), for inverter AC (NOM-026), and for AC equipment (023-ENER-2010).

Level of fund disbursement

131. As of September 2019, of the US $18,066,211 approved, US $17,077,105 (95 per cent) had been disbursed (US $12,666,604 for UNDP, and US $4,410,501 for UNIDO). A balance of US $989,106 will be returned to the Fund upon financial completion of stage I (Table 8).

Table 8: Financial report of stage I of the HPMP for Mexico as of September 2019 (US $)

Component	Agency	Funds approved (US $)	Funds disbursed		Balances (US $)**
			(US $)	(%)	
PU foam (Mabe)	UNDP	2,428,987	2,424,875	99.8	4,112

Component	Agency	Funds approved (US $)	Funds disbursed		Balances (US $)**
			(US $)	(%)	
PU foam (systems houses) including two XPS foam enterprises*		11,225,029	10,241,729	91.2	983,300
PU foam (Metalfrío, Fersa, Ojeda)	UNIDO	2,046,110	2,046,086	100.0	24
Aerosol (Silimex)		520,916	520,894	100.0	22
Refrigeration servicing sector		1,845,169	1,843,521	99.9	1,648
Total		**18,066,211**	**17,077,105**	**94.5**	**989,106**

* From the total funding approved for the systems houses project, at the 79th meeting the Committee approved a reallocation of US $1,293,558 for the conversion of two XPS foam enterprises.

**From the total balance of US $989,106, US $4,112 from the Mabe project, US $22 from the aerosol project and US $1,104 from servicing sector have already been returned to the Fund by UNDP and UNIDO at previous meetings. US $24 from the PU foam project will be returned by UNIDO at the 85th meeting, and the remaining balances (US $983,300 from the PU foam project by UNDP and any balance from the servicing sector by UNIDO) will be returned at the 87th meeting upon financial completion of the last tranche of stage I of the HPMP.

Secretariat's comments

132. The Secretariat notes with appreciation that the Government of Mexico, with the assistance of UNIDO and UNDP, has practically completed all the investment projects and refrigeration servicing sector activities under stage I, meeting and exceeding HCFC consumption reduction targets, including the conversion of close to 300 manufacturing enterprises. The only outstanding activities are the finalization of the conversion of the XPS foam enterprise Termofoam, and training for the last 145 technicians, both expected to be completed by December 2019.

133. In order to ensure the sustainability of the conversion of the XPS foam sector, the Government of Mexico committed not to issue any import quota for HCFC-142b starting on 1 January 2020, and to restrict any potential use of HCFC-22 in the manufacturing of XPS foam through its import and consumption quota system, as reflected in decision 79/38(c)(ii).

134. To streamline reporting in this case, where stage I is practically completed, the Secretariat suggests that the report on the completion of the technician training, the XPS foam project and the adjustment of the import quotas be reported as part of the next progress report and tranche request for stage II of the HPMP, due at the 86th meeting. In line with decision 82/33(c), the project completion report for stage I will be submitted no later than 30 June 2020.

135. In relation with decision 82/33(b), UNDP also submitted the final list of PU foam downstream users assisted under stage I of the HPMP and confirmed that an estimated unused balance of US $983,300 will be returned to the Fund at the 87th meeting after financial completion of stage I in December 2020. This balance corresponds to funds associated to the XPS foam enterprise Plasticos Espumados that did not participate in stage I of the HPMP (US $683,300), and estimated savings of US $300,000 from the conversion of the systems houses and PU foam downstream users.

Recommendation

136. The Executive Committee may wish to note:

(a) The 2019 progress report on the implementation of stage I of the HCFC phase-out management plan (HPMP) for Mexico submitted by UNIDO, contained in document UNEP/OzL.Pro/ExCom/84/22;

(b) That the enterprise Plasticos Espumados did not participate in stage I of the HPMP for Mexico and that the approved funds of US $683,300 will be returned to the Fund at the 87th meeting upon financial completion of stage I of the HPMP;

(c) A balance of US $24, which will be returned by UNIDO at the 85th meeting, and the estimated balance of US $300,000 and any remaining balance from the servicing sector, which will be returned by UNDP and UNIDO, respectively, at the 87th meeting upon financial completion of stage I of the HPMP; and

(d) That UNDP and UNIDO will submit the last report on the completion of the remaining activities under stage I as part of the next progress report associated with stage II of the HPMP, and will submit the project completion report of stage I no later than 30 June 2020, in line with decision 82/33(c).

Qatar: HCFC phase-out management plan (stage I – final progress report) (UNIDO and UNEP)

Background

137. At its 82nd meeting, the Executive Committee extended the stage I of the HPMP for Qatar from January 2015 to July 2019; requested the Government of Qatar, UNIDO and UNEP to submit the final progress report at the 84th meeting; to return the remaining balances by 31 December 2019; and to provide the project completion report at the first meeting in 2020 (decision 82/34).

138. At its 82nd meeting, the Executive Committee also noted that the Government could submit the request for stage II of the HPMP at the 83rd meeting, on the understanding that it would include the verification of the country's consumption for the years 2017 to 2018; however, none was submitted at the 83rd nor 84th meeting.

Secretariat's comments

139. During the project review, the Secretariat was informed that due to a change in the national ozone unit, the final progress report of stage I could not be submitted, and that while the activities under stage I had been completed, additional time, i.e., until 31 December 2020, would be needed to financially complete the project.

Recommendation

140. The Executive Committee may wish to:

(a) Note the request for the extension of stage I of the HCFC phase-out management plan (HPMP) for Qatar contained in document UNEP/OzL.Pro/ExCom/84/22;

(b) On an exceptional basis, and noting that no further extension of project implementation would be requested, to approve the extension of the date of completion of stage I of the HPMP for Qatar to 31 December 2020; and

(c) To request the Government of Qatar, UNIDO and UNEP to submit to the 87th meeting the final progress report and the project completion report, and to ensure financial completion and return the remaining balances by the 87th meeting.

Uruguay: HCFC phase-out management plan (stage II – report on progress in implementation of the conversion of the foam enterprises) (UNDP)

Background

141. At its 82nd meeting, the Executive Committee considered the request for the second tranche of

stage II of the HPMP for Uruguay.[23] The request included the implementation of a project for the phase-out of HCFC-141b used in foam manufacturing through converting 21 SMEs to HFO technology. UNDP had indicated the continued challenges of getting supply of HFOs in the region. In approving the tranche, the Committee requested UNDP to report on the progress in implementation of the conversion of the SMEs and the availability of HFO/HFO-based PU systems and their associated components to the 84th meeting (decision 82/76(b)(ii)).

Progress report

142. In line with the above-mentioned decision, UNDP reported that most of the foam enterprises are using HCFC-141b and HFC-based systems based on the price of the formulation; however, no conversion to low-global-warming potential (GWP) blowing agent has been done in those companies.

143. The NOU had meetings with local suppliers of PU systems, where the following barriers were identified: the small foam market in the country is not economically feasible for international systems houses to distribute such systems; local distributors have no knowledge of HFO systems and are therefore reluctant to offer these to clients; and, the high cost of HFOs compared to HCFC-141b and HFC systems. The NOU also had a meeting with a system house that offered HFO-based systems in the region where the formulation suitable for the applications used in Uruguay were identified, and the supply of these HFO systems will be supplied on a trial basis by 2020.

Secretariat's comments

144. The Secretariat noted the continued challenges faced by the SMEs in sourcing HFOs which is the selected technology for the conversions, and the efforts taken by UNDP to assist the Government of Uruguay to ensure the supply of low-GWP polyols systems and the conversion of the SMEs.

145. In response to whether alternatives other than HFOs had been considered, UNDP reported that the larger SMEs had committed to make additional investment to convert their production to cyclopentane as a blowing agent, while the remaining SMEs are testing water-based systems for specific applications.

146. It was noted that UNDP and the Government of Uruguay would continue to monitor the conversions of these enterprises, and would report on the status of the availability of HFOs and the results of the testing of other low-GWP alternatives to the 85th meeting. UNDP further reiterated that the Government is fully committed to ensuring the phase-out of HCFC-141b used by the SMEs, and will do its utmost to ensure that low-GWP alternatives can be made available in 2020.

Recommendation

147. The Executive Committee may wish:

(a) To note the report provided by UNDP on the progress in the implementation of the conversion of the foam enterprises and the availability of HFO/HFO-based polyurethane systems and their associated components funded under stage II of HCFC phase-out management plan for Uruguay, contained in document UNEP/OzL.Pro/ExCom/84/22; and

(b) To request UNDP to continue assisting the Government of Uruguay in securing the supply of HFO/HFO-based polyurethane systems and their associated components, or other low-global-warming-potential (GWP) alternatives, and to report to the 85th meeting and at each meeting thereafter on the status of the conversion of the 21 small and medium-sized

[23] UNEP/OzL.Pro/ExCom/82/61.

enterprises in the foam sector until the technology originally selected or another technology with low-GWP had been fully introduced.

Demonstration projects for low-GWP alternatives to HCFCs and feasibility studies for district cooling

Egypt: Demonstration of low-cost options for the conversion to non-ODS technologies in the polyurethane foam sector at very small users (final report) (UNDP)

Background

148. The demonstration project on low-cost options for very small users (VSU) for PU foam applications in Egypt was approved at the 76th meeting,[24] at the amount of US $295,000, plus agency support costs of US $20,650 for UNDP. The project was expected to develop foam dispensing unit for pour-in-place (PIP) applications used by VSUs at a lower cost of dispensers available in the market; and to explore the option of pre-packaging PU foam systems for certain foam applications that would be easy to use for VSUs, with the low-cost foaming units. At its 83rd meeting, the Committee considered a preliminary final report of the project and, *inter alia*, requested UNDP to submit the final report of the project, no later than the 84th meeting, noting that it would include details of the comparison of the specifications of the original equipment with those of the optimized low-cost units, the performance of the equipment during testing, including the foam systems used during the testing, the results of using the new equipment and recommendations regarding its utility for very small users (decision 83/29(c)).

149. In line with decision 83/29(c), on behalf of the Government of Egypt, UNDP has submitted the final report of the demonstration project to optimize non-ODS technologies in the PU foam sector in Egypt. The final report is annexed to the present document.

Summary of the final report

150. UNDP designed the project to be implemented in two parts: the first part involved equipment selection (i.e., developing specifications for the equipment, bidding, review of bids, and procurement), and the second part was the optimization of pre-packaged foaming systems, which included the selection of a systems house sourcing the pre-packaged systems from suppliers, and field testing the system with the selected equipment with small foam users.

151. The project included different specifications to modify small and mobile foam dispensers typically used by VSUs. As a result, simpler equipment was designed through a bidding process with resulting cost-savings as follows: a basic sole pour-in-place (PIP) foam dispenser at a cost of US $5,500 rather than US $10,000; a basic spray/PIP dispenser at a cost of US $7,000 rather than US $10,000; and a basic integral skin foam (ISF) dispenser at a cost of US $20,000 instead of US $25,000-30,000. Three different types of foaming machines were purchased: one high-pressure, one low-pressure, and another low-pressure machine for ISF houses, and tested.

152. Each of the equipment was tested in selected systems houses using locally available water-based, methyl formate, and methylal formulations. During testing, while overall equipment performance was positive, it was found that the modified equipment could only be used with formulations based on a 1:1 ratio of blowing agent to polyol; however, some systems houses operated with chemical systems having variable ratios (e.g. 1:1.5 to 1:70 for water-based formulations). Upon a request by UNDP one supplier modified the equipment to allow it to operate with variable systems; however, further testing to verify the performance

[24] UNEP/OzL.Pro/ExCom/76/31.

of the modified equipment with locally available systems using variable ratios could not be done due to the project completion deadline.

153. During the implementation of the optimization of pre-packaged foaming systems, it was found that these systems were very expensive and were for applications not prevalent in Egypt. Therefore, it was concluded that this option was not cost-effective or sustainable in the majority of Article 5 countries.

154. The report concluded that the project demonstrated the following:

(a) Specifications to modify basic foam dispensers for small foam users could be proposed resulting in lower prices (i.e. 30-50 percent less than standard dispensers);

(b) Adjustments may need to be made for specifications of foam dispensers to allow these to be used with variable ratios of chemical systems; and

(c) The use of pre-packaged chemicals designed for narrowly specialized applications (e.g. back fill around electrical posts) which are not common in Article 5 countries; therefore, these packages are not cost-effective and sustainable in the majority of Article 5 countries.

Secretariat's comments

155. The Secretariat noted that UNDP had sought a peer review from an expert on the final report after the report was submitted for consideration by the Executive Committee. The technical evaluation by the reviewer identified issues related to limitation on the use of the equipment with variable ratios of chemical systems, the need to verify the utility of the modified equipment with end-users using local foaming systems, and the lack of information on the results of the testing with end-users. UNDP explained that the peer review was commissioned after the final report was prepared and the results of the review had not been included in the version sent to the Secretariat. UNDP was therefore requested to re-submit a revised report which would take into account the observations contained in the reviewer's report.

156. It was also noted that in decision 83/29(c), UNDP was requested that the final report should include a comparison of the specifications of the original equipment with those of the optimized low-cost foaming unit. However, the final report did not provide this information, but only the minimum specifications for equipment for PIP, PIP/spray and ISF applications compared with specifications of standard foaming units. The equipment component of the project only considered a very basic foaming unit and removed some components, like heated hoses and self-cleaning features, that were essential for the foaming operations. These changes contributed to reducing the cost of the equipment.

157. Regarding whether the uptake of these small low-cost foaming units would be affected by the incompatibility of the local systems and the dispensers due to variable chemical ratios, UNDP clarified that this will be tested during the implementation of stage II the HPMP when dealing with small users. It was also confirmed that as the suppliers of foaming units or dispensers were able to make modifications to the basic equipment to include variable ratios, once verification of the use of these equipment was completed, it would ensure their use for VSUs in future.

158. UNDP clarified that the overall objective of the demonstration project which was to demonstrate the possibility of having small low-cost foaming units for VSUs was met as shown in the conclusions of the final report.

159. The results of the project concluded that with very clear specifications of the minimum components of the equipment to allow foaming operations, basic foam dispensers might be available at 30-50 per cent less than standard dispensers therefore potentially reducing equipment costs of future foam projects funded

by the Multilateral Fund for small and very small foam manufacturers. In some cases, the equipment specifications should be adjusted to allow for the use of chemical systems of variable ratios.

Recommendation

160. The Executive Committee may wish:

(a) To note, with appreciation, the final report on the demonstration of low-cost options for the conversion to non-ODS technologies in the polyurethane (PU) foam sector at very small users (VSUs) in Egypt, submitted by UNDP and contained in document UNEP/OzL.Pro/ExCom/84/22; and

(b) To invite bilateral and implementing agencies to take into account the report referred to in sub-paragraph (a) above when assisting Article 5 countries in preparing PU foam projects for VSUs using low-global-warning-potential refrigerants.

Morocco: Demonstration of the use of low-cost pentane foaming technology for the conversion to non-ODS technologies in polyurethane foams at small-and medium-sized enterprises (final report) (UNIDO)

161. At its 75th meeting, the Executive Committee approved the demonstration project on the use of low-cost pentane foaming technology for the conversion to non-ODS technologies in PU foams at SMEs in Morocco, in the amount of US $280,500, plus agency support costs of US $19,635 for UNIDO (decision 75/41).

