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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-second Meeting
Montreal, 3-7 December 2018

PROJECT PROPOSAL: ZIMBABWE

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

Refrigeration

•	Conversion of domestic refrigerator and freezer manufacturing at Capri from the use of HFC-134a as the refrigerant to isobutane (R-600a)	UNDP

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

Zimbabwe

PROJECT TITLE(S)	BILATERAL/IMPLEMENTING AGENCY
(a) Conversion of domestic refrigerator and freezer manufacturing at Capri from the use of HFC-134a as the refrigerant to isobutane (R-600a)	UNDP

NATIONAL COORDINATING AGENCY	Ministry of environment, water and climate, Government of Zimbabwe

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE 7 DATA (METRIC TONNES (MT), 2017)

HFCs	n/a

B: COUNTRY PROGRAMME SECTORAL DATA (MT, 2018)

HFCs	n/a

HFC consumption remaining eligible for funding (mt)	n/a

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		**Funding (US $)**	**Phase-out (mt)**
	(a)	407,713	0.00

Particular	**Units**	**HFC-134a**
HFCs used at enterprise:	mt	14.50
	CO_2 eq	20,735
HFCs to be phased out through this project:	mt	14.50
	CO_2 eq	20,735
HFCs/alternatives to be phased in:	**Units**	**R-600a**
	mt	6.79
	CO_2 eq	30.45
Project duration (months):		24 months
Initial amount requested (US $):		1,138,841
Final project costs (US $):		
Incremental capital costs:		514,660
Contingency (10 % on equipment and trial):		48,866
Incremental operating costs:		163,428
Total project costs:		726,954
Local ownership (%):		100
Export component (%):		0
Co-funding by the enterprise (US $)		300,000
Requested grant (US $):		426,954
Cost-effectiveness:	US $/kg	29.45
	US $/$CO_2$ eq tonnes	20.59
Implementing agency support costs (US $):		29,887
Total cost of project to Multilateral Fund (US $):		456,840
Counterpart funding (Y/N):		Yes
Project monitoring milestones included (Y/N):		Yes

SECRETARIAT'S RECOMMENDATION	For individual consideration

PROJECT DESCRIPTION

Background

Consideration of the project for Capri at the 81st meeting

1. On behalf of the Government of Zimbabwe, UNDP submitted to the 81st meeting a project proposal for the conversion of two manufacturing lines for domestic refrigerators and freezers at Capri from HFC-134a to iso-butane (R-600a), at a total cost of US $1,038,689, plus agency support costs of US $72,708 in line with decision 78/3(g).

2. Further to discussions with UNDP on technical and cost aspects of the proposals, the Secretariat recommended that the Executive Committee consider approving the project proposal for Capri in the amount of US $563,526, plus agency support costs of US $39,447.[1]

3. At its 81st meeting, the Executive Committee considered the proposal but did not approve it owing to concerns raised during the discussions in the contact group established to consider the HFC investment projects that were submitted to that meeting, particularly in relation to the project's cost-effectiveness (CE) and the fact that the project did not account for potential incremental savings. There was no discussion about incremental operational costs (IOCs) during the review as they were not requested in the project.

4. As a result of the discussions, the Executive Committee decided that those HFC investment projects about which concerns had been expressed at the 81st meeting could be resubmitted in accordance with decision 79/45[2] only if those specific concerns had been addressed (decision 81/53(c)).

Re-submission of the project for Capri for consideration at the 82nd meeting

5. On behalf of the Government of Zimbabwe, UNDP has re-submitted the project to the 82nd meeting for the conversion of two manufacturing lines for domestic refrigerators and freezers at Capri from HFC-134a to isobutane (R-600a), at a total cost of US $838,841, plus agency support costs of US $58,719.

6. The revised proposal is the same as the proposal submitted to the 81st meeting, but includes information on the IOCs and co-funding of US $300,000 by Capri to address the concerns raised by the Executive Committee at its 81st meeting. The following sections[3] comprise a description of the proposal, the Secretariat's comments including the discussion on the concerns raised at the 81st meeting have been addressed in the present resubmission, and a recommendation.

