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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-first Meeting
Montreal, 18-22 June 2018

PROJECT PROPOSAL: LEBANON

This document consists of the comments and recommendation of the Secretariat on the following project proposal:

Phase-out

- HCFC phase-out management plan (stage II, second tranche) — UNDP

Refrigeration

- Conversion from HFC-134a and R-404A to R-600a and R-290 in domestic refrigeration at Lematic Industries — UNIDO

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Lebanon

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (Stage II)	UNDP (lead)	75th	75% by 2025

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2016	58.86 (ODP tonnes)

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)									Year: 2017
Chemical	Aerosol	Foam	Fire fighting	Refrigeration		Solvent	Process agent	Lab use	Total sector consumption
				Manufacturing	Servicing				
HCFC-141b		26.84		1.76					28.60
HCFC-22				4.29	22.11				26.40
HCFC-141b in imported pre-blended polyol									

(IV) CONSUMPTION DATA (ODP tonnes)			
2009 - 2010 baseline:	73.50	Starting point for sustained aggregate reductions:	73.50
CONSUMPTION ELIGIBLE FOR FUNDING (ODP tonnes)			
Already approved:	61.21	Remaining:	12.32

(V) BUSINESS PLAN		2018	2019	2020	After 2020	Total
UNDP	ODS phase-out (ODP tonnes)	9.73	0.0	0.0	5.93	15.66
	Funding (US $)	1,191,980	0	0	727,413	1,919,393

(VI) PROJECT DATA			2015	2016	2017	2018	2019	2020	2021	2022-2023	2024	2025	Total
Montreal Protocol consumption limits			66.15	66.15	66.15	66.15	66.15	47.78	47.78	47.78	47.78	23.88	n/a
Maximum allowable consumption (ODP tonnes)			66.15	66.15	60.64	60.64	48.71	36.78	36.78	36.78	27.58	18.39	n/a
Agreed funding (US $)	UNDP	Project costs	2,410,000	0	0	1,114,000	0	0	420,462	0	259,364	0	4,203,826
		Support costs	168,700	0		77,980	0	0	29,432	0	18,155	0	294,268
Funds approved by ExCom (US$)		Project costs	2,410,000	0	0	0	0	0	0	0	0	0	2,410,000
		Support costs	168,700	0	0	0	0	0	0	0	0	0	168,700
Total funds requested for approval at this meeting (US$)		Project costs	0	0	0	1,114,000	0	0	0	0	0	0	1,114,000
		Support costs	0	0	0	77,980	0	0	0	0	0	0	77,980

Secretariat's recommendation:	For individual consideration

PROJECT DESCRIPTION

1. On behalf of the Government of Lebanon, UNDP as the designated implementing agency, has submitted a request for funding for the second tranche of stage II of the HCFC phase-out management plan (HPMP), at the amount of US $1,114,000, plus agency support costs of US $77,980.[1] The submission includes a progress report on the implementation of the first tranche, the verification report on HCFC consumption for 2017 and the tranche implementation plan for 2018 to 2020.

Report on HCFC consumption

2. The Government of Lebanon reported a consumption of 58.86 ODP tonnes of HCFC in 2016 and estimated a consumption of 55 ODP tonnes for 2017, which is 20 and 25 per cent below the HCFC baseline for compliance, respectively. The 2013-2017 HCFC consumption is shown in Table 1.

Table 1. HCFC consumption in Lebanon (2013-2017 Article 7 data)

HCFC	2013	2014	2015	2016	2017*	Baseline
Metric tonnes						
HCFC-22	610.00	581.00	566.00	540.12	480.00	653.55
HCFC-123	0.49	0.00	0.00	0.00	0.00	2.50
HCFC-141b	355.00	343.00	315.75	265.00	260.00	341.18
Total (metric tonnes)	965.49	924.00	881.75	805.12	740.00	997.23
ODP tonnes						
HCFC-22	33.55	31.96	31.13	29.71	26.40	35.95
HCFC-123	0.01	0.00	0.00	0.00	0.00	0.05
HCFC-141b	39.05	37.73	34.73	29.15	28.60	37.53
Total (ODP tonnes)	**72.61**	**69.69**	**65.86**	**58.86**	**55.00**	**73.50**

*Country programme data.

3. The consumption of HCFC-141b in refrigeration manufacturing is currently used for the production of sandwich panels used in commercial refrigerators in 2017. This consumption will decrease by 2019 when the conversion of foam enterprises has been completed. Similarly, consumption of HCFC-22 will decrease by June 2019 when the conversion of the air-conditioning (AC) manufacturing sector has been completed. Additional reduction will also be achieved with the implementation of activities in the refrigeration servicing sector.