162. The objective of the project was to explore the possibility of reducing the initial capital cost by designing a simple, standardized, easy-to-handle and compact foaming machine capable of operating with flammable pentane, equipment and movable ventilation systems serving several products.

163. Accordingly, the project was designed with three major cost reduction measures: the use of pentane-based pre-blended polyols; the design of a compact pentane foaming unit with a moving mixing head to allowing disbursing foam to moulds located in a large area; and design of a more simplified safety system to cover all the foaming areas.

164. The project was proposed to be implemented in Engequife, an SME using HCFC-141b-based pre-blended polyols for insulation foam for commercial refrigeration products consuming 1.9 mt of HCFC-141b. The project has been completed and the final report is annexed to the present document.

165. For cost-effectiveness, cyclopentane-based pre-blended polyol would be supplied in small tanks or drums. The pre-blended polyol with cyclopentane in the drum would be off-loaded to a compact high-pressure foaming machine with two streams flow of raw material; to allow the safe use of the formulation, sensors would be installed in all the potential sources of emissions of cyclopentane and two extraction systems would remove gases, if any, in the foam production areas. Significant cost reduction could also be achieved through a standardization of the equipment.

166. With this approach, the project was implemented in four steps as explained below.

Step 1. Study tour for chemical supplier identification and visits to select the supplier

167. Three suppliers were identified and based on discussions, Pumex, a Mexico-based supplier, was identified as a potential supplier of cylopentane-based pre-blended polyol systems. A study tour was undertaken in September 2017 to discuss safety aspect of the supply and the use of cyclopentane pre-blended systems with the technical team in Pumex and with two different customers of Pumex. After detailed consultations and technical assessment, Pumex agreed to supply their cyclopentane system to Engequife.

Step 2. Equipment and technical study visit to identify the technology and equipment suppliers

168. The project team organized a mission to Italy in October 2017, to discuss with four equipment suppliers, the design and the technical and safety aspect relating to the use of cyclopentane-based pre-blended systems at the SMEs; safety equipment needs; and potential cost saving interventions in the equipment/system design.

Step 3. Supply of equipment, chemicals, local works and commissioning

169. A competitive bidding process for equipment supply was initiated; based on the bidding process, Cannon Afros was identified as the supplier.

170. Cannon Afros' offer included the foaming equipment that was very compact with limited piping, sensors in two raw material streams with drum filling system and integrated control panel, moving mixing head with boom[25] to serve different moulds and presses; cost optimisation by installing a double ventilator for the wet area and one extractor fan for the dry area; installation of six sensors and alarm detection systems and nitrogen equipment connected to one control panel; all ducting and tubes were to be installed by Engequife locally. Pumex supplied cyclopentane systems in drums.

171. The commissioning was delayed due to the relocation of Engequife production to a new facility; following the completion of the local electrical and civil works, equipment installation was completed and training delivered.

Step 4. Project results and dissemination

172. All tests and foam productions were carried out. The main findings are given below.

(a) Pre-blended cyclopentane systems are sufficiently stable and can be commercially used; there are no specific issues for the transportation and shipment of cyclopentane pre-blended systems in drums. They are shipped as any "dangerous chemicals" with the corresponding extra cost;

(b) The foam quality produced with cyclopentane systems is similar to the foam produced using HCFC-141b; there was no specific safety issue or difficulty encountered in using cyclopentane system with the supplied equipment;

(c) Operations of foam manufacturing facilities without elaborate blending and storage systems of cyclopentane, compact pentane technology with cost-effective design of foaming head and ventilation and safety system results in lower capital costs; this compact pentane technology can be applied in many SMEs in the rigid foam sub-sector and its replication can lead to potential cost savings;

(d) Savings are expected from lower price of cyclopentane compared to HCFC-141b price; and

(e) Nitrogen consumption was found to be high and its use has to be optimized.

173. A workshop was organized where outcomes of the demonstration project were presented. The meeting was followed by a visit to Engequife's factory. Moroccan companies involved in the production of rigid foam have participated in the workshop and the plant visit.

[25] Boom is a locally manufactured mechanical system to control movement of mixing head for easy manufacturing operations.

Secretariat's comments

174. UNIDO explained that the delay in the implementation of the project was due to the unavailability of the NOU to participate in the study tour to identify the potential suppliers for pre-blended HC-based polyols and foaming equipment and installation of equipment had to be installed in the newly built premises, in an industrial zone which was not ready when equipment was delivered in 2018.

175. On the supply system for raw materials, UNIDO explained that there is no storage tank for raw materials; the raw materials are supplied through drums (i.e., one for isocyanate and one for cyclopentane-based pre-blended polyol) which are connected to a compact high-pressure foaming machine. Savings were accrued as no storage tank for pentane with associated civil works and safety systems were required (savings of US $50,000 to US $100,000); no pre-blending system including buffer tank and associated safety equipment were needed (savings of US $50,000 to US $100,000); and savings were also accrued from the installation of compact machine and cost-effective exhaust system using double ventilator and extractor fan (savings of US $50,000 to 100,000).

176. UNIDO provided the information given in Table 9 on the incremental capital cost of equipment installed in the demonstration project.

Table 9: Incremental costs for equipment for using pre-blended cyclopentane-based system (US $)

Compact foaming equipment with mixing head and boom	103,000
Nitrogen inertisation valve	1,100
Safety systems including control panel, gas sensors and ventilators	44,400
Engineering and design	11,100
Sub-total	**159,600**
Spare parts	9,300
Freight and delivery	2,500
Installation and commissioning	17,400
Total	**188,800**

177. On incremental operating costs, UNIDO explained that the costs of the systems before and after conversion (Table 10) reflect prices and costs for small order quantities used in the project; thus, they may not be reflective of actual costs in situations that involve larger scale adoption.

Table 10: Incremental costs for equipment for using pre-blended cyclopentane-based system

Chemical	Unit consumption (mt)	Composition (%)	Price (US $/unit)	Total cost (US $)
HCFC-141b pre-blended polyol	3 .1	41	2.35	7,285.00
Polymeric MDI	4 .52	59	2.30	10,396.00
Other additives	-		-	-
Total before conversion	**7 .62**	**100**		**17,681.00**
Cyclopentane-pre-blended polyol	2 .93	39	2.25	6,592.50
Polymeric MDI	4 .52	61	2.30	10,396.00
Other additives	-		-	
Total after conversion	**7 .45**			**16,988.50**
Savings after equalisation of quantities of system*				**(304.84)**

Note: Systems based on pre-blended polyol using HCFC-141b is about 1.022 times those based on cyclopentane pre-blended polyol; the costs given for cyclopentane-based pre-blended polyol need to be proportionately increased to assess actual increase in costs.

*Savings for production of an equivalent of 7.62 mt of HCFC-141b-based foam systems.

178. The Secretariat notes that the project results shows lower incremental capital costs when pre-blended cyclopentane is used mainly on account of lower costs for storage and handling of pre-blended cyclopentane, cost-effective design of moving head in foam operations and cost-effective ventilation and exhaust system. Operating costs are also lower than formulations using pre-blended HCFC-141b largely driven by high price of HCFC-141b. The savings in capital and operating costs could be higher with higher volumes of procurement of equipment, improvement in cost-efficiencies for equipment components and safety systems, and increase in prices of HCFC-141b due to supply constraints in different markets.

Recommendation

179. The Executive Committee may wish:

(a) To note the final report, submitted by UNIDO, on the use of low-cost pentane foaming technology for the conversion to non-ODS technologies in the polyurethane (PU) foam manufacturing sector at small and medium-sized enterprises (SMEs) in Morocco, submitted by UNIDO and contained in document UNEP/OzL.Pro/ExCom/84/22; and

(b) To invite bilateral and implementing agencies to take into account the report referred to in sub-paragraph (a) above when assisting Article 5 countries in preparing projects for the PU foam manufacturing sector at SMEs.

Saudi Arabia: Demonstration project for the phase-out of HCFCs by using HFO as foam-blowing agent in the spray foam applications in high ambient temperatures (UNIDO)

Background

180. At its 76th meeting, the Executive Committee approved the demonstration project for the phase-out of HCFCs by using HFO as foam-blowing agent in the spray foam applications in high ambient temperatures in Saudi Arabia, in the amount of US $96,250, plus agency support costs of US $8,663 for UNIDO, and requested the Government of Saudi Arabia and UNIDO to complete the project within 16 months of its approval and to submit a comprehensive final report soon after project completion (decision 76/31).[26]

181. At the 83rd meeting, UNIDO submitted a detailed progress report on the demonstration project. Given that the report is to be used by other Article 5 countries when formulating and implementing projects, UNIDO agreed to include in the field testing, several tests that could not be done in the first part of the project, such as adhesion strength, water absorption, closed cell content, durability of thermal resistance and compression strength against ageing/degradation, among others. In order to complete the remaining activities that would provide valuable information from field tests in high-ambient temperature conditions and noting that considerable progress was achieved, the Executive Committee agreed to extend the project completion date to 31 October 2019, on the understanding that no further extension of project implementation would be requested and requested UNIDO to submit, no later than the 84th meeting, the final report of the project (decision 83/35 (b) and (c)).

Secretariat's comments

182. In line with decision 83/35(c), UNIDO submitted the final report of the demonstration project on 11 November 2019, i.e., five weeks before the commencement of the 84th meeting. Therefore, the Secretariat was unable to review the final report. The Secretariat will undertake a review of the report and present its findings to the 85th meeting.

[26] At the 80th meeting, the project completion date was extended to 31 December 2018 (decision 80/26(i)).

Recommendation

183. The Executive Committee may wish to take note of the submission by UNIDO of the final report on the demonstration project for the phase-out of HCFCs by using HFO as foam-blowing agent in the spray foam applications in high ambient temperatures in Saudi Arabia, which will be reviewed and presented by the Secretariat at the 85th meeting.

West Asia region: Demonstration project on promoting alternative refrigerants in air-conditioning for high-ambient countries in West Asia (final report) (UNEP and UNIDO)

Background

184. At its 76th meeting, the Executive Committee approved the demonstration project on promoting alternative refrigerants in AC for high-ambient countries in West Asia[27] better known as PRAHA-II, which aimed to build on the progress of the demonstration project, PRAHA-I by advancing the capacity of stakeholders to use low-GWP refrigerants in the AC sector in countries with high-ambient temperature.

185. At its 83rd meeting, a progress report on the demonstration project PRAHA-II was submitted. Noting the progress achieved so far, and the likely benefits to high ambient temperature countries that the completed project would provide, the Executive Committee decided *inter alia* to extend, on an exceptional basis, the date of completion of the project to 15 November 2019, and to request UNEP and UNIDO to submit the final report no later than the 84th meeting and to return all remaining balances by the 85th meeting (decision 83/27).

Secretariat's comments

186. In line with decision 83/27, UNEP and UNIDO submitted the final report of the project on 24 October 2019. While noting the comprehensive report with appreciation, the Secretariat was unable to review the report in the limited time available. The Secretariat will undertake a review of the report and present its findings to the 85th meeting.

Recommendation

187. The Executive Committee may wish to take note of the submission by UNEP and UNIDO of the final report on the demonstration project on promoting alternative refrigerants in air-conditioning for high-ambient countries in West Asia (PRAHA-II), which will be reviewed and presented by the Secretariat at the 85th meeting.

Global (Eastern Africa and Caribbean regions): Demonstration project on refrigerant quality, containment and introduction of low-GWP alternatives in the RAC sector (progress report) (UNIDO)

Background

188. At its 76th meeting, the Executive Committee decided to approve the demonstration project in the Eastern Africa and Caribbean regions on refrigerant quality, containment and introduction of alternatives with low-GWP in the amount of US $425,650, consisting of US $50,000 plus agency support costs of US $6,500 for UNEP, and US $345,000 plus agency support costs of US $24,150 for UNIDO, in line with decision 72/40 (decision 76/36).

[27] Bahrain, Egypt, Kuwait, Qatar, Oman, Saudi Arabia, and the United Arab Emirates. No funding was provided for the United Arab Emirates, and the local industry built the prototypes and attended the PRAHA sessions at their own expense.

189. At the 82nd meeting, the Executive Committee decided to cancel the component implemented by UNEP and to extend to 31 July 2019 the project completion date for the component implemented by UNIDO, on the understanding that no further extension would be requested, and to request UNIDO to submit the final report no later than the 84th meeting (decision 82/22(c)). The total funding for UNEP (US $56,500) was returned to the 82nd meeting.

190. In line with decision 82/22(c), UNIDO submitted a progress report on the demonstration project in the Eastern Africa and the Caribbean region.

Progress report

191. From the information provided in the progress report and additional information gathered through discussions with UNIDO, the Secretariat noted that the project was completed by 31 June 2019 in line with decision 82/22(c)(ii).

192. The project component related to the African region covering Eritrea, Kenya, Rwanda, the United Republic of Tanzania, and Zambia was aimed at ensuring refrigerant quality in the market. Given the United Republic of Tanzania's geographical location, larger size and bigger population, it was selected as the pilot country for the implementation of specific technical activities.

193. The project carried out surveys and a train-the-trainer workshop for refrigeration technicians, customs officers, environmental inspectors and importers. The project achieved its goal of taking stock of the counterfeit refrigerants in the region, and identified the gaps leading to regional market penetration of counterfeit refrigerants. Stakeholders were trained in the technical aspects of identifying counterfeit refrigerants, measuring performance parameters using pure and counterfeit refrigerants, and the use of refrigerant analysers. The project strengthened refrigerant testing centres through the provision of tools and equipment, and raised awareness on counterfeit refrigerants, taking into account mislabelling, the consequences of using counterfeit refrigerants, and potential safety risks.

194. The project component related to the Caribbean region covering the Bahamas, Grenada, Saint Lucia, Saint Vincent and the Grenadines, and Suriname was aimed at facilitating the introduction of low-GWP refrigerants in the servicing sector by: enhancing the expertise of technicians and training specialized trainers; upgrading the training curricula at vocational centres; providing basic equipment at the regional training centres; and providing information to stakeholders on the latest HC-based equipment available on the market.

195. The activities implemented included *inter alia*: holding a regional workshop for policy makers and curriculum developers with representatives from NOU and training providers; equipping the regional training centre in Grenada with tools and equipment suitable for low-GWP flammable refrigerants; holding a regional train-the-trainers workshop in Grenada where participants were trained on theoretical aspects of refrigeration servicing, including training on the safe handling of alternative refrigerants; designing a regional training and certification curriculum to ensure that only qualified technicians handle and service equipment and flammable refrigerants; delivering two R-290-based air conditioners to four countries; and holding the Regional Expert Group meeting back-to-back with the ozone officers' meeting in Suriname in October 2019.

Secretariat's comments

196. In reviewing the progress report, the Secretariat noted that additional information was required, noting that the project was the only demonstration project in the refrigeration servicing sector that had been approved by the Executive Committee and that the results could be used in all countries implementing activities in this sector.

197. The additional information required includes, *inter alia*: safety aspects when retrofitting HCFC-22-based equipment to flammable refrigerants; results on the performance and servicing of the HC-based units installed in each country in the Caribbean; regulations and standard considerations and their impact on the uptake of the technology in these countries; additional conclusions on the tools needed to operate with flammable refrigerants based on the experience of the regional centre in Grenada; relevance of the counterfeit refrigerant issue for NOUs in the context of compliance with the Montreal Protocol and the phase-out of controlled substances; lessons on practical measures that could be introduced by countries to ensure refrigerant quality in the domestic markets; and the monitoring and enforcement actions needed to reduce the risk of the imports and local sales of counterfeit refrigerants.