HFC consumption and sector background

7. According to the data reported under the surveys on ODS alternatives submitted to 78th meeting, a total of 117.50 mt of HFCs (pure and in blends) was imported in Zimbabwe in 2015. These were mainly R-410A (40.94 per cent), HFC-134a (30.20 per cent), R-404A (25.36 per cent), and R-507A (1.40 per cent). HFC-134a is used both for manufacturing refrigeration equipment and in the refrigeration servicing sector. In 2015, the consumption of HFC-134a amounted to 48.30 mt.

8. Capri is a locally owned enterprise that has already received Multilateral Fund assistance. At the 20th and 65th meetings, funding was approved to replace CFC-11 with HCFC-141b technology (later

[1] UNEP/OzL.Pro/ExCom/81/52

[2] Decision 79/45 states that all submitted HFC investment projects should have broad replicability within the country, region or sector, and should take into account geographic distribution.

[3] Information was extracted from document UNEP/OzL.Pro/ExCom/81/52 where relevant.

changed to cyclo-pentane) and to replace CFC-12 with HFC-134a.[4] The Secretariat therefore considers that this conversion falls under paragraph 18(b) of decision XXVIII/2.

Enterprise background

9. The manufacturing of domestic refrigerators and freezers is done by two enterprises, Capri and Imperial. However, production at Imperial is negligible.

10. Capri has two manufacturing lines: one for refrigerators, with production capacity of 130,000 units/year, and one for freezers, with production capacity of 104,000 units/year. In 2017, the enterprise produced 97,000 units as shown in Table 1.

Table 1. Production of domestic refrigerators and freezers at Capri (2015-2017)

Production line	**Year**				
	2013	**2014**	**2015**	**2016**	**2017**
Refrigerator	25,000	32,000	35,000	35,000	36,000
Freezer	40,000	46,000	43,000	56,000	61,000
Total units	65,000	78,000	78,000	91,000	97,000
HFC-134a consumption (mt)			11.60	13.60	14.50

Conversion

11. The currently available replacements for HFC-based capacity are R-600a, HFOs and their blends. Capri has chosen to convert all of its products to R-600a giving that it is a proven and mature technology and cost-effective; the characteristics of the product, including its performance and energy efficiency; its compliance with established standards on safety and the environment; and reduced carbon emissions. In addition, the enterprise has experience in handling flammable substances as it is manufacturing insulation foam with cyclopentane.

12. Given the flammability of R-600a, changes are required in the manufacturing process, refrigerant storage and supply, and product design. As the freezer line and refrigerator line are located in two separate buildings, equipment for both lines needs to be replaced. Costs associated with modifications to the refrigerant storage and supply station, training and certification are for both lines.

13. The conversion to R-600a technology includes replacement of one shared R-600a refrigerant storage and supply station for both freezer and refrigerator lines; two refrigerant charging stations, along with a refrigerant booster pump; two safety control systems, ventilation systems; two ultrasonic welding machines; two post-charge leak detectors and two helium leak-detection systems; two gas ejection units to replace the proposed gas evacuation units for repair areas. Costs for safety audit, certification and installation are included in some equipment items (e.g. refrigerant storage and distribution system, leak detection system).

14. IOCs are related to the change of refrigerant and the modification of certain components (compressor, electrical safety fan and light) to ensure the safety of the new models and to optimize efficiency. The change of refrigerants from HFC-134a to R-600a results in incremental savings of US $16,242 calculated using the price of US $5.82/kg for HFC-134a, US $9.5/kg for R-600a, and the consumption in 2017 was used for calculating the IOC of refrigerant change and the average production from 2015 to 2017 was used for calculating the IOC of component change. The modification of the components to meet the safety requirements leads to IOCs of US $130,733 for the refrigerator line and

[4] ZIM/REF/20/INV/08 and ZIM/PHA/65/INV/44

US $240,000 for the freezer line. The overall IOCs amount to US $354,491, of which US $54,491 is being requested from the Fund. The calculation of IOC is presented in Table 2.