Country programme (CP) implementation report

4. The Government of Lebanon reported HCFC sector consumption data under the 2016 CP implementation report which is consistent with the data reported under Article 7 of the Montreal Protocol.

Verification report

5. The verification report confirmed that the Government is implementing a licensing and quota system for HCFC imports and exports and that the total consumption of HCFCs for 2017 was 55.15 ODP tonnes, which is lower than the maximum allowable consumption of 60.64 ODP tonnes based on its Agreement with the Executive Committee. The verification report also indicated that the

[1] As per the letter of 24 April 2018, from the Ministry of Environment of Lebanon, to UNDP.

policy/regulatory actions and institutional support were substantively carried out in accordance with the 2017 annual plan.

Progress report on the implementation of the first tranche of the HPMP

Legal framework

6. Ministerial Decisions for the amended decree on ODS licensing system were developed and enforced in 2017. These included policies relating to the distribution of quotas among importers over the next five years; amendments to the deadline of submission of import licenses, and strict use of the harmonized system (HS) codes for HCFCs. Drafts of HS codes for HFCs, and the enforcement of general procedures for issuing import licenses for these substances have also been initiated. The National Ozone Unit (NOU) continues its collaboration with the Customs Authorities for the efficient implementation of the newly incorporated and amended HS Codes.

7. Two training workshops on ozone layer depletion and the Montreal Protocol, types of ODS and ODS-containing appliances, identification of refrigerants, ODS testing methods, phase-out schedule of HCFCs, Customs roles, illegal trade of ODS, and safe handling of ODS were conducted for 26 Customs officers.

Manufacturing sector

Polyurethane (PU) foam

8. Agreements were signed with four of the six foam beneficiary enterprises. The conversion at one enterprise (Kilzi Industries) was successfully completed in December 2017 resulting in the phase-out of 32.0 mt (3.52 ODP tonnes) of HCFC-141b replaced with isopentane technology. The NOU will continue to monitor and provide technical assistance to Kilzi Industries to ensure that the phase-out of HCFC achieved is sustained.

9. The conversion to isopentane of three other enterprises (Mezher Industries, Awkal and Saydah, and ProFoam) is expected to be completed in November 2018, resulting in the phase-out of 138.50 mt (15.24 ODP tonnes) of HCFC-141b. The remaining two enterprises (SPEC and Prometal) converting to HFO technology will be assisted during the implementation of the second tranche, with an expected completion date by June 2019.

10. The foam sector plan also included technical assistance for 11 small-sized sandwich panel manufacturers for solar and electric water heaters, which will be implemented when the selected HFO technology becomes more readily available in the local market. Initial discussions have been completed with these enterprises and information has been provided on the options available for their conversion.

Room AC

11. Agreements were signed with two of the five room AC manufacturing enterprises. One enterprise (Iceberg S.A.R.L.) completed its conversion from HCFC-22 to HFC-32 as refrigerant and from HCFC-141b to HFC-365mfc as foam blowing agent resulting in the phase-out of 12.6 mt (0.69 ODP tonnes) of HCFC-22, and 18.6 mt (2.0 ODP tonnes) of HCFC-141b. The use of HFC-365mfc is for an interim period until HFOs are commercially available in Lebanon.

12. The conversion of a second enterprise (Frigo Liban) from HCFC-22 to HFC-32 is expected to be completed by November 2018. Agreements with the three remaining enterprises (UNIC, CGI-Halawany and Industrial and Commercial Refrigerators) will be signed by the third quarter 2018 and their conversion is expected to be completed by June 2019.

Refrigeration servicing sector

13. The following activities were implemented:

(a) Two workshops on ozone depletion and the Montreal Protocol, ODS and alternatives in refrigeration and air-conditioning (RAC) sector, recovery and recycling, zero emission programmes, and servicing of AC split units were conducted for 35 servicing workshops for RAC equipment (with about two technicians per workshop);

(b) Curricula of 11 vocational schools teaching air-conditioning and heating principles were updated to include Montreal Protocol related guidelines (e.g., phase-out of HCFCs, future plan for HFC phase-down and use of alternative refrigerants to HCFCs and to HFCs, including flammable refrigerants), and a guide book and manual for RAC technicians for good practices in refrigeration was being developed;

(c) Bidding procedures were initiated for the renovation of a vocational school in Beirut and a list of equipment to support the technicians training programme was prepared; and

(d) Awareness raising was continued through technical and thematic workshops/meetings on HCFC alternatives, including preparation and distribution of awareness materials targeting end-users, refrigeration servicing workshops, importers and the public.