198. It was also noted that most of the funding approved for UNIDO had been disbursed; however, a detailed financial report was not included in the report.

199. Noting the limited time available to address the comments raised by the Secretariat, it was agreed that UNIDO would undertake additional work to finalize a consolidated report and submit it to the 85th meeting.

Recommendation

200. The Executive Committee may wish:

(a) To note the progress report on the global (Eastern Africa and Caribbean regions) demonstration project on refrigerant quality, containment and introduction of low-global-warming-potential alternatives in the refrigeration and air-conditioning sector, submitted by UNIDO; and

(b) To further note that UNIDO would submit a final report of the project mentioned in sub-paragraph (a) above and the project completion report to the 85th meeting, and that unused balances would be returned to the 86th meeting.

Methyl bromide (MB)

Argentina: Critical use exemptions (UNIDO)

Background

201. At its 30th meeting, the Executive Committee approved the project for the phase-out of MB in strawberry, protected vegetables and cut flower production in Argentina, and at its 36th meeting, approved the project for the phase-out of MB for soil fumigation in tobacco and non-protected vegetable seed-beds. The Agreement between the Government of Argentina and the Executive Committee was subsequently modified at the 45th meeting. While the Agreement explicitly excluded quarantine and pre shipment (QPS) applications from the targets for national MB consumption, the Agreement did not include an exclusion for critical-use exemptions (CUEs) that the Parties to the Montreal Protocol may authorize, and instead specified zero national consumption of MB by 2015. The Parties authorized CUEs for Argentina at the 26th, 27th, 28th, 29th, 30th and 31st Meetings of the Parties for use in 2015, 2016, 2017, 2018, 2019 and 2020, respectively.

202. Argentina reported MB consumption of 46.00 ODP tonnes in 2018 which was equal to the authorized CUEs for that year. Accordingly, the Secretariat considers that the level of consumption of MB for Argentina in 2018 was zero, as the maximum level specified in the Agreement, except for any CUEs approved by the Parties.

Recommendation

203. The Executive Committee may wish to note that the reported level of consumption of methyl bromide for Argentina in 2018 was zero, as per the Agreement between the Government and the Executive Committee, except for the critical-use exemptions approved by the Parties to the Montreal Protocol.

Change of lead implementing agency

Senegal: HCFC phase-out management plan (stage I – request for change in lead implementing agency (UNEP/UNIDO)

204. The Government of Senegal has sent an official letter[28] to the Secretariat requesting for a change in the lead implementing agency for stage I of the HPMP[29] from UNIDO to UNEP, which is currently the cooperating implementing agency. Subsequently, UNIDO and UNEP confirmed this request.

Secretariat's comments

205. Notwithstanding the delay in the submission of the third tranche of the HPMP, the Secretariat noted that the Government of Senegal has reported HCFC consumption of 15.13 ODP in 2018 under Article 7 of the Montreal Protocol, which is 41.8 per cent of the baseline (36.20 ODP tonnes). Therefore, it appears that the country is not at risk of complying with its obligations under the Protocol.

206. In reviewing the request from the Government of Senegal, it was noted that while stage I of the HPMP for Senegal will be completed in 2020, the third funding tranche (US $100,000, plus agency support costs for UNIDO and UNEP), that was due in 2018, had not yet been submitted. In addition, the fourth and final funding tranche (US $70,000, plus agency support costs for UNIDO and UNEP) would be due for submission in 2020.

207. In discussing the urgency in submitting the outstanding funding tranche, UNEP indicated that subsequent to the 84th meeting (after the Committee might had noted the request for the change of the lead implementing agency), it would discuss with the Government of Senegal a revised plan of action based on the remaining funding available, together with a revised Agreement (indicating the change of the lead and cooperating implementing agencies and a potential extension of the completion of stage I), and submitted the third tranche to the 85th meeting.

Recommendation

208. The Executive Committee may wish:

(a) To note the request from the Government of Senegal to change the lead implementing agency for stage I of the HCFC phase-out management plan (HPMP) from UNIDO to UNEP, and the cooperating implementing agency from UNEP to UNIDO; and

(b) To request UNEP as lead implementing agency to submit the third funding tranche of stage I of the HPMP, together with the revised Agreement between the Government of Senegal and the Executive Committee, no later than the 85th meeting.

[28] Letter dated 2 October 2019 from the NOU of Senegal

[29] The HPMP for Senegal was approved in principle at the 65th meeting (decision 65/46). At the 77th meeting, the starting point for aggregated reductions in HCFC consumption was revised to 20.96 ODP tonnes, and the funding level was revised to US $630,000, plus agency support costs (decision 77/55).

Requests for extension of enabling activities (UNDP, UNEP, UNIDO, World Bank and the Government of Germany)

209. In line with decision 81/32(a),[30] on behalf of 63[31] Article 5 countries, the bilateral and implementing agencies have submitted official requests for extension of enabling activities that have an expected completion date of December 2019, as shown in Table 11.

Table 11: Requests for extension of enabling activities for HFC phase-down submitted to 84th meeting

Country	Lead implementing agency	Extension requested
Afghanistan	UNEP	12 months
Argentina	UNIDO	12 months
Bahrain	UNEP	12 months
Bangladesh	UNDP*	12 months
Benin	UNEP	12 months
Botswana	UNEP	12 months
Chad	UNEP	12 months
Comoros	UNEP	12 months
Côte d'Ivoire	UNEP	12 months
Cuba	UNDP**	12 months
Democratic Republic of the Congo	UNEP	12 months
Djibouti	UNEP	12 months
Egypt	UNEP***	12 months
El Salvador	UNDP**	12 months
Equatorial Guinea	UNEP	12 months
Eswatini	UNEP	12 months
Ethiopia	UNEP	12 months
Georgia	UNEP	12 months
Guinea Bissau	UNEP	12 months
Guyana	UNEP	12 months
Honduras	UNEP	12 months
Indonesia	World Bank	12 months
Iran (Islamic Republic of)	UNDP****	6 months
Iraq	UNEP	12 months
Kenya	UNEP	12 months
Kiribati	UNEP	12 months
Kuwait	UNEP	12 months
Lao People's Democratic Republic	UNEP	12 months
Liberia	Germany	6 months
Libya	UNIDO	12 months
Madagascar	UNEP	12 months
Malawi	UNEP	12 months
Mali	UNEP	12 months
Marshal Islands	UNEP	12 months
Mauritania	UNEP	12 months
Micronesia (Federated States of)	UNEP	12 months
Morocco	UNIDO	12 months
Mozambique	UNEP	12 months
Myanmar	UNEP	12 months
Nauru	UNEP	12 months

[30] The Committee decided to maintain the 18-month implementation period for enabling activities and, if needed, to extend that period by no more than 12 months (totalling 30 months from project approval), when an official request for extension was received by the Secretariat.

[31] Three countries (Liberia, Papua New Guinea and Seychelles) were approved at the 80th meeting, and Iran (Islamic Republic of) was approved at the 82nd meeting.

Country	Lead implementing agency	Extension requested
Nepal	UNEP	12 months
Nicaragua	UNIDO	12 months
Niger	UNIDO	12 months
Niue	UNEP	12 months
Oman	UNEP	12 months
Pakistan	UNEP	12 months
Panama	UNDP**	12 months
Papua New Guinea	Germany	6 months
Paraguay	UNEP*****	12 months
Saint Kitts and Nevis	UNEP	12 months
Samoa	UNEP	12 months
Sao Tome and Principe	UNEP	12 months
Saudi Arabia	UNEP	12 months
Seychelles	Germany	6 months
Sierra Leone	UNEP	12 months
Solomon Islands	UNEP	12 months
South Sudan	UNEP	12 months
Sri Lanka	UNEP	12 months
Tuvalu	UNEP	12 months
Uganda	UNEP	12 months
United Republic of Tanzania	UNEP	12 months
Vanuatu	UNEP	12 months
Venezuela (Bolivarian Republic of)	UNIDO	12 months

* UNEP and Canada as cooperating implementing agencies
** Canada as cooperating implementing agency
*** UNIDO as cooperating implementing agency
**** UNEP as cooperating implementing agency
***** UNDP as cooperating implementing agency

Secretariat's comments

210. The main reasons for the extension included *inter alia*, the need to complete planned activities; delayed start of implementation; and difficulties in coordination between NOUs and the implementing agencies. The Secretariat noted that issues that delay the start of implementation of enabling activities have been addressed and progress has been achieved. The Governments of the countries concerned are aware that the enabling activities should be completed no later than the extended period being requested, and balances should be returned once the activities have been completed.

Recommendation

211. The Executive Committee may wish:

(a) To note the requests for extension of enabling activities for HFC phase-down submitted by the respective bilateral and implementing agencies for the 63 Article 5 countries listed in Table 11 of document UNEP/OzL.Pro/ExCom/84/22; and

(b) To extend the completion date for the enabling activities for HFC phase-down to 30 June 2020, for Liberia, Papua New Guinea and Seychelles and to 31 December 2020, for Afghanistan, Argentina, Bahrain, Bangladesh, Benin, Botswana, Chad, Comoros, Côte d'Ivoire, Cuba, Democratic Republic of Congo, Djibouti, Egypt, El Salvador, Equatorial Guinea, Eswatini, Ethiopia, Georgia, Guinea Bissau, Guyana, Honduras, Indonesia, Iran (Islamic Republic of), Iraq, Kenya, Kiribati, Kuwait, Lao People's Democratic Republic, Libya, Madagascar, Malawi, Mali, Marshal Islands, Mauritania, Micronesia (Federated

States of), Morocco, Mozambique, Myanmar, Nauru, Nepal, Nicaragua, Niger, Niue, Oman, Pakistan, Panama, Paraguay, Saint Kitts and Nevis, Samoa, Sao Tome and Principe, Saudi Arabia, Sierra Leone, Solomon Islands, South Sudan, Sri Lanka, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, and Venezuela (Bolivarian Republic of), on the understanding that no further extension would be requested and that bilateral and implementing agencies would submit, within six months of the project completion date, a final report of the enabling activities completed in line with decision 81/32(b).

SECTION II: REPORTS ON PROJECTS WITH SPECIFIC REPORTING REQUIREMENTS FOR INDIVIDUAL CONSIDERATION

Temporary use of a high-global-warming-potential technology in approved projects

Trinidad and Tobago: HCFC phase-out management plan (stage I – report on temporary use of a high-GWP technology) (UNDP)

Background

212. At the 81st meeting, UNDP reported to the Executive Committee that one of the foam enterprises which had received financial support to convert from the use of HCFC-141b to methyl formate as the blowing agent under stage I of the HPMP for in Trinidad and Tobago, was using a different foam blowing agent from the one that had been approved. Subsequently, UNDP was requested to provide a status report on the use of methyl formate and the alternative blowing agent being used, under stage I of the HPMP, in the enterprise being assisted by the Multilateral Fund (decisions 81/52(b) and 82/26).

213. At the 83rd meeting, UNDP reported that one of the foam enterprises, Seal Sprayed Solutions (Seal), uses HFC-based blowing agents in spray foam applications when specifically requested by the clients. In light of this, the Executive Committee requested: The Government of Trinidad and Tobago, through UNDP, to inform the enterprise that it should supply systems based only on the selected technology or other low-GWP-based blowing-agent technologies; and UNDP to continue assisting the Government and to provide, at the 84th meeting, a report on the status of the introduction of the proposed technology in applications covered under the foam sector (decision 83/15(c) and (d)).

214. In line with decision 83/15(c), UNDP, on behalf of the Government of Trinidad and Tobago, submitted a report to the 84th meeting, covering the status of implementation of four enterprises,[32] namely Seal, Ice Fab, Tropical Marine and Vetter. The report indicates that Seal, after it had been informed about the decision, has decided not to request incremental operating costs (IOCs) and discontinue its participation in the project. Although the enterprise has invested its own resources to introduce polyol systems based on low-GWP blowing agents and sells such polyol systems to customers, the enterprise also sells HFC-based systems to some clients from non-Article 5 countries as they demand the use of HFC-based systems. Taking into account the market and commercial factors that related to all types of blowing agents, the enterprise has decided to supply HFC-based systems as the alternative as requested by some of their important clients.

Secretariat's comments

215. Upon further discussions, UNDP explained that Seal has developed, tested and is selling formulations using methyl formate for spray foam applications in the local market; in cases where clients expressly specify use of HFC-based blowing agents in their requirements primarily driven by technology

[32] As reported to the 83rd meeting, the enterprise Ice Con decided to stop its foam operations applications; UNDP would return unspent balances when submitting the fifth funding tranche request (decision 83/15(b)). Conversion of Ice Fab to methyl formate is ongoing; equipment supply is in process; trials to be undertaken by May 2020; completion is expected by September 2020. With regard to the remaining two enterprises, Tropical Marine and Vetter had converted to the selected technologies (i.e., water and methyl formate, respectively).

choices of the clients' management, the enterprise uses HFC-based formulations. Furthermore, while Seal could sell methyl formate-based formulations, in the current context, it would be unable to fully discontinue use of HFC-based formulations; as a result, it has expressed its preference to discontinue participation in the project and not request IOC amounting to about US $5,000.

216. The Secretariat requested information on whether the results of demonstration of low-GWP foam-blowing agents-based formulations (e.g., HFO-based formulations) in spray foam applications, including demonstration projects approved at the 76th meeting, could be used by the enterprise; UNDP informed that the enterprise is not pursuing these options as availability and cost-factors make HFO-based formulations unattractive.

Recommendation

217. The Executive Committee may wish:

(a) To note the report provided by UNDP on the status of use of different technologies and the challenges faced while adopting low-global-warming-potential (GWP) foam-blowing agents by enterprises that had been provided with assistance under stage I of the HCFC phase-out management plan (HPMP) for Trinidad and Tobago, contained in document UNEP/OzL.Pro/ExCom/84/22; and

(b) To request UNDP to monitor availability and use of low-GWP foam blowing agents in Trinidad and Tobago and to provide an update on the adoption of technology by the enterprises assisted in the foam sector, including Seal and Ice Fab, to the 86th meeting along with the fifth tranche request of stage I of the HPMP for Trinidad and Tobago.

Reports related to HPMPs

Indonesia: HCFC phase-out management plan (stage I – progress report and status report on the conversion of the RAC enterprises and PU foam conversion) (UNDP, UNIDO, World Bank, and the Government of Australia)

Background

218. On behalf of the Government of Indonesia, UNDP as the lead implementing agency, has submitted to the 84th meeting the annual progress report on the implementation of the work programme associated with the third and final tranche of the HPMP,[33] in line with decision 76/47(d), and a report on the status of enterprises temporarily manufacturing high global-warming potential GWP-based RAC equipment at enterprises that received funding to convert to low-GWP alternatives in line with decisions 77/35, 81/11(c), 82/30(e), and 83/22(c).

HCFC consumption

219. The Government of Indonesia reported a consumption of 235.56 ODP tonnes of HCFC in 2018, which is 27 per cent below the HPMP target of 323.12 ODP tonnes for 2018, and 42 per cent lower than the established baseline of 403.9 ODP tonnes.