Table 2: IOCs for the conversions at Capri in Zimbabwe (US $)

Cost item	Refrigerator line		Freezer line		Total
	Unit cost	Total	Unit cost	Total	
Compressor	1	35,333	1.5	80,000	115,333
Electrical safety fan and light	2.2	77,733	2.5	133,333	211,066
Efficiency modification	0.5	17,667	0.5	26,667	44,334
Sub-total	3.7	130,733	4.5	240,000	370,733
Savings from the change of refrigerants	(0.18)	(6,472)	(0.18)	(9,770)	(16,242)
Total	**3.52**	**124,261**	**4.32**	**230,230**	**354,491**

Project costs

15. Addressing the issues raised at the 81st meeting, the project cost submitted to the 82nd meeting has been decreased to US $1,138,843, consisting of US $784,350 of ICC and US $354,491 of IOCs. Of the total cost, the Government is requesting US $838,841 from the Multilateral Fund, resulting in a cost-effectiveness of US $57.85/kg. Capri will provide co-funding of US $300,000 for the conversion project. The detailed costs are presented in Table 3.

Table 3. Costs for the conversion of domestic refrigerator and freezer manufacturing at Capri

Description	Proposed costs (US $)		Secretariat recommended costs (US $)
	81st meeting	82nd meeting	
Refrigerant storage, distribution and safety system	155,500	112,000	58,000
Helium leak-detection system including helium storage and recovery	258,017	210,000	90,000
Vacuum pump and accessories (60 units)	291,658	20,000	0
Refrigerant-charging system including pumps and accessories	220,502	140,000	110,000
Leak detection for R-600a in refrigerant charging area	36,759	30,000	26,000
Ultrasonic welding machine	99,519	70,000	50,000
Gas evacuation system for repair area	27,380	20,000	4,000
Safety and ventilation	107,133	120,000	100,000
Sub-total	**1,196,468**	**722,000**	**438,000**
Installation, inspection visit, spare parts and startup	78,474	25,000	30,660
Test and trial			20,000
Contingency on equipment, test and trial	63,747	37,350	48,866
Redesign, safety certificate, technical assistance and training			26,000
Total ICCs	**1,338,689**	**784,350**	**563,526***
IOCs	Not requested	354,491	163,428
Total costs	**1,338,689**	**1,138,841**	**726,954**
Counterpart funding	(300,000)	(300,000)	(300,000)
Total requested	**1,038,689**	**838,841**	**426,954**
HFC-134a consumption to be phased out (mt/year)	14.5	14.5	14.5
Cost-effectiveness based on total project costs (US $/kg)	92.32	78.54	50.13
Cost-effectiveness based on funding requested (US $/kg)	71.63	57.85	29.45

*Recommended costs at the 81st meeting

16. The resubmission also included milestones for monitoring the progress of implementation, including signing of the project document; completion of design; completion of bidding for equipment; delivery of equipment; completion of installation, test and trial; commission. Each milestone will be linked to a payment instalment. Furthermore, in line with decision 22/38 and subsequent decisions of the Executive

Committee, equipment to be replaced in the project will, as part of the project, be destroyed or rendered unusable.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

17. The Secretariat has reviewed the project proposal on the basis of the current policies and decisions of the Executive Committee; the project proposal submitted to the 81st meeting; and similar approved conversion projects for CFC and HFC phase-out and approved projects to phase out ODS with flammable alternatives.

Level of production at Capri

18. Noting the current relatively low production level (97,000 units in 2017) as compared to the production capacity at Capri (over 230,000 units/year), UNDP informed that, according to the NOU and Capri, the current production levels were in part due to the economic situation in the country. The production facility had undergone expansion in its foam production at the end of 2017, and had experienced operational and technical issues in integrating new equipment with the existing one; as a result, the full capacity can not be achieved. UNDP confirmed that Capri is currently resolving the technical issues relating to the foam line, which will also benefit the conversion of the refrigeration line.