Project implementation and monitoring unit (PMU)

14. The NOU is responsible for the overall coordination and monitoring of activities of stage II of the HPMP. A project coordinator and assistant were hired to manage and monitor implementation of activities under the supervision of the NOU, with the assistance of UNDP. The NOU is supported by the Ministry of Environment.

Level of fund disbursement

15. As of 1 April 2018, of the US $2,410,000 approved so far, US $1,745,257 (72.4 per cent) had been disbursed. The balance of US $664,743 will be disbursed in 2018.

Implementation plan for the second tranche of the HPMP

16. The following activities will be implemented between January 2018 and December 2021:

(a) Conduct three workshops to facilitate enforcement of regulations on imports and exports of ODS and their alternatives to representatives from the government, RAC association, enterprises and importers (UNDP) (US $30,147);

(b) *Foam sector:* Finalise the conversion at three foam enterprises (Mezher Industries, Awkal and Saydah, and ProFoam); finalise the agreements and initiate the activities for the conversion at the remaining two foam enterprises (SPEC and Prometal); and provide technical assistance to 11 SMEs in the solar and water heaters sub-sector (UNDP) (US $454,396);

(c) *Air-conditioning sector:* Finalise the conversion at one AC enterprise (Frigo Liban); finalise the agreements and initiate the activities for conversion of the three remaining enterprises (UNIC, CGI-Halawany, and Industrial and Commercial Refrigerators) (UNDP) (US $389,459);

(d) Technical assistance activities to foam and air-conditioning sectors such as project-related technical support during implementation including project planning, support on equipment procurement, and information exchange relating to safe adoption of technology (UNDP) (US $28,959);

(e) Organize technical training for three RAC trainers/teachers in Germany; conduct three workshops for 35 RAC technicians on good practices in refrigeration; conduct ten training sessions for 100 technicians and students on good servicing practices including information on new low-global warming potential (GWP) alternatives and handling of flammable refrigerants; provide equipment (e.g., welding and vacuum test stand, refrigerant analyzer, brazing tools) to RAC training centre for future training programmes (UNDP) (US $136,039); and

(f) Project coordination and monitoring (UNDP) (US $75,000).

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

17. The Secretariat noted that, as per the Agreement between Lebanon and the Executive Committee, the second tranche of stage II of the HPMP for Lebanon is only due at the 82nd meeting. The Secretariat has reviewed it and produced a recommendation based on the level of progress and of disbursement achieved. The early submission of the tranche request does not affect funding planning as it is within the same business plan year.

Progress report on the implementation of the first tranche of the HPMP

Legal framework

18. The Government of Lebanon has already issued HCFC import quotas for 2018 at 52.58 ODP tonnes, which is lower than the Montreal Protocol control targets and the maximum allowable consumption set in its Agreement with the Executive Committee.

Manufacturing sector

PU foam

19. For the two remaining enterprises (SPEC & Prometal), the Secretariat sought confirmation on whether the HFO was already available as it was indicated when stage II of the HPMP was approved. UNDP explained that HFO polyol systems are still being developed and optimized and, expected to be available in 2018. During implementation of the second tranche, UNDP and the NOU will take all feasible steps to ensure that HFOs will be available. The technical assistance for the small water heaters manufacturers who are expected to convert to HFO technology will be implemented at a later tranche keeping in view availability of HFO technologies.

20. The Secretariat expressed concern that as reported, the funding levels indicated in the proposed agreements with each of the six foam enterprises were lower than the funding levels approved for each enterprise, potentially resulting in savings to the Fund. UNDP clarified that not all agreements with the enterprises have been signed; the information provided was the planned allocation for each enterprise, and that, only some disbursements have been made. In addition, funds allocated for technology transfer support, trials and training, incremental operating costs (IOC), and the contingency related costs, were not included in the allocated funding, and would be apportioned for each of these enterprises towards the end of the

conversion. In support to this information, UNDP submitted a revised funding allocation for each of the enterprises. UNDP also confirmed that any funding that will remain unused at the end of conversions of the six enterprises will be returned to the Multilateral Fund but only after the total conversion of the sector has been fully addressed, and all expenditures recorded.