220. The Government submitted sector consumption data under the 2018 country programme implementation report consistent with the data reported under Article 7 of the Montreal Protocol.

[33] The third and final of stage I of the HPMP was approved at the 76th meeting at a total cost of US $1,260,461, consisting of US $901,102, plus agency support costs of US $67,583 for UNDP, and US $271,420, plus agency support costs of US $20,356 for the World Bank.

Progress report on the implementation of the third and final tranche of the HPMP

Polyurethane foam sector

221. The PU foam sector plan has been completed. The enterprise Aneka Cool, which manufactured discontinuous (sandwich) PU foam panels for cold rooms units, and received assistance from the Multilateral Fund to convert its discontinuous line, decided to outsource sandwich panels and, therefore, US $60,500 associated with the conversion that had been partially disbursed to the enterprise would be recovered and returned to the Multilateral Fund at the 85th meeting. With this action, the PU foam sector has been completed; any remaining balances would be returned to the Multilateral Fund by the 85th meeting. The ban on imports of HCFC-141b in bulk and contained in imported pre-blended polyols is expected to be implemented by 1 January 2021, in line with decision 76/38(c).

RAC manufacturing sector

222. Stage I of the HPMP included conversion of 48 enterprises in the RAC manufacturing sector to low-GWP technologies. However, during implementation, 28 enterprises (16 in the AC sector and 12 in the commercial refrigeration sector) decided to convert to high GWP technology with their own resources, and returned US $3,134,216, plus agency support costs, to the Multilateral Fund.

Progress as of the 83rd meeting

223. At the 83rd meeting, it was reported that of the remaining 20 enterprises, only one (Panasonic) was manufacturing air conditioners based on HFC-32 technology. Eight large- and medium-sized enterprises had manufactured HFC-32-based prototype equipment, while eight small-sized enterprises are assemblers that work based on custom-made orders; at that time, no orders for HFC-32 based equipment had been received. Three additional manufacturing enterprises were still waiting for the market for HFC-32-based equipment to improve before undertaking their conversion. At the time, the 19 enterprises were manufacturing equipment based on high-GWP (principally R-410A, R-404A, and HFC-134a) refrigerants.

224. It was also reported that the reasons for the delay in the conversion and manufacturing of RAC equipment with the agreed technology by the enterprises were: limited commercial availability of HFC-32-based compressors and components at affordable prices; lack of demand in the local market for HFC-32-based equipment; and higher cost of HFC-32-based equipment compared to other equipment available in the country.

Report to the 84th meeting

225. UNDP attended the April 2019 China Refrigeration Expo, and held bilateral meetings with and site visits to compressor manufacturers and commercial AC manufacturers to survey the market and assess challenges to the introduction of HFC-32, leading to the following assessment:

(a) The compressor supply chain has changed since the review of the safety standards in China. A number of manufacturers based in China are marketing products and detailed catalogs are available for online consultation. In Indonesia, Emerson has already trained local distribution centers; in addition, Siam Compressor (Thailand) has also developed a line of HFC-32 compressors;

(b) The availability for small compressors (less than 6 horsepower (HP)) is established and stable, with many models being marketed. However, for medium to large sizes (8-60 HP), compressors in the region are mostly marketed by three suppliers (Emerson, Hitachi and Siam-Mitsubishi). In practical terms, although availability is improving, HFC-32

compressors for larger units tend to be more expensive (up to 30 per cent) than R-410A and R-407C compressors; and

(c) Improved installation, maintenance and servicing, as well as the availability in the market of replacement components, were critical to ensuring consumer acceptance of HFC-32-based equipment, and to reducing maintenance and servicing costs.

226. In order to determine a path forward, each enterprise took into account UNDP's assessment and the following considerations:

(a) Those enterprises that manufacture under the original equipment manufacturer (OEM) brand and upon order from the OEM, have no influence on the technology choice of the OEM. Orders come from a complex network (headquarters, regional offices and distributors owned by multinational enterprises), for specific models with a given refrigerant (typically, R-410A and R-407C);

(b) End-user decision-making is influenced by perceptions about safety, which leads to the uptake of equipment that does not use flammable refrigerants, and ease of installation, operation, maintenance and servicing. Currently, R-410A and R-407C units meet all the criteria for new buildings and retrofit of current installations. Regarding the former, large clients can have a disproportionate influence on the market as they may prefer established R-410A and R-407C technologies in order to harmonize with their currently installed base of equipment (e.g., a public enterprise that already has replacement parts and trained staff for commercial AC units with R-407C, may be reluctant to make a new procurement of HFC-32 units); and

(c) Although HFC-32 compressors and parts are (or are becoming) available, their price still tend to be 5-30 per cent higher than for high-GWP HFC compressors. Measures to encourage the uptake of HFC-32 equipment could be considered, such as awareness of energy efficiency gains or promotion of incentives; however, further policies to restrict the uptake of high-GWP alternatives could only be taken once Indonesia ratified the Kigali Amendment and the country's phase-down schedule started to be enforced.

227. Based on the above, the following enterprises[34] decided to remain in the project and convert their non-OEM manufacturing to HFC-32: in the commercial AC manufacturing sub-sector, Gita Mandiri Teknik, Fata Sarana Makmur, and Industri Tata Udari; and in the commercial refrigeration manufacturing sub-sector, Sumo Elco Mandiri, Alpine Cool Utama, and Anekacool Citratama. UNDP proposed that the proportion of approved incremental operating costs (IOCs) associated with manufacturing under the enterprise's brand would be released upon confirmation of manufacturing with HFC-32, while the proportion associated with OEM manufacturing would be returned to the Multilateral Fund to the 85th meeting.

228. In addition, the following two enterprises decided to remain in the project:

(a) Metropolitan Bayu Industri, a niche manufacturer of commercial ACs for specialized clients (e.g., health sector, clean rooms, heritage hotels, museums). The AC manufacturing line conversion to HFC-32 has been completed and the enterprise has built a prototype; however, further improvement in design is needed. UNDP therefore proposed to continue

[34] Excluding Panasonic, which had already converted to HFC-32 and was already manufacturing room ACs with that technology.

to provide technical assistance to improve design and manufacture of prototype unit(s), and to disburse IOCs when manufacturing with HFC-32 was initiated; and

(b) Rotaryana Prima, a manufacturer of refrigerators and freezers with a charge between 450 to 900 g for commercial and industrial kitchens. While the manufacturing line conversion to HFC-32 was completed, prototype units did not perform well. Based on the recent updates to the International Electrotechnical Commission Standard 60335-2-89, which allow a charge of up to 500 g of A3 refrigerants in self-contained commercial refrigeration cabinets, the enterprise decided to convert to HCs.

229. Table 12 summarizes IOCs to be disbursed and returned for enterprises manufacturing equipment with low-GWP alternatives.

Table 12: IOCs to be disbursed and returned for enterprises manufacturing equipment with low-GWP alternatives

Enterprise	Consumption (mt)	IOC (US $)	OEM Manufacturing*	To be disbursed (US $)	To be returned (US $)
Gita Mandiri Teknik	98.98	130,032	30	91,330	38,702
Fata Sarana Makmur	48.48	63,686	34	42,150	21,536
Industri Tata Udara	10.78	14,161	0	14,161	0
Sumo Elco Mandiri	28.6	56,020	35	36,520	19,500
Alpine Cool Utama	28.8	40,160	0	40,610	0
Anekacool Citratama	4.2	17,510	0	17,510	0
Metropolitan Bayu	10.88	14,287	0	14,287	0
Rotaryana Prima	19.12	25,296	0	25,296	0
Total	**250**	**361,152**	**22**	**281,864**	**79,738**

* Percentage of manufacturing in 2018 at the enterprise for an OEM.

230. In contrast, the following eleven enterprises decided to withdraw from the project and manufacture high-GWP-based equipment, with a total funding of US $764,842 that would be returned to the Fund at the 85th meeting:

(a) In the commercial refrigeration sub-sector, Mentari Metal Pratama, Polysari Citratama, and Inti Tunggal, with a total funding allocation of US $375,930 that had not been disbursed; and

(b) In the commercial refrigeration assembly sub-sector, Sabindo Refrigeration, Global Technic, AVIS Alpin Servis Tr, Aneka Froze Triutama, Graha Cool Technic, United Refrigeration, Gaya Technic Supply, and Ilthabi Mandiri Tech, with a total funding allocation of US $417,872, of which US $28,960 has been disbursed to develop a prototype (i.e., US $3,620 for each enterprise), and the balance US $388,912 would be recovered and returned to the Fund.

Servicing sector

231. The Government of Australia's component in the RAC servicing sector was completed as reported under the 2018 progress report. There were no remaining balances.

Project management unit (PMU)

232. A total of US $450,000 was allocated to the PMU, of which US $434,200 had been disbursed. The remaining US $15,800 will be disbursed by 31 December 2020 to continue the following activities:

(a) Administrative and operational support for technical assistance activities;

(b) Overall management of the implementation of investment projects;

(c) Organization of missions, meetings and technical visits to enterprises;

(d) Preparation of periodic reports and reporting to the Project Steering Committee, the Government of Indonesia and the Multilateral Fund;

(e) Verification of project implementation performance, achievement of milestones, field verification of enterprises;

(f) Day-to-day administration of the stage I activities (managerial and operational); and

(g) Budget and financial control of approved funds.

Level of fund disbursement

233. As of November 2019, of the US $12,692,684 approved, US $11,791,079 (93 per cent) had been disbursed (US $8,048,258 for UNDP, US $777,208 for UNIDO, US $2,665,613 for the World Bank, and US $300,000 for the Government of Australia) as shown in Table 13.

Table 13: Financial report of stage I of the HPMP for Indonesia (US $)

Agency	Approved (US $)	Disbursed (US $)	Disbursement rate (%)
UNDP	8,901,102*	8,048,258*,**	90
UNIDO	777,395	777,208	100
World Bank	2,714,187***	2,665,613***	98
Government of Australia	300,000	300,000	100
Total	**12,692,684**	**11,791,079**	**93**

* Including US $3,134,216 returned at the 76th meeting.
** Including US $349,900 disbursed to Aneka Cool and eight enterprises in the commercial refrigeration assembly sub-sector that would be returned to the 85th meeting.
*** Including US $35,000 returned at the 81st meeting and US $301,539 returned at the 83rd meeting.

Extension of stage I

234. In line with decision 82/30(g)(i), and in order to allow the remaining enterprises that had decided to remain in the project to manufacture low-GWP-based equipment, the Government of Indonesia proposed to extend the implementation of stage I of the HPMP to 31 December 2020.

Secretariat's comments

235. The Secretariat notes with appreciation the efforts of the Government, industry and UNDP to address the challenges in introducing low-GWP equipment into the market. The Secretariat considers the proposal by UNDP to be a meaningful solution by allowing those enterprises that can continue to participate in the project to do so. The Secretariat considers the change of technology at Rotaryana Prima from HFC-32 to HCs, at no additional cost to the Multilateral Fund, is in line with decision 83/22(c).[35]

236. On that basis, the Secretariat supports the proposed extension of stage I of the HPMP to 31 December 2020. The Secretariat suggested that the disbursement of IOCs could be based on the actual sales of low-GWP equipment or purchase of low-GWP compressors that take place in 2021, as long as the associated disbursement takes place no later than 31 December 2021.

[35] Until the technology originally selected or another low-GWP technology.

237. Notwithstanding best efforts by the Government and UNDP, enterprises that will manufacture both HFC-32-based equipment under their enterprises' brands and high-GWP-based equipment from orders from OEMs, are likely to face particular challenges in manufacturing (and selling in the market) their HFC-32-based equipment. In order to monitor the progress in introducing into the market of low-GWP based equipment, it was agreed that UNDP would provide aggregated data on the sales of HFC-32-based, HC-based and high-GWP-based equipment manufactured by the enterprises as part of the annual progress reports.

238. Given that the foam and servicing sectors had been completed, the Secretariat suggested that future annual progress reports on the implementation of the stage I of the HPMP, which would be submitted through the completion of the project, only include the report by UNDP on the progress in the implementation of the RAC manufacturing sector, including the disbursement of IOCs to beneficiary enterprises, and the activities that will be undertaken by the PMU.

239. Decision 82/30(g)(ii) notes that the Executive Committee could consider the request for an extension of stage I of the HPMP at the last meeting of 2019 and, if it were to be agreed, adjustments would be made to the starting point for sustained aggregate reductions for HFC consumption for the country, as noted in document UNEP/OzL.Pro/ExCom/82/20. In this regard, the Secretariat noted:

(a) For those RAC manufacturing enterprises that returned the funding associated with their conversion, their associated consumption of HFCs would be eligible for funding under an HFC phase-down, in line with paragraph 18(d) of decision XXVIII/2;

(b) For those RAC manufacturing enterprises that converted to HFC-32, their associated consumption of HFC-32 would be eligible for funding under an HFC phase-down, in line with paragraph 18(c) of decision XXVIII/2;

(c) Some RAC manufacturing enterprises that converted to HFC-32 would be manufacturing both HFC-32-based equipment, under their enterprises' brands, and high-GWP-based equipment, from orders from OEMs, on their single production line. The IOCs associated with the manufacturing for OEMs would be returned to the Multilateral Fund. The Secretariat is unclear on how the eligibility of the consumption, and hence inclusion in the starting point for HFCs, of high-GWP HFCs associated with the OEM portion of those enterprises that received funding under the project would be addressed.

240. On this issue, the Government of Indonesia considers that no reduction in HFC consumption eligible for funding should apply as those enterprises have no influence on the decision-making and market strategies of OEMs, which are non-Article 5 owned multinational companies. Moreover, OEM contracts with the local manufacturers do not stipulate the equipment to be manufactured yearly, but varies by OEM demand; establishing an *a priori* reduction in consumption would not take into account dynamics in the market. Moreover, as a methodology for establishing the starting point for HFCs had not yet been decided, it was not fair to impose such reductions for reasons that were out of the control of the Government and manufacturers.

Recommendation

241. The Executive Committee may wish to:

(a) Note the update on enterprise conversion of technology and the progress report on the implementation of stage I of the HCFC phase-out management plan (HPMP) for Indonesia, submitted by UNDP, UNIDO, the World Bank, and the Government of Australia, contained in document UNEP/OzL.Pro/ExCom/84/22;

(b) Note that the following enterprises had decided to withdraw from stage I of the HPMP for Indonesia, and the funding associated the enterprises would be returned to the 85th meeting:

(i) In the commercial refrigeration sector, Mentari Metal Pratama, Polysari Citratama, and Inti Tunggal, with a return of US $375,930, plus agency support costs of US $28,195 for UNDP; and

(ii) In the commercial refrigeration assembly sub-sector, Sabindo Refrigeration, Global Technic, AVIS Alpin Servis Tr, Aneka Froze Triutama, Graha Cool Technic, United Refrigeration, Gaya Technic Supply, and Ilthabi Mandiri Tech, with a return of US $388,912, plus agency support costs of US $29,168 for UNDP;

(c) Note that the enterprise Aneka Cool decided to outsource its polyurethane (PU) foam manufacturing and, therefore, US $60,500 associated with the enterprise would be returned to the 85th meeting;

(d) Note that Gita Mandrin Teknik, Fata Sarana Makmur, and Sumo Elco Mandiri had decided to covert their production lines to HFC-32 technology and would manufacture HFC-32-based equipment under their enterprises' brands and high-GWP-based equipment upon orders from original equipment manufacturers for which US $79,738, plus agency support costs of US $5,980 for UNDP has been deducted from the project costs and would be returned to the 85th meeting;

(e) To approve the change of technology at Rotaryana Prima, a manufacturer of refrigerators and freezers, from HFC-32 to hydrocarbons at no additional cost to the Multilateral Fund;

(f) To agree to extend the completion date of stage I of the HPMP for Indonesia until 31 December 2020, on the understanding that:

(i) Any remaining balances from the PU foam sector would be returned to the 85th meeting; and

(ii) The Government of Indonesia and UNDP would continue to submit, on annual basis, through the completion of the project, progress reports on the implementation of stage I of the HPMP that would include aggregated information on the sales of low-GWP-based and high-GWP-based equipment manufactured by the enterprises participating in the project, and would submit the project completion report by 30 June 2021; and

(g) To consider the potential impact to the starting point for sustained aggregate reductions for HFC consumption for the country in light of the information provided in paragraphs 239 and 240 of document UNEP/OzL.Pro/ExCom/84/22.