Incremental costs

19. Upon discussion, the Secretariat and UNDP agreed that the ICCs recommended by the Secretariat at the 81st meeting (as shown in Table 3) is acceptable for recommendation to the Executive Committee.

20. The Secretariat reviewed the information on the calculation of the IOCs and noted that the price of R-600a of US $9.50/kg was significantly higher than the prices in neighbouring countries. After discussion, the price of R-600a was adjusted to US $6.00/kg, resulting in an increase of savings from US $16,242 to US $42,212 from the change of refrigerants. The IOCs from the change of component were calculated using the average production from 2015 to 2017 in the submission to the 82nd meeting. During the review, UNDP requested to use the latest production of 97,000 units in 2017.

21. The IOCs associated with the efficiency modification was removed and in line with previously approved projects, the IOC for the compressor was agreed at US $1.00 per unit, and for the electrical fan and light at US $1.12 per unit. After deducting the incremental savings of US $42,212 indicated in paragraph 20, the net IOCs for the project were subsequently calculated at US $163,428.

22. The total eligible cost of the project as agreed amounts to US $726,954, consisting of US $563,526 of ICCs and US $163,428 of IOCs. Capri has committed co-funding of US $300,000 for the implementation of the conversion project (a letter from Capri on that matter has been received by the Secretariat).

23. The Secretariat noted that the co-funding of US $300,000 will be able to cover the full IOC and partial ICC. Therefore, the total project costs requested from the Fund amounts to US $426,954 at a cost-effectiveness of US $29.45/kg.

24. The conversion to R-600a has the potential to produce a larger number of products with low-global warming potential alternatives. The project could also be replicated in a large number of low-volume consuming countries where manufacturing enterprises similar to Capri are currently in operation.

25. The Secretariat notes that the purpose of implementing projects under decision 78/3(g) is to gain experience in the ICCs and IOCs that might be associated with phasing down HFCs. On the basis of the

information available at the time of review, the Secretariat considers that the agreed costs are its best estimates of the overall incremental costs of conversion; these estimates, however, might change as more information becomes available and according to the specific characteristics of the enterprise. The Secretariat, therefore, considers that approval of the project at the levels proposed above would not constitute a precedent.

Climate benefits

26. The reduction of 14.5 mt of HFC-134a consumption and the expected introduction of R-600a in the project is expected to result in an emission reduction of 20,735 tonnes of CO_2 equivalent. No estimate of the indirect emissions savings associated with improved energy efficiency has been provided.

2018–2020 business plan

27. This project is included in the 2018–2020 business plan of the Multilateral Fund at a value of US $407,713, including agency support costs, but with no indication of phase-out of HFCs. The Secretariat notes that, after the adjustments to the costs, the proposal is US $49,128 more than what had been included in the business plan.

Recommendation

28. The Executive Committee may wish to consider:

(a) The project proposal for the conversion of domestic refrigerator and freezer manufacturing at Capri from the use of HFC-134a as the refrigerant to isobutane (R-600a) in Zimbabwe, in the context of its discussion on HFC stand-alone projects submitted to the 82nd 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/82/31);

(b) Whether or not to approve the project proposal indicated in sub-paragraph (a) above in the amount of US $426,954, plus agency support costs of US $29,887 for UNDP, 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 Zimbabwe had been received by the depositary at the Headquarters of the United Nations in New York;

(ii) That 14.50 metric tonnes (mt) (20,735 mt CO_2-eq tonnes) of HFC-134a would be deducted from the starting point for sustained aggregate reduction in HFC consumption once it had been established;

(iii) That the project would be completed within 24 months of the transfer of funds to UNDP, and that a comprehensive completion report would be submitted within six months of project completion, with detailed information on:

a. The eligible incremental capital cost for all equipment and other components including those not funded under the project;

b. Incremental operating costs;

c. Any possible savings incurred during the conversion and relevant factors that facilitated implementation (e.g. whether any purchased and/or

installed equipment or supplies had gone through a competitive quote/bidding process and the details thereof);

d. Changes in energy efficiency of the products being manufactured and any related policies undertaken by the Government; and

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