Room AC

21. The Secretariat drew UNDP's attention to the use of HFC-365mfc for the foam conversion in one enterprise in the AC manufacturing sector (Iceberg), where the originally agreed alternative was HFO. UNDP clarified that HFC-365mfc will be used during an interim period, until HFOs are commercially available in Lebanon. Although the technology was expected to be available soon, it would depend on the global commercial availability of it. UNDP also explained that the conversion of the four remaining AC enterprises will start in 2018, and it may possibly introduce HFC-365mfc as an interim substitute, given that the Government has banned the use of HCFC-141b as of 1 January 2020, and the urgency to complete the conversions as a result of the ban.

22. UNDP agreed that in line with decision 77/35(a)(ii) and (iii),[2] UNDP will submit reports on the status of the conversion at the enterprise (Iceberg) currently using HFC-365mfc as an interim technology, and at all other enterprises that would potentially introduce the same interim technology, at each meeting until the conversion to the agreed technology is completed.

23. The Secretariat also expressed a concern that the funding levels allocated in the agreements to be signed with the beneficiary enterprises in the AC sector were different from those approved at the 75th meeting. With two showing higher values, and the rest showing lower funding allocations, the total conversion cost was 10 per cent above what had been approved for the sector. UNDP clarified that the funding allocations in the agreements were only planned allocations for each enterprise; not all agreements have been signed, and only some disbursements have been made.

24. UNDP also described some challenges faced in the AC sector conversion where two of the enterprises required more support than what had been agreed. In the case of Iceberg (whose conversion has been completed), the enterprise was required to relocate the manufacturing facility due to the zoning regulations in place; accordingly, additional safety related investments, and cost for the set up of new operations, were required. In addressing the Secretariat's concern, UNDP submitted a revised funding allocations at the enterprise level, with the total amount equal to the funding approved at the 75th meeting. These adjustments were made by the NOU in line with the flexibility clause in the Agreement with the Executive Committee, and in close consultation with the beneficiary enterprises. This approach will allow the cost-effective conversion of the whole sector within the agreed overall funding approved. These changes assumed that co-financing will be provided by these enterprises, the amount of which will be established only after project completion, and that all beneficiary enterprises have committed to phase out the use of HCFCs in line with this funding arrangement. UNDP confirmed that any funding remaining at the end of the conversions will be returned to the Multilateral Fund. Based on the explanations and assurance provided

[2] (a)(ii) To report to the Executive Committee, as soon as they became known, exceptional cases where enterprises that had received funding from the Multilateral Fund to manufacture products and equipment using substances with low-global-warming potential (GWP) were temporarily manufacturing products and/or equipment using high-GWP substances, and to identify the reasons for the use, the steps to be taken to enable the enterprises to start manufacturing using the technology for which the funding had been approved, and a timeline for when such manufacturing was expected to commence; (iii)To continue reporting the status of manufacturing at the enterprises identified in sub-paragraph (ii) above to each meeting of the Executive Committee until those converted manufacturing lines used only the low-GWP technology for which funding had been approved, or another alternative technology with a lower GWP.

by UNDP the Secretariat considers that the proposed approach would assist the country in implementing conversions at enterprise level.

Refrigeration servicing sector

25. The Secretariat sought clarification on whether activities implemented during the first tranche of stage II of the HPMP included those that were not implemented from stage I. UNDP explained that servicing sector activities under stage II will be initiated only in 2018, it was necessary to start in 2017 contractual agreements with training partners, and some other preparatory activities to enable the country to fully implement activities in 2018. UNDP also confirmed that activities undertaken in 2016 and 2017 were only related to stage I, and clearly differentiated in the progress report. There are no remaining funds from stage I for the servicing sector.

Conclusion

26. The HCFC consumption in 2017 of 55.15 ODP tonnes was about nine per cent lower than the target in the Agreement between the Government and the Executive Committee. The Government continues to implement its licensing and quota systems for monitoring and controlling HCFCs, and providing training to customs and law enforcement officers on enforcement of regulations on imports and exports of ODS and their alternatives and refrigeration technicians on servicing equipment with HCFC-free alternatives. The Government is also fully committed in completing the phase-out of HCFCs in the foam and AC manufacturing sectors by June 2019, where one enterprise each from each sector had been fully converted; The Government is cognizant that the use of an HFC-365mfc as an interim replacement until the technology would be commercially available, and will exert all efforts to ensure that HFOs will be available in the country, and will report on the status of implementation in line with decision 77/35. Disbursement under stage II of the HPMP is 72 per cent.