DEMONSTRATION OF LOW-COST OPTIONS FOR THE CONVERSION TO NON-ODS TECHNOLOGIES IN PU FOAMS AT VERY SMALL USERS (VSU)

OCTOBER 2019

FINAL REPORT

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Disclaimer

This demonstration project in Egypt was implemented by UNDP and the Government of Egypt.

VSUs are in this study defined as foam enterprises (end-users) that consumes less than 0.5 MT of HCFC 141b per year in the foam manufacturing process. Many VSUs practice hand-mix which is an operation deemed an industrial hygienic and health concern as no emission control or personal protection is used. Therefore, there is a need to improve current manufacturing practices for VSUs.

The finding of the project could be helpful for the implementation of programs designed for VSUs. The specific focus in this study is on VSUs and conclusions and recommendations cannot be extrapolated to non-VSUs and the applicability will also depend on local market conditions (availability of consumables and spare parts, after sale service, maintenance of the equipment, training, assistance from the local system houses, etc.).

UNDP does not in any way endorse the equipment (type, brand, manufacturers, etc.) that was tested in this study. The results cannot be used for any marketing purposes by public and private entities.

EXECUTIVE SUMMARY

This project for the Government of Egypt is based on ExCom Decision 72/40, offering a special window for demonstration projects and, at the same time, completing global efforts to make the ODS phaseout for SMEs (small and medium enterprises) and VSUs (very small users) in the foam industry more feasible and effective.

In Egypt, very small users usually account for less than a half ton of annual use of HCFCs on annual basis with infrequent services in foam blowing and application in the field. In this respect, it has been always difficult to achieve compliance for VSUs because of cost thresholds. Compounding the situation is that there are at least 8 viable options to replace HCFCs in PU foam, from which around five apply to Spray/PIP (Pour-In-Place). Some of these change equipment requirements—and prices. This report summarizes previous actions that can—and mostly have already—been taken to lower the cost threshold for this group of ODS users through following approaches:

- Management : Use local experts; work with group projects
- Technology : Evaluate and validate new technologies
- Equipment : Use more retrofit; develop affordable equipment
- Trials/Tests : Get suppliers (system houses) involved
- IOCs : Apply the lowest cost technology feasible in the national context

While all these approaches have led to significant cost savings, it was felt that more can be done to introduce very simple and affordable equipment for VSUs to replace current practice of hand mix for reasons of health and industrial hygiene for very low and infrequent ODS users. The purpose of this project therefore is to:

- Optimize and validate low cost chemical and equipment options for ODS phaseout at VSUs;
- Demonstrate these in downstream operations;
- Transfer the technology to interested system houses and other users around the world, and
- Use the outcome in existing projects thus improving the success of these projects.

The Project has attempted to economize costs for VSUs into three ways:

- For infrequent PU users, make available the option of prepackaged PU systems that are sealed, have a long lifetime and can be used upon demand. Alternatively design properly sized day tank options with moisture protection for PIP (pour-in-place) equipment (currently such equipment operates mostly from drums);
- Develop easy-to-use and maintain, low-cost foam dispensing units for low volume PIP/Spray Rigid Foam applications that demand low electrical power or no power at all for VSUs;
- Develop low-cost variable ratio foam dispensers for PIP rigid or integral skin applications for VSUs.

The equipment part of the project was be staged as follows:

1. The selection of (a) producer/installer/service provider(s) based on bidding through requests for proposals;
2. Review of substantially responsive offerings, followed by

- Negotiations with selected providers on modifications to reach potential cost savings (the goal is to reach a price level below US$ 10,000 for a PIP dispenser and US$ 30,000 for ISF equipment);
- Selection of equipment (one high-pressure, one low-pressure; one low-pressure variable ratio (ISF);

3. Procurement of the most promising equipment;
4. Validation of this equipment in the (Egyptian) market;
5. Formulation of a report to UNDP/EEAA/MFS on outcome, conclusions, limitations and recommendations, taking into account ExCom stipulations from a previous, interim report.

The implementation of the chemical part of the project was envisioned as follows:

1. Selection of a system house willing to cooperate on this approach;
2. Identification of existing prepackaged systems with stable storage life-time/easy component perforation when in need for field application. One company making these is in the USA but there might be more companies on the global market. Evaluate this technology at the selected system house;
3. If successful, install a local component facility and/or assembly facility;
4. Organization of trials/tests to assure that the equipment is suitable for the earmarked ODS phaseout technologies;
5. Incorporation of the outcome in the mentioned report in the equipment section;
6. While the project includes trials/tests, these will be conducted to the extent possible at system house development facilities and with one or two selected customers. Industrialization should take place through National Phaseout Plans.

The project was substantially implemented as designed through a Taskforce consisting of a dedicated project team, including an International Expert and a National Expert. The three system houses in Egypt, Baalbaki Egypt for Chemical Industries (BCI), Dow Middle-East (DME) and Technocom Commercial Agencies (TCA) cooperated closely with the Taskforce in evaluating the selected equipment. The prices of the selected equipment showed the following range of indicative prices compared to currently used equipment as follows, excluding delivery, warranty and other associated costs:

Equipment Category	Price	Notes
PIP Dispenser (Pumer, Tecmac)	From ca. US$ 5,500- 7,000	FOB[1]
SPF Dispenser (Pumer, Tecmac)	From ca. US$ 5,500- 7,000	FOB; no spray package included
ISF Dispenser (Transtecnica)	From ca. US$ 20,000	FOB

*Technically Pumer can be used also for PIP/SPF however, because it's low pressure it will be an air/PU mixture

From each category, one dispenser was purchased and placed for evaluation at the following Egyptian system houses.

Only a small number of VSUs (customers of the system houses) participated in field test due to limited number of dispensers available, and time available to complete the field tests.

An Agreement was signed to evaluate the dispenser in development departments of the system houses as well as with selected customers. The outcome of this evaluation can be summarized as follows:

[1] FOB = Price of equipment before shipment

Systems house	Equipment tested	Blowing agent used	Results of testing	Tested with end-user? (Y/N)
DOW (DME)	PUMER	ALL WATER BASED	NEGATIVE	Y*
BAALBAKI (BCI)	TECMAC	ALL WATER BASED METHYL FORMATE	NEGATIVE POSITIVE	Y*
TECHNOCOM (TCA)	TRANSTECNICA	HFO-1233	POSITIVE	Y*

*The end users (VSU) have no equipment and only a small number (one per each system house) of them participated due to time remaining in project's implementation. This can continue as part of the HPMP programme and its small users' component.

Analysis showed that the BCI and DME systems had both 1:1.5 ratio's (Taskforce had requested for 1:1) while the Pumer and Tecmac equipment operated on 1:1 (fixed) ratio. In other words, systems and dispensers were "incompatible". While the issue could have been resolved with a modification of the pump, the team asked the pertinent manufacturers if they could include "true" variable ratio so that they would be able to cope with all systems. This was the case with one supplier so that all available systems can be satisfactorily processed.

The difference in ratio was addressed with suppliers of equipment as well as the system houses. One supplier, Tecmac, can provide variable ratio dispensers immediately and such equipment has already been pursued in the mean time and can be supplied end of 2019 or beginning of 2020. Another supplier, Pumer, is prototyping a concept and expects to have a solution by December 2019, if successful. The team looked also into why there is need to deviate from the standard PIP ratio. From Dow and Baalbaki SHs, which offered water-based PIP systems based on 1:1.5 ratio, Baalbaki SH offered a methyl formate based 1:1 system, while Dow MidEast SH has been initiating development of such a system based on an HFO option.

It was therefore determined feels that the issue of diverging ratio's is addressed through:

- the availability of variable ratio dispenser from the same suppliers in the same price range, and
- using systems based on methyl formate/methylal (HCOs) and HFOs.

Further trials of all these systems could be conducted as part of the Egyptian HPMP programme and its VSU component.

As for the chemical packages, SHs showed no interest in pre-packaged chemicals. They see these:

- As a specialized application for back-fill around (electrical) posts and fences than as a way to extend the chemical life-time;
- While the life-time can be extended from 6 months to 2 years, they expect that this does not make up for larger chemical losses and of packaging materials;
- As an application that is not fit for a developing country. The main advantage of PU foam as back-fill material instead of concrete is time-saving through faster curing. This is interesting for developed countries with high wages but not for countries where labor is relatively cheap;
- Finally, the investment will be too high in view of the risk of non-acceptance by potential clients.

The option to offer different sizes of tanks and install silica gel breathers on the MDI tank (to avoid humidity in tanks) was, however seen as positive and was integrated in the dispenser specifications.

A number of conclusions of the entire project applicable for the VSU sector in Egypt is as follows:

Cost Evaluation (excluding delivery, certification, maintenance and servicing by warranty):

- **A basic, sole purpose, fixed ratio (**1:1/1:1.5/1.7**) PIP dispenser can now be purchased for starting US$ 5,500 rather than around US$ 10,000 or more.**
- **A basic, fixed ratio (**1:1/1:1.5/1.7) **Spray/PIP dispenser can be purchased for starting from US$ 7,000 rather than US$ 1510,000 or more.**
- **A basic, variable ratio Spray/PIP dispenser can be purchased starting from US$ 7,000 rather than US$ 15,000 or more.**
- **A basic ISF dispenser can be purchased for US$ 18,480 instead of US$ 25,000-30,000.**
- **Local or regional servicing/maintenance representation, spare parts availability, trouble-shooting speed and quality of support, training are important elements in the consideration**

Packaged Chemicals

Attempts to introduce smaller, packaged chemicals were not successful. It is better to install for PIP operations smaller sized tanks with silica gel breathers, to control humidity in the tank and to assure that the master drum is properly closed after filling.

1. INTRODUCTION

This project was submitted in response to the ExCom's Decision 72/40. The relevant part of this decision states as follows:

> *(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 UNEP/OzL.Pro/ExCom/72/47 36 management plans (HPMPs);*
>
> *f. The project proposals should promote energy efficiency improvements, where relevant, and address other environmental impacts;*

While the foam sector did not qualify for prioritization, the ExCom nevertheless approved the project, recognizing the need for effective implementation of technology transfer for very small users (VSUs), specifically in Egypt and where similar situations could occur.

This report first reviews **Past Efforts** made in this respect during the CFC phaseout period as well as during the HCFC phaseout over the last ten years. It is followed by chapters on **Project Design, Implementation/Outcomes, Conclusions** and **Limitations**.

2. HISTORY OF PAST EFFORTS TO LOWER COST THRESHOLDS

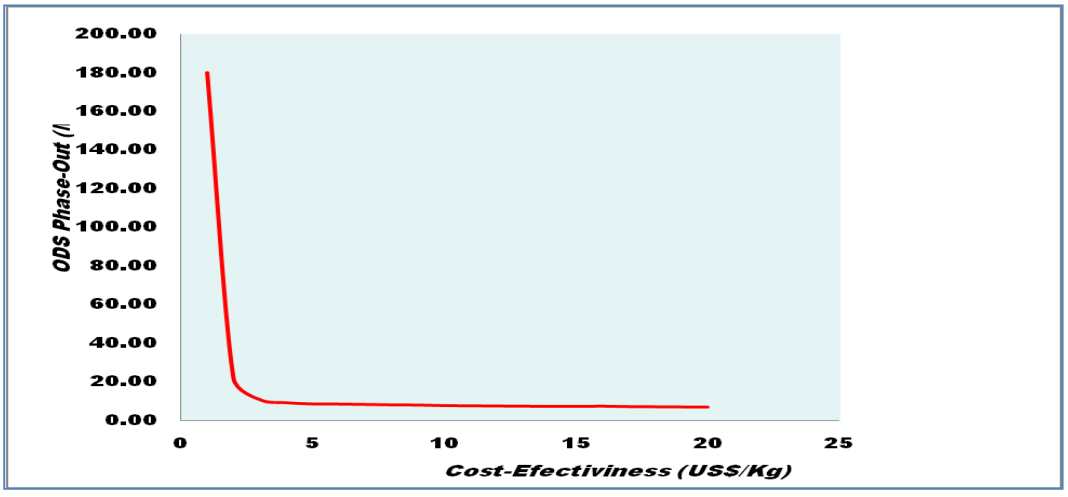
The stated objective of this projects is to:

- Optimize and validate low cost chemical and equipment options for ODS phaseout at VSUs;
- Demonstrate these in downstream operations;
- Transfer the technology to interested system houses and other users around the world, and
- Use the outcome in existing projects thus, at no additional costs, improving the success of these projects.

MLF projects are since 1993 subject to Cost-Effectiveness (C/E) Thresholds. In foam sector, these thresholds are based on the conversion cost for consumption volumes at large and medium size enterprises, and therefore are difficult to meet the funding demand by very small users (VSUs). Many VSUs practice hand-mix, an operation deemed an industrial hygienic concern as no emission control or personal protection is used. These companies need low cost/easy to use equipment that meets applicable limits on cost-effectiveness. Others use infrequently PU foams and have problems with inventories in view of the relatively short life-time of existing systems (3-6 months).

A first attempt to deal fairly and effectively with small users (SMEs) was a 1995 study by UNDP called ***"Determination of Cost-Effective Phaseout Approaches for Enterprises with relatively Small ODS Use"***.

The Multilateral Fund Secretariat (MFS) prepared, based on this study, Document 17/55 (June 30, 1995) called "Strategy Paper for Small Foam producing Enterprises". It recommended dividing projects by size and foam category; to assign to large and medium sized enterprises specific C/E thresholds and to make the approval of small projects subject to specific cost containment procedures. This would have addressed the issue. In developing the cost guidelines of the HCFC phase-out, the Executive Committee of the MLF decided to increase the cost-effectiveness threshold (CE) for foam SMEs up to 40% above the $7.83/kg CE when needed for the introduction of the low GWP alternatives (Desicion74/50). Although this policy helped to address the financial burden for SMEs to some extent, however, the cost challenge remains for very small users (VSU) since only a few thousand dollars are available for them and the conversion to the low GWP alternatives including the costs of complicated equipment and formula, safety measure, increased IOC for specific alternative and necessary training. Essential is to realize that the cost effectiveness increases exponentially when the consumption decreases, as following graph shows:



Following approaches have been attempted by to obtain cost containment when dealing with SMEs:

- Management : Use local experts; work with group projects
- Technology : Evaluate and validate new technologies
- Equipment : Use more retrofit; develop low-cost equipment
- Trials/Tests : Get suppliers involved, often combined with group projects
- IOCs : Apply the lowest cost technology

The following is a review of cost optimizing efforts in these categories:

Management - The largest success has been created by ODS phase-out projects using PU System Houses as project managers. This approach provided not only local project management but also larger economy of scale and supplier-arranged trials/tests.