RECOMMENDATION

27. The Executive Committee may wish:

(a) To note the progress report on the implementation of the first tranche of stage II of the HCFC phase-out management plan (HPMP) in Lebanon;

(b) To note that the enterprise Iceberg in the room air-conditioning sector for which conversion had been approved on the basis of an alternative with a low global-warming potential (GWP) was temporarily using HFC-365mfc owing to lack of availability of HFOs;

(c) To further note that the remaining four air-conditioning manufacturing enterprises under current conversion would possibly temporarily use HFC-365mfc;

(d) To request UNDP:

(i) To continue assisting the Government of Lebanon, during the implementation of the HPMP, in securing the supply of HFO for Iceberg and other enterprises under the HPMP, on the understanding that any incremental operating costs would not be paid until the original alternative technology selected or another technology with a low-GWP had been fully introduced;

(ii) To report to the Executive Committee on the status of use of the interim technology selected by Iceberg at each meeting until the original technology selected or another technology with a low-GWP had been fully introduced;

(iii) To report to the 82nd meeting the status of implementation of the conversion at the enterprises Frigo Liban, UNIC, CGI-Halawany and Industrial and Commercial Refrigerators, on the understanding that the remaining funds from the conversion of the enterprises would be returned to the Multilateral Fund after the total conversion of the sector has been fully addressed, and all expenditures recorded;

(e) To approve the second tranche of stage II of the HPMP for Lebanon, and the corresponding 2018-2021 tranche implementation plan, at the amount of US $1,114,000, plus agency support costs of US $77,980 for UNDP.

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

LEBANON

PROJECT TITLE	BILATERAL/IMPLEMENTING AGENCY
(a) Conversion from HFC-134a and R-404A to R-600a and R-290 in domestic refrigeration at Lematic Industries	UNIDO

NATIONAL CO-ORDINATING AGENCY	National Ozone Unit

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (METRIC TONNES, 2017, AS OF MAY 2018)

Annex F, Group I	mt	n/a
	mt CO_2-eq.	n/a

B: COUNTRY PROGRAMME SECTORAL DATA (METRIC TONNES, 2017, AS OF MAY 2018)

Annex F, Group I	mt	n/a
	mt CO_2-eq.	n/a

HFC consumption remaining eligible for funding	mt	n/a
	mt CO_2-eq.	n/a

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US $	Phase-out mt
	(a)	689,545	80

PROJECT TITLE:	Lematic Industries	
HFC-134a used at enterprise:	mt	67
	mt CO_2-eq.	95,810
R-404A used at enterprise:	mt	34.08
	mt CO_2-eq.	133,661.76
HFC-134a to be phased out through this project:	mt	78.46
	mt CO_2-eq.	112,198
R-404A to be phased out through this project:	mt	34.08
	mt CO_2-eq.	133,661.76
R-600a to be phased in:	mt	33.5
	mt CO_2-eq.	100.5
R-290 to be phased in:	mt	6.5
	mt CO_2-eq.	19.5
Project duration (months):		24
Initial amount requested (US $):		2,174,163
Final project costs (US $):		
Incremental capital cost:		868,115
Contingency (10%):		Included in ICC
Incremental operating cost:		185,743
Total project cost:		1,053,858
Local ownership (%):		100
Export component (%):		0
Requested grant (US $):		1,053,858
Cost-effectiveness (US $/kg) and (US $/mt CO_2-eq.)	US $/kg	9.36
	US $/mt CO_2-eq.	4.28
Implementing agency support cost (US $):		73,770
Total cost of project to Multilateral Fund (US $):		1,127,628
Status of counterpart funding (Y/N):		Y
Project monitoring milestones included (Y/N):		Y
SECRETARIAT'S RECOMMENDATION	For individual consideration	

PROJECT DESCRIPTION

28. On behalf of the Government of Lebanon, UNIDO has submitted a request for funding the conversion of three domestic refrigerator manufacturing lines at Lematic S.A.L., Lebanon (Lematic) from HFC-134a and R-404A to isobutane (R-600a) and propane (R-290) as refrigerants, at a total cost of US $2,174,163, plus agency support costs of US $152,191. Preparation funding was provided for this project at the level of US $30,000 at the 80th meeting.

29. The submission was accompanied by a letter dated from the Government of Lebanon committing to the ratification of the Kigali Amendment and agreeing that no further funding would be available from the Multilateral Fund until the instrument of ratification had been received by the depositary at the Headquarters of the United Nations in New York; and that any amount of HFC reduced as a result of the project would be deducted from the starting point, in line with decision 78/3(g).