Technology - The validation of new technologies was almost equally successful. In the foam sector, ten (10) demonstration projects to evaluate new—or to modify existing—technologies were conducted in the last several years. Through this program, methyl formate (MF) and methylal (ML)—both oxygenated hydrocarbons or HCOs— are now in application in a number of countries and in several of these countries by now conversions have been successfully completed. Some system houses are able to offer preblended hydrocarbons, including to smaller users in spray foam, with respective safety measures to be followed. While some of the demonstrated technologies suffer under economic constraints, such as license fees (supercritical CO_2) or high operating costs (HFOs), the program in general has contributed with new knowledge on low GWP HCFC replacement technologies.

Equipment - Attempts to optimize equipment costs had mixed results. The following summarized these attempts:

- Retrofit of equipment has optimized costs when using water, MF or ML technologies;
- Renting out equipment to very small users (VSUs) was not proved successful because of frequent mishandling of equipment as well as chemicals;
- An attempt to import low cost equipment was not fully successful because of lack of training and local equipment service (availability of consumables, spare parts and after sale service locally or regionally);
- An attempt to optimize costs of ISF equipment for VSUs required further fine-tuning;
- Infrequent use—in particular, when combined with bad maintenance—leads to aging issues with chemicals and maintenance issues.

Trials/Tests – through involvement of suppliers (system houses), trials could be lowered in price and amounts, while testing is generally provided through the supplier.

IOCs – While the freedom of choice between the available zero ODP/low GWP technology is maintained, the IOC is calculated on the lowest cost applicable technology.

Compounding the precarious position of the VSUs is the multitude of HCFC phaseout options:

- There were two (2) options to phase out CFCs in rigid PU foams—but there are eight (8) options to phase-out HCFCs in PU foams.
- Just one (1) of these CFC phase out options could be applied to Spray/PIP but all eight HCFC phase out options apply to Spray/PIP.

This leads to the offering of PU systems in the market that are more complicated in equipment requirements and therefore, more costly. Examples are different for different Polyol/MDI ratios—requiring variable output ratios—or the use of flammable substances, requiring emission exhaust or even explosion proof equipment. Equipment prices over-proportionally increase through these requirements for higher sophistication.

Clearly, and in spite of past successes, there was still a need to find solutions for very small users (VSUs)—in particular for PIP manufacturers who have the smallest volumes of consumption. The purpose of the project was to identify more simple, affordable equipment applicable for VSUs requirements and improved life-time for chemicals in case of low/sporadic use.

3. PROJECT DESIGN

The Project was generally designed into three stages:

- For infrequent PU users, make available the option of pre-packaging PU systems that are sealed, have a long life-time and can be used upon demand. Alternatively, develop properly sized day tank options with humidity control for PIP equipment;
- Develop specifications for a basic, easy-to-use and maintain lower cost foam dispensing unit for PIP/Spray rigid foam applications;
- Develop specification for a low-cost, variable ratio foam dispenser for rigid foam PIP/Spray foam and integral skin foam applications.

The equipment part of the project was be staged as follows:

- Develop specifications for the mentioned dispensers to be used for bidding by existing suppliers;
- Select equipment through open bidding;
- Purchase and validate the most promising equipment;
- Report to UNDP/EEAA/MFS on the outcome, conclusions and recommendations.

Interested equipment suppliers that could potentially meet requirements from the project are listed below as prospective bidders to provide such services. It was emphasized that selection was subject to applicable procurement procedures which included their display on the UNDP web-site and allowed therefore other, not yet identified bidders as well to apply.

- Pumer	Belo Horizonte	Brazil	RPF only
-Transtecnica	Porto Alegro	Brazil	ISF and RPF
- Cannon	Milano	Italy	ISF and RPF
- Zadro	Guadalajara	Mexico	ISF only
- Tec Mac	Milano	Italy	ISF and RPF
- BMK	St. Louis	USA	RPF only

Further, the implementation of the chemical part of the project was envisioned as follows:

1. Selection of a system house willing to cooperate on this approach;
2. Identification of existing pre-packaged systems with stable storage life-time/easy component perforation when in need for field application. One company making these in the USA but there could be more companies on the global market. Evaluate this technology at the selected system house;
3. If successful, install a local component facility and/or assembly facility;
4. Conduct trials/tests to assure that the equipment is suitable for the proposed technologies;
5. Include the outcome in the mentioned report in the equipment section.

While the project includes trials/tests, these will be conducted to the extent possible at system house development facilities and with one or two selected customers. Industrialization should take place through National Phaseout Plans.

3.1. EQUIPMENT

VSUs overwhelmingly produce products consisting of rigid PU foam. There is, however, also some production of integral skin foam (ISF). Past experience has shown that combining these two applications

in one dosing machine will not lead to lower costs. The machine requirements are too different to be combined. In addition, many VSUs do—or would like to—combine PIP with Spray and are willing, in case they are eligible for PIP only, to pay the cost difference. Therefore, low cost options were pursued in the following categories:

- PIP only for rigid PU foam
- Spray/PIP for rigid PU foam
- Pouring for ISF foams

Technical specifications will be developed for each of these machine groups. For each of these categories, potential suppliers will be identified world wide and, if interested asked for quotations.

3.2. CHEMICALS

Some VSUs produce infrequently for products such as molds, setting electrical or fence poles and other construction applications, etc. Some require small, pre-determined amounts of chemical to set a pole—much like cement but much faster in solidifying, some others require larger amounts but irregularly. Because of irregular, in field use, there are problems with chemical life-time—now typically 3-6 months when stored properly but much shorter in field use. A life-time of at least one year is desired. The Taskforce located a company that manufactures pre-packaged chemicals for pole setting applications with a life-time of up to 2 years and intended to bring this technology to the attention of existing system houses that were interested.

But there are other options as well. The prevailing current equipment at this time is the Spray equipment used for in-place pouring (PIP). They are fed from 200 l barrels—two barrels at a time, Polyol blend and MDI—through drum pumps. Because 400 l is a large amount, these drums are exposed to the atmosphere for a long time allowing oxidation, hydrolysis and MDI to react. This shortens the life-time of material considerably. Introducing day-tanks, sized for the type or application and fitted with silicone dryers would go a long way in protecting these chemicals better and prolonging the useful life-time. Introducing smaller drums might work also in some applications, as will better procedures (protected vents on drums, etc.).

In this respect, it was proposed to discuss these options with System Houses and their end-users before developing equipment specifications or specific chemical packaging systems.

3.3. ESTIMATED POTENTIAL PROJECT IMPACT

Depending of the stage of industrial development and the population size of a country, VSUs' market share in foam applications can range from 5% to more than 30%.

It was proposed to implement this programme in Egypt, since system houses are highly developed there, and a large number of VSUs are present on the market.

The Egyptian HPMP Stage I made a reference that "from available information it has been determined that "Micro Users" (=*VSUs*) account for 22.3 t HCFC-141b and, assuming an average use of 250 kg/y per company, include up to 100 companies", so there was sufficient market for trials, tests and equipment validation.

The current demonstration project contributes to a complementary phase-out of 4.4 ODP tons at VSUs unaccounted in HPMP-I and further researched as potential additional VSUs under HPMP-II preparation process.

3.4. CHOICE OF HCFC REPLACEMENT TECHNOLOGY

Foam dispensers are based on blending of two reactive components: isocyanate, and polyol blend. The polyol blend includes polyol as the main component but also other, minor, components such as blowing agent(s), stabilizer, catalysts etc. When blended, this leads to a controlled blowing and polymerization reaction, resulting in polyurethane foam.

The foam dispenser poses in principle no restriction on the type of blowing agent. This implies that any HCFC replacement can be used. However, there are safety considerations to be taken into account. Based on such considerations, flammable systems have in general been avoided unless special safety features have been incorporated. However, one cannot take the flammability of a pure component to predict the flammability of a blend or mixture. If the blowing agents are water, methyl formate (up to 5.5%), methylal (up to 5%), HFCs or HFOs—or combinations of these—then the blend is non-flammable. If the blend contains hydrocarbons (HCs), then the result is, as a rule, flammable with resulting safety pre-cautions required to be in place. Methyl formate and methylal blends, if properly prepared, can thus be treated the same way as water, HFCs and HFOs. As blends are prepared by System Houses, these have to take safety precautions when blending the original components.

A new development changed this situation: pre-blending of HCs at system house level. Up to recent years, the normal procedure would be that the end processor had to blend hydrocarbons in-house. Some exceptions were discovered in the market where the end processor, to save the costly pre-blending installation, received pre-blended HC systems (Bayer) or injected HCs directly in the mixing head (Elastogran/BASF). These approaches were analyzed in a previous pilot project in Egypt and concluded that both approaches are feasible and can save costs.

4. PROJECT IMPLEMENTATION AND OUTCOME

4.1. EQUIPMENT

A taskforce consisting of one person delegated by EEAA, and two experts – national and international from the project team, was handed the task of implementing this project.

The taskforce first contacted all the known equipment suppliers that had shown interest in cooperating on this project. With their input, technical specifications were prepared based on which the procurement process on a basis of a bidding was conducted. **Attachment-2** shows these specifications.

The invitation to bid was sent to all these suppliers, and, in addition, published on a procurement web-site. After a technical and a price evaluation, the following equipment was selected (prices determined for this regional location exclude delivery, warranty, servicing support etc):

- PIP dispenser for rigid PU foam from US$ 5,500
- Spray/PIP dispenser for rigid PU foam from US$ 7,000
- Pouring dispenser for ISF foams from US$ 20,000

From each category, one dispenser was purchased and placed for evaluation at the following Egyptian system houses:

- Baalbaki Chemical Industries (BCI) Tecmac Dispenser (Spray/PIP)
- Dow-Middle East (DME) Pumer Dispenser (PIP)
- Technocom Commercial Agencies (TCA) Transtecnica Dispenser (ISF)

An Evaluation Agreement was signed in which the system houses agree to evaluate the dispenser in their development department as well as with selected customers in the field.

Regretfully, there were some transportation and connection damages that delayed installation and start-up of the equipment. Ultimately, all equipment was functioning, and the evaluation process could be conducted. The outcome of this evaluation can be summarized as follows:

Systems house	Equipment tested	Blowing agent used	Results of testing	Tested with end-user? (Y/N)
DOW (DME)	PUMER	ALL WATER BASED	NEGATIVE	Y*
BAALBAKI (BCI)	TECMAC	ALL WATER BASED METHYL FORMATE	NEGATIVE POSITIVE	Y*
TECHNOCOM (TCA)	TRANSTECNICA	HFO-1233	POSITIVE	Y*

*The end users (VSU) have no equipment and only a small number (one per each system house) of them participated due to time remaining in project's implementation. This can continue as part of the HPMP programme and its small users' component.

Subsequent analysis determined the BCI and DME systems had a 1:1.5 ratio by volume (despite the project asked for 1:1—but it was their standard Non-HCFC PIP system). The Pumer and Tecmac equipment

operated on 1:1 (fixed) ratio by volume. In other words, systems and dispensers were "incompatible". While the issue could have been resolved with a modification, the project asked the pertinent manufacturers if they could include variable ratio so that they would be able to cope with all systems. This was the case for Tecmac, and such a machine was purchased to verify the statement. However, as the variable system is known and proven, it is expected that this equipment can process satisfactory with all locally available systems. Pumer is developing such a modification.

This incident brought to light an important fact: the need for variable ratio under the HCFC phase-out program. While under the CFC phaseout program there was no change in ratio needed for PIP applications, under the HCFC program this appears to be advisable or even essential. In particular, for all-water-based formulations the need for more MDI leads to ratios of between 1:1.5 and 1:1.7. This is not the case for HCO and HFO formulations so, if a processor wants to keep his supply options open, having variable ratio on his/her foam equipment is essential. The Transtecnica dispenser has this feature, but the Pumer and Tecmac dispensers - not.

Following other comments do apply, too:

- The simplified equipment from **Pumer** is, despite being the lowest price, is amazingly sturdy. Set-up instructions were provided by video—which was easy but did not work well with trouble shooting. The dispenser works pneumatically. The foam at BCI and DME (water-based) was too soft and shrunk. However, at TCA the foam was perfect: fine, closed cells, firm to the touch and no shrinkage. The implementation team concluded to system issues at BCI and DME. It turned out that the system required a 1:1.5 ratio while the dispenser provides 1:1 (all by volume). This is fine for hand mixed foam, where the ratio can adapt (manually) easily—but not for a dispenser. Pumer can provide a different pump, suited for 1:1.5 ratio but that defeats the purpose (complicated, not suited for 1:1 systems, more expensive). It was already concluded that, where the market offers different ratios for the same application—based on different phaseout technologies—variable ratio is needed. The Pumer's option is not considered as suited for such markets. Instead, it is suited for "homogenous" VSU markets.

- The **Tecmac**'s equipment was developed from a more expensive dispenser with more complex technical features available earlier. The machine worked mechanically well in trials. Exactly the same experience as with Pumer equipment was faced—and the same conclusion was drawn—with the Tecmac dispenser. However, in this case, the solution was easy. The producer can offer—and offered—the same dispenser with variable ratio at virtually the same price. Therefore, such equipment is universally suited for the VSU market.

- The **Transtecnica's** reduced specification dispenser is earmarked for ISF as well as RPF applications. It is well designed and sturdy. It performed well with all systems. When using high viscous (ISF) systems, prior calibration is required (pump slip). It is the most expensive dispenser of the three and probable only affordable under MLF funding for companies that produce ISF or with a large counterpart funding. But, the Transtecnica dispenser is suited for all applications. If used for spray, the user should realize that it generates PU/air laydown which is more irregular than airless laydown.

4.2. CHEMICALS

From the beginning, system houses showed scant interest in pre-packaged chemicals. They see this:

- Rather as a specialized application for back-fill around (electrical) posts and fences than as a way to extend the chemical life time;

- While the life time can be extended from 6 months to 2 years, they expect that this does not make up for larger chemical losses and of packaging materials;
- They also view this as an application that is not fit for a developing country. The main advantage of PU as back-fill material, instead of concrete, is time saving through faster curing. This is interesting for developed countries with high wages but not for countries where labor is relatively cheap;
- The related investment as too high in view of the risk of non-acceptance of these systems by end-users.

A visit at a company in North America, where such product is made, confirmed the high related investment and the specialized application for back-filling (where the packaging is integrated in the back-fill and no waste is created). It was decided not to spend remaining funding in further pursuing this part of the project.

The option to offer different sizes of tanks and install silica gel breathers on the MDI tank was integrated in the dispenser specification. The silica gel keeps the humidity out and the tanks allow to keep the drums closed.

5. CONCLUSIONS and LIMITATIONS

From the results received for the VSU trials compared to current pricing, it was determined that:

- In Egypt, very small users usually account for less than a half ton or lower of HCFCs on annual basis with infrequent services in foam blowing and application in the field. Other interested countries should determine applicability of the findings of the report to their conditions, and VSU markets, if they exist.