HFC consumption in Lebanon and sector background

30. Based on the survey of ODS alternatives undertaken in Lebanon, 940.25 mt of HFCs was consumed in 2015. Out of the five HFCs (pure and blends) imported into the country, only three substances (i.e., HFC-134a, R404A, and R-410A) represent approximately 94 per cent of the total consumption. The consumption of HFC-134a constitutes 69 per cent of the total consumption in mt, and 52 per cent in mt CO_2-eq., followed by R-404A with 14 per cent in mt, and 29 per cent in mt CO_2-eq., and R-410A at 10 per cent in mt and 11 per cent in mt CO_2-eq. Both HFC-134a and R-404A are used in refrigeration manufacturing while HFC-134a and R-410A are used in air-conditioning manufacturing and servicing.

31. The use of HFCs in the domestic and commercial refrigeration sector in Lebanon is dominated by one enterprise. There are around 17 small- and medium-sized enterprises (SMEs) using HCFCs which assemble local refrigeration equipment in the country and are being provided technical assistance under stage II of the HCFC phase-out management plan (HPMP) for Lebanon to enable their conversion to low-global warming potential (GWP) alternatives. Domestic and commercial refrigeration equipment using HCFCs, HFC-134a and R-404A are also imported and sold in the country. In 2017, the estimated total sales volume of imported equipment was 500,000 units.

Enterprise background

32. Lematic is the sole local manufacturer of HFC-134a domestic and commercial refrigeration appliances in Lebanon and is 100 per cent locally owned. Originally founded as a specialized manufacturer of household refrigerators, the enterprise is now a regional pioneer of the no-frost cooling system and produces 45 per cent of the domestic refrigerator demand in Lebanon. The current annual production is about 220,000 domestic refrigerators, and 130,000 water coolers and freezers using HFC-134a and R-404A, respectively, in three assembly lines that operate at an average six days per week. The company's HFC-134a and R-404A consumption in 2017 were 67 mt and 34.08 mt, respectively.

33. At the 22nd meeting (April 1997), Lematic received Multilateral Fund assistance to convert its manufacturing capacity from CFC-11 to cyclopentane (insulation foam component) and from CFC-12 to HFC-134a (refrigeration component). Subsequently, at the 64th meeting (July 2011), Lematic received assistance to phase out the use of HCFC-22 in the manufacture of domestic air-conditioning equipment to be replaced with R-410A. The project has been successfully implemented resulting in the phase-out of 90 mt (4.92 ODP tonnes) of HCFC-22.

HFC consumption by the enterprise

34. The 2014-2017 HFC-134a and R-404A consumption at Lematic is shown in Table 1.

Table 1. Consumption of HFC-134a and R-404A at Lematic (2014-2017)

Year	HFC-134a (mt)	mt CO_2-eq	R-404A (mt)	mt CO_2-eq	Total (mt)	mt CO_2-eq
2014	123	175,890	55.69	218,416	178.69	394,306
2015	65	92,950	45.62	178,922	110.62	271,872
2016	64	91,520	37.22	145,977	101.22	237,497
2017	67	95,810	34.08	133,662	101.08	229,472

35. The sharp decrease in consumption from 2014 to 2015 was due to economic and other geopolitical reasons; since 2015, the consumption of HFC-134a and R-404A was in the range of 64 to 67 mt and 34 to 46 mt, respectively.

Project overview and funding request

Selection of alternative technology

36. Isobutane (R-600a) was selected as the alternative technology as it is a proven and cheaper alternative to HFC-134a, and the technology is widely used in domestic and stand-alone commercial refrigeration. In future, the enterprise will introduce R-290 for larger coolers and freezers; therefore, the current proposal is designed to allow for this future use in refrigeration applications.

Project description

37. Lematic has three manufacturing lines, each located on a different floor of the facility. Each of these lines is capable of producing domestic and commercial refrigeration appliances with HFC-134a and R-404A as refrigerants, at the same lines.

38. The project proposes to convert domestic refrigerator manufacturing from HFC-134a to R-600a, and commercial refrigeration appliances from R-404A to R-290. Given that hydrocarbons (HC) are flammable alternatives, changes are foreseen in the production process of the three assembly lines including refrigerant charging equipment, leak detection equipment and enhance safety infrastructure. The enterprise proposes to optimise cost of conversion using two of their production lines to produce only domestic refrigerators based on R-600a and one production line to produce freezers and water coolers based on R-290. Laboratory testing modifications will also be made to work with HC-based refrigerants. General activities including product development to include modifications for the use of a flammable refrigerant, testing and trials for certification; training of personnel; plant safety certification; and third party certification after full conversion. Technical assistance by international experts including supervision of conversions will also be included.