- Minimum-level technical specifications for dispensers were developed and only basic features required for a PIP, PIP/Spray and ISF works were left as compared to regular models of same equipment (with no delivery, warranty and other costs included):

    - A basic, sole purpose, fixed rate PIP dispenser can now be purchased from US$ 5,500 (before shipment). The average current market price is around US$ 10,000 or more.
    - A basic Spray/PIP dispenser with variable ratio can now be purchased from US$ 7,000 and higher (before shipment). The average current market price is US$ 15,000 or more.
    - A basic ISF dispenser can now be purchased from US$ 20,000 (before shipment). The average current market price is US$ 25,000-35,000.

- The field tests for VSUs in the Egypt's market were performed with help of participating system houses manufacturing polyols and a small of number of end-users due to time limitations in the programme. Despite being simple equipment, a training was required for technicians.

- Project implementation should strictly follow established processing and occupational health requirements when equipment is planned and/or in use and should respect restrictions applicable to specific polyols.

- The study did not evaluate the long-term sustainability (availability of consumables, spare parts, after-sale service, maintenance, durability of equipment, etc.)

- Attempts to introduce smaller, packaged chemicals were not successful. It is better to install, for PIP operations, small sized tanks with silica gel breathers and to assure that the master drum is properly closed after filling.

ATTACHMENT I:

Incorporation of Stipulations from the ExCom

The ExCom, upon receiving a preliminary report on the VSU project, stipulated, under others, that the final report on this project should include:

- Details of the comparison of the specifications of the original equipment with those of the optimized low-cost units;
- The performance of the equipment during testing, including the foam systems used during the testing;
- The results of using the new equipment and
- Recommendations regarding its utility for very small users.

These stipulations were incorporated in the current document as follows:

SPECIFICATIONS

It is not possible to reduce the development of the specifications for the VSU equipment to just one original template. The Taskforce looked into a multitude of existing equipment in the market—at least 20 different suppliers in different parts of the world. They even reviewed hardware from some end-users that made their own equipment.

The project team prepared out of these offerings three simplified, "barefoot", specifications for what is at the minimum needed to conduct a PIP, PIP/Spray and ISF task. That excludes, under others, timers, heated hoses, sophisticated (self-) cleaning features—in—short, everything that facilitates the operator's task but is not absolutely needed, while still offering a machine that provides a suitable product and a safe operation. The "barefoot" specification was then "upgraded" depending on its use with tanks, a PIP injector, limited (5-6 m) hose, static mixer and low-pressure rotating pumps (ISF)and variable ratio (ISF).

Based on these specifications, an open (internet) bidding was conducted and selected three (3) candidates that offered equipment that appeared to meet the specifications. From these three, prototype equipment was purchased and tested it in the laboratory and at the end user level.

From the feedback received, some changes were made in the specification:

- Variable ratio is desired for all applications. The simplest dispenser may achieve that with cylinder exchange ("limited") variability; the others - with ("true") variability.[2]
- Installation by a trained (local) mechanic is required; training by video is not sufficient.

PERFORMANCE TESTING

The Taskforce placed each prototype at a selected System House, and found out that, despite the equipment is simple, a technician is needed to provide training and supervise the start-up. The Taskforce collected feedback from SHs and end users. In particular, the feedback from end-users—the actual target of the whole exercise—was obtained in terms of direct interviews (verbally) and

[2] "Limited Variable" ratio (German: Sprung-fix) is meant variable ratio through the replacement of one pump cylinder by one of a different volume (1:1; 1:1.5; 1:1.7, etc). "True Variable" ratio means seamless variability (1:1 thru 1:1.7).

not in the form of physical data. The system houses prepared a written report but asked for confidentiality.

During the change from CFCs to HCFCs — practically the only phaseout option for PIP and spray — the system ratio remained 1:1. It was surprising that the project team was now confronted with different ratios (1:1 and 1:1.5), based on the use of different phase-out technologies (water or HFOs). Even equipment with fixed ratio can be adapted but this is a cumbersome operation. Variable ratio is recommended.

OUTCOME

The achieved result in terms of simplification of equipment in the selected application areas will make more small users being able to use very basic dispenser equipment, therefore reducing the co-financing burden of VSUs. This is especially important when the previous rent-out dispenser models of operation with VSUs have not performed well, or costs of equipment available of the global market was high.

Safety measures should also be in place when processing polyols, and training is required for technicians despite equipment being of simple design.

RECOMMENDATIONS

Chapter 5 of the report lists conclusions.

ATTACHMENT II:

DISPENSER SPECIFICATIONS and TECHNICAL EVALUATION of BIDS

Project:	**Low Cost Options for the Conversion to non-ODS Technologies in PU Foams at Very Small Users (VSUs)**
Reference :	**RFQ / UNDP / 003 / 2018**
Funds Provided by:	**The Multilateral Fund for the Implementation of the Montreal Protocol (MLF)**

1. INTRODUCTION

The objective of this project is to support very small users (VSU) of PU systems in a cost-effective way by optimizing, validating and disseminating easy to use low cost PU metering equipment. A request for quotation for mobile foam dispensers for rigid or integral skin PU foam and mobile foam dispensers for pour-in-place rigid PU foam has been issued and 3 potential suppliers have responded to this RFQ.

This technical analysis report (TAR) reviews the technical parameters that were received on their compliance. A selection recommendation finalizes the TAR.

2. BIDDERS

Following is an overview of the companies that responded to the RFQ:

COMPANY	ABBR.	COUNTRY of MANUFACTURE
Polyurethane Ind. COM. Ltda	Pumer	Brazil
Tecmac	Tec	Italy
Transtecnica Ind.Con.Ldta	Trans	Brazil

3. TECHNICAL EVALUATION

Item 1 SPECIFICATIONS FOR A SMALL POUR-IN-PLACE DISPENSER FOR RIGID PU FOAM

Description of basic unit	**Mobile two component dispenser to produce rigid PU foam for pour-in-place applications**		**Vendor's Confirmation**			
			Pumer	**Tec**	**Trans/ option 1**	**Trans/ option 2**
	Capacity	**Approximately 4-7kg/min**	**Y**	**Y**	**Y**	**Y**
General features	**Equipped with:**	**A pumping system capable to handle viscosities up to 1,000 cPs.**	**Y**	**Y**	**Y**	**Y**
		Isocyanate pump lubrication or scrape ring	**Y**	**Not needed**	**Y**	**Y**
		Safety valves or rupture disks to safeguard against over-pressure	**Y**	**Y**	**Y**	**Y**
		Working pressure appr.y 25 bar at gun exit	**Y**	**Y**	**No**	**Y**
Applicator(s)	**Pouring gun attached to 5-10 m hoses**		**Y**	**Y**	**Y**	**Y**
Tanks	**Two chemical tanks, one for polyol blend and one for MDI**		**Y**	**Y**	**Y**	**Y**

Size	**25-50 l with a filter against humidity on MDI**	**Y**	**Y**	**Y**	**Y**
Barrel pumps	**For the polyol blend**	**Y**	**Y**	**Optional**	**Optional**
	For the isocyanate	**Y**	**Y**	**Optional**	**Optional**
Compressor	**Sized for the function of the equipment**	**Y**	**Y**	**Y**	**Y**
Location	**Integrated or separately delivered**	**Y**	**Y**	**Y**	**Y**
Power	**220V, 50Hz, 1 Phase**	**Y**	**Y**	**Y**	**Y**
Spare Parts	**Consumable and wear parts, suitable for one year of normal operation of the equipment, from the date of commissioning. The spare parts shall accompany the equipment**	**Y**	**Y**	**Y**	**Y**
Installation, Commissioning	**Instruction of a local representative to provide installation, connection to utilities, start-up, trial runs, operation and basic maintenance**	**Y**	**Y**	**Y**	**Y**
Manuals	**One set of instruction manuals for operation, service and maintenance and spare parts catalog (in English; can be instead or in addition be provided electronically)**	**Y**	**Y**	**Y**	**Y**
General Requirements	**1. The equipment offered shall be covered under a defect liability (parts and labor) for a minimum period of 12 months from the date of commissioning** **2. The equipment offered should conform to approved international quality certification, such as ISO, CE, etc.** **3. The prices to be quoted inclusive of sea-worthy packing, if applicable.** **4. Freight (DAT recipient) to be quoted separately** **5.The consumable and spare parts shall be shipped together with the equipment**	**Y**	**Y**	**Y**	**Y**

Item 2 SPECIFICATIONS FOR A SMALL SPRAY/POUR-IN-PLACE DISPENSER FOR RIGID PU FOAM APPLICATIONS

Description of basic unit	**Mobile two component dispenser to produce rigid PU foam for spray and pour-in-place applications**		**Vendor's Confirmation**			
			Pumer	**Tec**	**Trans/ option 1**	**Trans/ option 2**
	Capacity	**Approximately 4-7kg/min**	**Y**	**Y**	**Y**	**Y**
General features	**Equipped with:**	**A pumping system capable to handle viscosities up to 1,000 cPs.**	**Y**	**Y**	**Y**	**Y**
		Isocyanate pump lubrication or scrape ring	**Y**	**NOT NEEDED**	**Y**	**Y**
		Safety valves or rupture disks to safeguard against over-pressure	**Y**	**Y**	**Y**	**Y**
		Working pressure 25-70 bar at gun exit	**Y**	**Y**	**NO**	**Y**
Applicator(s)	**Pouring gun attached to 5-10 m hoses**		**Y**	**Y**	**Y**	**Y**
	Sprayfoam package (gun and extra hose) must be available		**Y***	**Y**	**NO**	**NO**
Tanks	**Two chemical tanks, one for polyol blend and one for MDI**		**Y**	**Y**	**Y**	**Y**
Size	**25-50 l with a filter against humidity on MDI**		**Y**	**Y**	**Y**	**Y**
Barrel pumps	**For the polyol blend**		**Y**	**Y**	**Optional**	**Optional**

	For the isocyanate	**Y**	**Y**	**Optional**	**Optional**
Compressor	**Sized for the function of the equipment**	**Y**	**Y**	**Y**	**Y**
Location	**Integrated or separately delivered**	**Y**	**Y**	**Y**	**Y**
Power	**220V, 50Hz, 1 Phase**	**Y**	**Y**	**Y**	**Y**
Spare Parts	**Consumable and wear parts, suitable for one year of normal operation of the equipment, from the date of commissioning. The spare parts shall accompany the equipment**	**Y**	**Y**	**Y**	**Y**
Installation, Commissioning	**Instruction of a local representative to provide installation, connection to utilities, start-up, trial runs, operation and basic maintenance**	**Y**	**Y**	**Y**	**Y**
Manuals	**One set of instruction manuals for operation, service and maintenance and spare parts catalog (in English; can be instead or in addition be provided electronically)**	**Y**	**Y**	**Y**	**Y**
General Requirements	**1. The equipment offered shall be covered under a defect liability (parts and labor) for a minimum period of 12 months from the date of commissioning** **2. The equipment offered should conform to approved international quality certification, such as ISO, CE, etc.** **3. The prices to be quoted inclusive of sea-worthy packing, if applicable.** **4. Freight (DAT recipient) to be quoted separately** **5.The consumable and spare parts shall be shipped together with the equipment**	**Y**	**Y**	**Y**	**Y**

Item 3 SPECIFICATIONS FOR A MOBILE FOAM DISPENSER FOR RIGID OR INTEGRAL SKIN PU FOAM

Mobile foam dispenser with variable output between 2 and 7 l/min to produce rigid and integral skin PU foam for small Applications		**Vendor's Confirmation**		
		Pumer	**Tec**	**Trans**
Output at mixing ratio 1:1	**7 l/min (approximately)**		**Y**	**Y**
	120 g/sec (approximately)		**Y**	**Y**
As a minimum, the unit must be equipped with:	**Filters before the component pumps**		**Y**	**Y**
	Safety valves or rupture disks for over-pressure		**Y**	**Y**
Two (2) variable output metering pumps			**Y**	**Y**
Capacity suitable of the entire machine rating			**Y**	**Y**
Hydraulically or pneumatically operated static or impingent mixing head/pistol, self-flushing or with manual flushing system			**Y**	**Y**
Size	**Suitable for entire output range**		**Y**	**Y**
Support	**Connected through a 5-10 m hose system**		**Y**	**Y**
Two (2) working tanks (polyol, isocyanate) to serve the dispensing unit			**Y**	**Y**
Isocyanate tank protected against humidity the infiltration of humid air			**Y**	**Y**
Working volume of 25-50 l per tank			**Y**	**Y**
Functions	**Buttons for start/stop, pour and emergency stop**		**Y**	**Y**
	Shot timer with digital readout		**Y**	**Y**
Power	**220 V; 50 Hz; 2 phases**		**Y**	**Y**

Spare Parts	**Consumable and wear parts, suitable for one year of normal operation of the equipment, from the date of commissioning. The spare parts shall accompany the equipment**		**Y**	**Y**
Installation, Commissioning	**Instruction of a local representative to provide installation, connection to utilities, start-up, trial runs, operation and basic maintenance**		**Y**	**Y**
Manuals	**One set of instruction manuals for operation, service and maintenance and spare parts catalog (in English). Instead or in addition, an electronic copy can be provided**		**Y**	**Y**
General Requirements	**1. The equipment offered shall be covered under a defect liability (parts and labor) for a minimum period of 12 months from the date of commissioning** **2. The equipment offered should conform to approved international quality certification, such as ISO, CE** **3. The prices to be quoted inclusive of sea-worthy packing, if applicable.** **4. Freight (DAT recipient) to be quoted separately** **5. The consumable and spare parts shall be shipped together with the equipment**		**Y**	**Y**

4. OBSERVATIONS

For Item 1:

- Tec's explanation that its isocyanate pump does not need lubrication or a scrape ring is accepted
- Trans/option 1 did not meet the required working pressure and therefore does not qualify
- Pumer and TecMac should provide clarification on why they did not offer Power 220V, 50Hz, 1 Phase with the equipment (has been confirmed in the meantime)
- Pumer offers training, installation assistance trouble-shooting and maintenance assistance by digital media—which can be accepted

For Item 2: same comments as under 2 and, in addition:

- Pumer offers a spray option at low pressure with an air spray gun

For Item 3:

- Tec explains that safety valves for over-pressure are not needed. However, as rupture discs are included, the relevant specification is met
- Upon review of the metering pump details from Tec it is determined that a fixed ratio offer is made which does not qualify.

5. CONCLUSION

For Item 1: Pumer and Tecmac are substantively responsive

For Item 2: TecMac is substantively responsive subject to clarification as mentioned on electrical power (has been confirmed)

For Item 3: Transtecnica is substantially responsive. **Tecmac** is not responsive. **Pumer** did not bid

ATTACHMENT III:
EVALUATION COMMITMENT LETTERS

Egyptian Environmental Affairs Agency
National Ozone Unit

United Nations
Development Programme

Dear .....,

You, as manager of a system house know too well that producing PU foam products by hand will expose the operator to hazardous emissions and will, on longer term, impact the health of the worker. Therefore do the MLF sponsored projects not allow hand mix operations -which hampers in financially and technically assisting those, mostly very small units (VSUs).

EEAA, in cooperation with UNDP has been granted by the MLF a project to search the international market on "Entry Level" type of PU foam production equipment, which would lower the cost threshold of providing a foam dispenser to a level that would allow to address even very small users in a safe way within the policies of the Fund.

We have selected models from three machine manufacturers which will be arriving within the next month or so in Egypt for evaluation. We are offering each of the three local PU system houses one of these dispensers for evaluation. The dispenser is, after completing - and reporting to us on - the evaluation for you to keep and to be used in your development and customer service program.

Attached to this letter you will find the specifications of the dispenser as well as the type of product the machine is designed for. We request you to first - within a month after receipt - make sure that the machine conforms to these specifications and can indeed produce the product it claims. We then ask you to place the machine with one of your customers who can assure an intensive use for about one year and is willing to report on a monthly base how the machine is performing.

Your cooperation will be highly appreciated
Sincerely

Amany Nakhla
Program Officer
UNDP

Ezzat Lewis
Head of Ozone Unit
EEAA

I, Yehia Fathy duly representing TECHNO COM declare herewith on behalf of my company that we are willing to receive the dispenser T.15/2.PM under the conditions as outlined above.

23.12.2018

تكنو كوم للتوكيلات التجارية
ش.ذ.م.م.

تكنو كوم للتوكيلات التجارية
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Your cooperation will be highly appreciated
Sincerely

Amany Nakhla
Program Officer
UNDP

Ezzat Lewis
Head of Ozone Unit
EEAA

I, Mona Adel duly representing Dow Mideast declare herewith on behalf of my company that we are willing to receive the dispenser ..... under the conditions as outlined above.

DOW MIDEAST SYSTEM S.A.E
DOW
داو ميدايست سيستمز ش.م.م

ATTACHMENT IV:
PICTURES OF THE OFFERED EQUIPMENT

Pumer

Transtecnica

TecMac Fixed ratio

TecMac variable ratio

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DEMONSTRATION OF THE USE OF LOW COST PENTANE FOAMING TECHNOLOGY FOR THE CONVERSION TO NON-ODS TECHNOLOGIES IN THE PRODUCTION OF POLYURETHANE FOAMS AT SMALL AND MEDIUM SIZED ENTERPRISES

- FINAL REPORT –

OCTOBER 2019

CONTENT

1. INTRODUCTION

In 2007, Parties to the Montreal Protocol agreed to accelerate the phase-out of the hydrochlorofluorocarbons (HCFCs) because of their increase in global consumption and taking into consideration the substantive climate benefits generated from their phase-out.

In the following years, Parties operating under the Montreal Protocol's Article 5 have formulated their HCFC Phase-out Management Plans (HPMPs) for implementation under financial assistance from the Multilateral Fund for the implementation of the Montreal Protocol (MLF).

To facilitate a smooth transition to ODS alternatives with low global warming potential (GWP), the Executive Committee of the MLF, in its decision 72/40, agreed to consider proposals for demonstration projects for additional low-GWP alternatives and invited bilateral and implementing agencies to submit demonstration project proposals for the conversion of HCFCs to low-GWP technologies in order to identify all the steps required and to assess their associated costs.

In particular, Par (b)(i)a. of Decision 72/40 indicates that project proposals should propose options to increase significantly 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.

In the framework of Decision 72/40, on behalf of the Government of Morocco, UNIDO, as the designated implementing agency, submitted to the 75th Meeting of the Executive Committee a funding request for a Demonstration project for the use of low cost pentane foaming technology for the conversion to non-ODS technologies for polyurethane foams production at small and medium enterprises in Morocco. The project was approved at the same Meeting.

The present report describes the different steps and actions of the implementation and validation of the technology. It includes conclusions and recommendations related to costs, equipment and safety in the use of cyclo-pentane foaming technology in small and medium enterprises.

2. PROJECT DESCRIPTION

2.1. Objectives:

The focus of the project is to:

- Develop and validate a low-cost Pentane technology option for ODS phase-out at Small and Medium Enterprises (SMEs) in Morocco and in those countries with similar conditions;
- Reduce the breakeven point for the introduction of pentane technology to SME in the rigid of PU foam, while guarantee safe application of the technology;

- Demonstrate the easy applicability of the technology and, consequently, the replicability of the results to SMEs;
- Transfer the technology to interested users, in particular those currently relying on pre-blended polyol systems.

The project has therefore a substantial contribution to the HCFC phase-out plan in the manufacture of rigid polyurethane insulation foam in Morocco, by identifying the most promising foaming technology for local SMEs, which are to be converted in Stage II of the HPMP

2.2. Technology and budget:

The foam blowing pentane technology is a proven and viable technology for the replacement of HCFC-141b in the manufacturing of PU foam products. However, due to the flammability of pentanes, the additional safety-related costs increase the overall costs for the conversion above the cost-effectiveness threshold. This has limited the use of this technology particularly in SMEs, which are essential consumers in the foam sector.

The objective of this project was to explore the possibility of reducing the initial capital cost by designing a simple, standardized and easy-to-handle compact foaming machine capable of operating with flammable pentane, equipment and movable ventilation systems serving several products. The technology could be considered as a solution for enterprises that do not have a high production rate, and have a non-regular need for foaming. The sector is to be addressed in stage II of the HCFC phase-out management plan (HPMP).

In order to reduce the initial investment costs it was decided to design a complete and compact Pentane foaming technology using a pre-blended Polyol/ Pentane raw material (POL/C5) and supplied in small and dedicated tank or drums. The POL/C5 pre-blend in drum is off loaded to a compact high-pressure pentane foaming machine with two streams flow of raw material. In order to allow the safe use of pentane formulation, the unit includes all necessary safety elements of the wet and dry parts, including dedicated safety systems which allows to detect and control the possible dangerous conditions that might occur in the normal utilization of the unit. By doing so, a significant cost reduction can be achieved through a standardization of the equipment, to make sure the engineering part of the “tailored-made” equipment is over.

ENGEQUIFE, a 100% indigenous Moroccan limited liability company was selected for the implementation of the demonstration project. The SME has been using HCFC-141b pre-blended polyols in the production of insulation foam for several commercial refrigeration products (Discontinuous sandwich panels, cold-room doors, etc.). Its consumption of HCFC-141b is 1.9 metric tons.

The Cost forecasts for demonstration projects are challenging as these projects are by nature unpredictable. UNIDO has used to the extent possible guidance provided by the Secretariat in Doc 55/47 Annex III,

The Executive Committee approved funding for the execution of this project as follows:

ITEM	ACTIVITY	BUDGET USD
1	Technical study tour on existing equipment and interested technology providers	10,000
2	Chemical study tour on chemistry	10,000
3	Engineering planning and technology adaptation (definition of technical and safety features)	60,000
4	Manufacturing, purchase and delivery of Pentane dispensing machines	90,000
5	Safety installation	40,000
6	Foam testing, field evaluation	25,000
7	Technology dissemination Workshop and publication	20,000
	Sub-total incremental capital cost	**255,000**
8	Contingencies (10%)	25,500
TOTAL		**280,500**

3. IMPLEMENTATION OF THE PROJECT:

3.1. Implementation procedure:

The project was implemented through four steps. The following concrete actions were planned:

1. Chemical study & visits to select the raw material supplier
2. Equipment & Technical study & visits to identify the technology and equipment suppliers
3. Procurement
4. Installation and test Trials at a Pilot Foam Plant (ENGEQUIFE Company) to validate the technology
5. Workshop to present the project outcomes and disseminate the technology

3.2. Chemical study & visits to select the raw material supplier:

As to pre-blended systems, our research and contacts led us to the following options:

- Local supply through MANAR: Discussions were held with the company's management, after which it appeared that this option could not be pursued.

- European supply: Covestro (ex-Bayer) and HUNNTSMAN who have supplied commercially pre-blended systems in Eastern Europe. Different communication and follow up were undertaken with technical and commercial managers with no result.

- PUMEX has developed CP pre-blended systems. This company is offering these systems to several customers in South America. The company was contacted and the discussions led to the organization of a study tour to the Mexican system house.

The study tour took place in September 2017. During this visit all safety aspect of the supply and the use of cyclo-pentane pre-blended systems were discussed with the PUMEX team and with two different customers of PUMEX.

According to PUMEX, to use the polyol pre-blended with cyclo-pentane they produce for their customers, only safety modifications were required. The product can be used with the same process

conditions used for HCFC-141b systems. For the use of pre-blended cyclo-pentane polyols only electrical grounding, cleanness and some air extraction are needed. PUMEX established for its different customers a procedure for Good Security practices for the use of cyclo-pentane systems (see annex).

During this mission, the project team visited also two PUMEX clients: EQUIPOS AMHER Company in Gomez Palacio and DOORS MANUFACTORING Company in Monterrey. The two companies converted their lines from HCFC-141b to CP-pre-blended systems. They retrofitted mainly the electrical side of their existing equipment (ATEX controls, electrical earth connections …) and they installed ventilation systems and some sensors and alarms. They follow safety requirements and Good security practices developed by Pumex. According to the two companies' managers, they did not face any challenges during this conversion or any safety problems. Their product quality is as good as it was before with HCF-141b. They did not report a significant change in their production cost.
The visits to PUMEX and its customers have been important and gave the Moroccan government and the beneficiary company ENGEQUIFE full confidence in the technology.

PUMEX agreed to supply their CP-system to ENGEQUIFE in Morocco.

3.3. Equipment & Technical study, visits to identify the technology and equipment suppliers:

After the PUMEX visit, the project team organized in October 2017 a mission to ITALY to discuss with SAIP, CANNON AFROS and EKOSYSTEM the design, the technical and safety aspect of the use of CP-pre-blended system at SMEs companies producing PU Rigid foams in Morocco. The team discussed with each company the possible cost saving and safety equipment to have been put into the system design so the application of the CP-pre-blended systems in SME is technically and economically viable. All the visited companies presented to the project team their idea and technologies. All of them shared their ideas and experiences in cyclo-pentane Technology to supply the requested equipment and services.

Every company was having its own idea on how to reduce the cost of the C5 equipment. The outcome of this mission was mainly the development of detailed technical specification for the supply of equipment and services related to the demonstration project

3.4. Supply of equipment, chemicals, local works and commissioning:

Following the visits and technical discussions, detailed terms of reference were prepared for the following:

- Supply of a foaming line
- Supply of safety equipment and control systems
- Elaboration of safety system and technical assistance
- On-the-job training of technicians, operators and maintenance personnel

A call for bids for the supply of equipment was published and contract awarded to Cannon Afros after the reviews of the received offers.

The offer can be summarized as follows:

- The foaming equipment is very compact with limited piping, sensors made of two raw material streams with drum filling system and integrated control panel.
- Instead of constructing a complete moving foaming machine, CANNON proposed to install a moving mixing head with boom to serve different molds and presses.
- The cost of the safety systems is reduced by installing one Double ventilator for the wet and one big extractor fan for the dry. The two fans are connected through different ducting tubes to every critical sources of cyclo-pentane vapors. 6 Sensors and alarm detection are installed at these critical points. All safety alarms, sensors, Nitrogen equipment are connected to one control panel
- All ducting tubes were installed locally by ENGEQUIFE

A summary of the equipment provided is:

A Compact 100PB with FPL14 mixing head and boom
Nitrogen Inertization Valve
Safety Control panel
Gas Sensors
Single and double Ventilators

PUMEX supplied some drums of their Cyclo-Pentane System: URECOL C 1990-30RF in line with ENGEQUIFE specifications. The chemicals were shipped from Mexico to Morocco with no hurdles.

The commissioning was substantially delayed due to the relocation of ENGEQUIFE production to a newly constructed facility. Following the completion of the local works (ducting, electrical connections, Boom support system...), equipment installation was completed and training delivered.

3.5. Project results and dissemination:

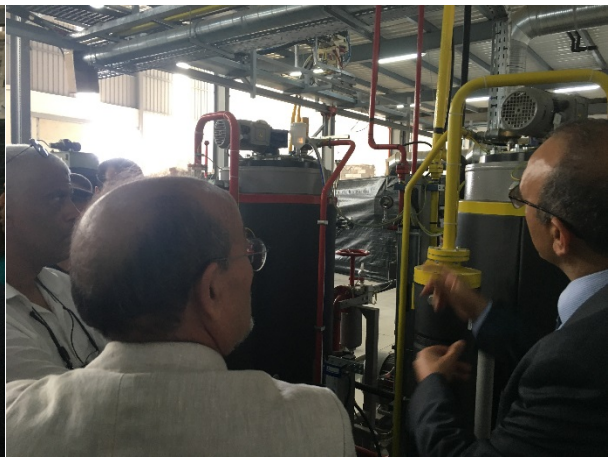
All tests and foam productions were carried out with the pre-blended system supplied by PUMEX using the equipment installed by CANNON AFROS and ENGEQUIFE.

The project has shown that:

- As an SME, ENGEQUIFE was a good choice to implement this project and to highlight the different safety issues related to this technology
- Pre-blended cyclopentane systems are sufficiently stable and can be commercially used;
- There are no specific issues for the transportation and shipment of C5-pre-blended systems in drums. They are shipped as any dangerous chemical with the corresponding extra cost.
- The foam quality produced with cyclo-pentane Systems is similar to the current HCFC-141b ones.
- There has been no specific safety issue or difficulty to use cyclo-pentane system with the supplied equipment
- There are costs savings expected from lower price of cyclo-pentane compared to HCFC-141b price.
- Nitrogen consumption is currently high and its use has to be optimized.
- This compact pentane technology can be applied in many SME enterprises in the rigid foam sub-sector and its replication can lead to potential cost savings

A workshop has been organized where outcomes of this demonstration project have been presented. The meeting was followed by a visit to Engequife's factory. Moroccan companies involved in the production of rigid foam have participated in the workshop and the plant visit.

Pictures of the meeting and the visit are shown below.


4. CONCLUSIONS

The successful implementation of this project, on the use of low cost pentane technology for the conversion to non-ODS technologies in the production of polyurethane foams at small and medium sized enterprises, has demonstrated that the initial capital cost can be reduced by designing a simple, standardized and easy-to-handle compact foaming machine capable of operating with flammable pentane with optimal safety and ventilation systems serving several products. The use of pre-blended cyclo-pentane (C5) in polyol has eliminated the need for pentane storage and blending and related equipment (mixing, tanks, piping…), thus reducing the capital cost of the conversion. In addition the foaming equipment is compact with limited piping, sensors and moving mixing head with boom to serve different molds and presses.
The cost of the safety system is optimized by installing one Double ventilator for the wet and one big extractor fan for the dry. The two fans are connected through different ducting tubes to every critical sources of cyclo-pentane vapors. Sensors and alarm detection are installed at these critical points. All safety alarms, sensors, equipment are connected to One Control panel.

Pre-blended cyclo-pentane systems are sufficiently stable and can be commercially used and the quality of the products manufactured with cyclo-pentane is similar to those produced with HCFC-141b.
The price of cyclo-pentane is lower than that of HCF-141b price, however, this can be offset by transportation cost. There are currently no system houses in Morocco offering cyclo-pentane systems, however, the replication of the technology will create to a demand that is expected to lead to the development of a local production and supply of cyclo-pentane pre-blended systems.
The technology has proved to be adapted for the conversion of small and medium enterprises to phase out the use of HCFC-141b in the production of rigid foam production. There are other SMEs using HCFC-141b pre-blended polyols in the manufacturing of PU foam, sandwich panels and soft foam for decoration in Morocco and they are planned to be converted in Stage-II of the HPMP.

Annex: Pumex's safety guideline for the use of cyclo-pentane systems