39. The main components where funding is requested include the following:

(a) Modifications to the storage and refrigerant supply system to make these explosion-proof by replacing the refrigerant supply pumps, installation of a safety system (i.e., leak detectors, fire-fighting equipment, shut-off valves, pressure sensors, water sprinkler, smoke detectors, and ventilation system); and relevant certifications; and

(b) Assembly line modifications including the installation of helium charging/recycling unit to complement the existing helium sniffer, safety system that includes the installation of HC sensors and ventilation, ultrasonic welding equipment for sealing of the refrigeration system, hand-held HC leak detector for storage area, and addition of repair area on assembly lines with safe recovery of R-600a/R-290.

Project costs

40. The total costs of the project as originally submitted were at US $2,174,163 including US $1,069,250 in incremental capital costs (ICC) and US $999,913 in incremental operating costs (IOC), summarized in Tables 2 and 3.

Table 2. Total costs for the conversion at Lematic

Description	**Cost (US $)**
Product development	50,000
Assembly line conversions	929,250
Certification by third party (TÜV)	40,000
Test and trials	50,000
Subtotal ICC	1,069,250
Equipment for 30 service teams	45,000
Training of service teams	10,000
Subtotal service	55,000
Project management unit	50,000
Total	**1,174,250**
Incremental operating cost	999,913
Total fund requested	**2,174,163**

41. The IOC were estimated based on the cost of raw materials, considering safety and rearrangement of electric components, and change in the compressor. The price of HFC-134a and R-600a was reported at US $3.42/kg and US $6.15/kg, respectively (Table 3).

Table 3. IOC for the conversion at Lematic

IOC	**HFC-134a**			**R-600a**		
Description	Quantity	Unit cost (US $)	Total (US $)	Quantity	Unit cost (US $)	Total (US $)
Refrigerant (average charge)	229 gr	3.42/kg	0.78	115 gr	6.15/kg	0.71
Compressor	1	50.00	50.00	1	65.00	65.00
TOTAL			50.78			65.71
IOC per year						999,913*

*Based on 67,000 units

42. The cost-effectiveness of the project is US $21.51/kg. The duration of the project is 24 months. The submission also indicates that co-financing amounting to US $250,000 would be covered in cash and in-kind.

43. The project is expected to result in direct emissions reduction of 229,592 CO_2-equivalent tonnes with the reduction of 67 mt of HFC-134a and 34.08 mt of R-404A, and the expected introduction of 33.5 mt of R-600a and 17.0 mt of R-290. No estimates of indirect emission savings associated with energy efficiency were provided.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Eligibility

44. This project has been submitted in line with decision 78/3(g). The Secretariat reviewed the project proposal based on current policies and decisions of the Multilateral Fund and the review of similar

conversion projects for CFC phase-out so far approved (i.e., conversion of refrigerant component from CFC-12 to R-600a involving product and manufacturing process redesign).

Regulatory framework

45. The Secretariat noted that with the conversion of Lematic, refrigeration manufacturing in the country would be converted to R-600a and R-290. The Government of Lebanon is committed to implementing a ban on the production of domestic refrigerators using HFC-134a and R-404A-based commercial refrigerators the year after the conversion project is completed (i.e., 2021). The Secretariat considers that such policy would not only help in phasing down the consumption of HFC-134a and R-404A in the local market, but would also reduce future servicing demand of HFC-based equipment in the regional market as the country exports domestic refrigerators.

Selection of enterprise

46. The Secretariat notes that Lematic received funding from the Multilateral Fund in 1997 to convert from CFC-11 as a blowing agent and CFC-12 as a refrigerant to cyclopentane and HFC-134a, respectively. As such, the Secretariat considers that this conversion falls under paragraph 18(b) of decision XXVIII/2.

Proposed costs

47. The Secretariat undertook a detailed review of the project submission. The proposed funding requested for ICC per line were based on costs agreed for previously approved projects for domestic refrigerator manufacturing conversion, except for those below where adjustments were made, thereby reducing the total ICC cost per line from US $309,750 to US $237,705 including contingencies, freight and installation costs, bringing the ICC for three manufacturing lines to US $713,115:

(a) The incremental cost for the refrigerant charging machine was reduced from US $65,000 to US $55,000 per unit inclusive of accessories;

(b) Modifications to the conveyor system and repair area was agreed at US $5,000 per line in lieu of US $10,000; and

(c) The cost for a helium charging and recovery unit was reduced from US $45,000 to US $40,000.

48. The following items were adjusted as follows:

(a) Cost of product development was reduced from US $50,000 to US $25,000, based on a lump sum agreed for only the basic number of prototype models that required adjustment;

(b) Test and trials of new products was adjusted from US $50,000 to US $10,000 (i.e. US $500 per unit for 20 models);

(c) Plant certification (TUV) was also agreed at US $35,000 instead of US $40,000; and

(d) Technical assistance was agreed at US $30,000 (in lieu of a PMU), and an additional US $55,000 was requested and agreed as part of service components (i.e. for equipment and training of the company’s service teams), and was considered at US $4.80/kg using cost for the service sector (i.e., equivalent to a reduction of 11.46 mt of HFC-134a).

49. These adjustments bring the total ICC plus other costs to US $868,115.

50. Based on the submission, the Secretariat noted a discrepancy in the amount requested by UNIDO for the IOC due to difference in the price of HFC-134a and R-600a used and overall consumption of HFC-134a. After discussion with UNIDO, and based on the difference for the price of refrigerant, compressor, and other components, the overall IOC was calculated at US $185,743, consisting of US $97,532 for R-600a and US $88,211 for R-290.

51. The total funding requested of the Multilateral Fund amounted to US $1,053,858 to phase out 78.46 mt (112,198 mt CO_2-eq.) of HFC-134a[3] and 34.08 mt of R-404A[4] (133,662 mt CO_2-eq.) with a cost-effectiveness of US $9.36/kg, as summarized in Table 4.

Table 4. Agreed costs for conversion of domestic and commercial refrigerator manufacturing lines at Lematic

Description	**Cost (US $)**
Product development	25,000
Assembly line conversions (3 lines)	713,115
Certification by third party (TÜV)	35,000
Test and trials	10,000
Subtotal ICC	783,115
Equipment for 30 service teams and training*	55,000
Technical assistance	30,000
Total	**868,115**
IOC	185,743
Total fund requested	**1,053,848**
HFC-134a and R-404A phase-out in manufacturing (mt)	101.08
HFC-134a phase-out in servicing	11.46
Total HFC phase-out in mt	112.54
Cost-effectiveness (US $/kg)	9.36

*Phase-out calculated using US $4.8/kg equivalent to 11.46 mt of HFC-134a.

Conclusion

52. The project would enable the complete phase-out of HFC-134a and R-404A in domestic and commercial refrigeration manufacturing in Lebanon through the introduction of HC-based equipment, and influence the regional market. The Government is committed to putting a ban on the production of domestic refrigerators using HFC-134a and R-404A-based commercial refrigerators the year after the conversion project is completed (i.e., 2021).

Business plan 2018 -2020

53. This project falls under the regular business plans submitted to the Secretariat and is presented to the Executive Committee under the purview of decisions 78/3(g) and 79/45(b).

RECOMMENDATION

54. The Executive Committee may wish to consider:

(a) The project proposal for the conversion the conversion from HFC-134a and R 404A to R-600a and R-290 in domestic and commercial refrigeration at Lematic Industries, in the

[3] GWP of HFC-134a is 1430.
[4] GWP of R-404A is 3922.

context of its discussion on HFC stand-alone project submitted to the 81st meeting in line with decision 78/3(g), as described in the document on the Overview of issues identified during project review (UNEP/OzL.Pro/ExCom/81/14);

(b) Whether or not to approve the project proposal indicated in sub-paragraph (a) above in the amount of US $1,053,858, plus agency support cost of US $73,770 for UNIDO, on the understanding, if the project were to be approved:

(i) That no further funding would be available until the instrument of ratification by the Government of Lebanon had been received by the depositary at the Headquarters of the United Nations in New York;

(ii) That 78.46 mt (112,198 mt CO_2-eq) of HFC-134a and 34.08 mt (133,662 mt CO_2-eq) of R-404A would be deducted from the starting point for sustained aggregate reduction in HFC once it has been established;

(iii) That the project would be completed within 24 months of the transfer of funds to UNIDO, and a comprehensive completion report with detailed information on the eligible incremental capital costs, incremental operating costs, any possible savings incurred during the conversion and relevant factors that facilitated implementation, would be submitted within six months of the project completion;

(iv) That any remaining funds will be returned to the Multilateral Fund no later than one year after the date of project completion; and

(v) The Government of Lebanon is committed to putting a ban on the production of domestic refrigerators using HFC-134a and R-404A-based commercial refrigerators the year after the conversion project is completed (i.e., 2021).