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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: DOMINICAN REPUBLIC

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

Refrigeration

- Conversion of a commercial refrigerator manufacturing line at Fábrica de Refrigeradores Comerciales, SRL (FARCO) from HFC-134a and R-404A to propane (R-290) as refrigerant UNDP and Canada

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT**DOMINICAN REPUBLIC****PROJECT TITLE****BILATERAL/IMPLEMENTING AGENCY**

(a) Conversion of a commercial refrigerator manufacturing line at Fábrica de Refrigeradores Comerciales, SRL (FARCO) from HFC-134a and R-404A to propane (R-290) as refrigerant	UNDP and Government of Canada
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NATIONAL CO-ORDINATING AGENCY	Programa Nacional de Ozono (PRONAOZ) Ministerio de Ambiente y Recursos Naturales
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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 ODP tonnes
	(a)	227,644	n/a

PROJECT TITLE:	FARCO	
HFC-134a used at enterprise:	mt	4.01
	mt CO ₂ -eq.	5,734.3
R-404A used at enterprise:	mt	0.15
	mt CO ₂ -eq.	588.3
HFC-134a to be phased out through this project:	mt	4.01
	mt CO ₂ -eq.	5,734.3
R-404A to be phased out through this project:	mt	0.15
	mt CO ₂ -eq.	588.3
R-290 to be phased in:	mt	2
	mt CO ₂ -eq.	6
Project duration (months):		24
Initial amount requested (US \$):		370,760
Final project costs (US \$):		
Incremental capital cost:		157,850
Contingency (10%):		Included in ICC
Incremental operating cost:		25,645
Total project cost:		183,495
Local ownership (%):		98 %
Export component (%):		<5 %
Requested grant (US \$):		179,825
Cost-effectiveness (US \$/kg) and (US \$/CO ₂ -eq.)	US \$/kg	43.23
	US \$/CO ₂ -eq.	22.65
Implementing agency support cost (US \$):		8,984
Cooperating agency support cost (US \$):		10,400
Total cost of project to Multilateral Fund (US \$):		199,209
Status of counterpart funding (Y/N):		Y
Project monitoring milestones included (Y/N):		Y
SECRETARIAT'S RECOMMENDATION	For individual consideration	

PROJECT DESCRIPTION

1. On behalf of the Government of Dominican Republic, UNDP, as the lead implementing agency, has submitted a request for funding the conversion of a commercial refrigerator manufacturing line at Fábrica de Refrigeradores Comerciales, SRL (FARCO) from HFC-134a and R-404A to propane (R-290) as refrigerant, at a total cost of US \$402,713, consisting of US \$270,760, plus agency support costs of US \$18,953 for UNDP, and US \$100,000, plus agency support costs of US \$13,000 for the Government of Canada.

2. The project proposal for the conversion at FARCO was submitted with a letter from the Government of Dominican Republic 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 Dominican Republic

3. Based on the survey of ODS alternatives undertaken in the Dominican Republic, 819.17 mt of HFCs was consumed in 2015. Out of the 11 HFCs (pure and blends) imported into the country, only three substances (i.e., HFC-134a, R404A, and R-410A) represented approximately 93 per cent of the total consumption. The consumption of HFC-134a constitutes 66 per cent of the total consumption in mt, and 50 per cent in mt CO₂-eq, followed by R-404A with 15 per cent in mt, and 32 per cent in mt CO₂-eq, and R-410A at 11 per cent in mt and 13 per cent in mt CO₂-eq. All three substances are used in the refrigeration manufacturing and servicing sectors.

4. Domestic refrigerators are no longer manufactured in Dominican Republic, however, there are two local manufacturers of commercial refrigeration appliances, FARCO and Metalgas. Of these two, FARCO manufactures all commercial refrigeration appliances whereas Metalgas partly imports and only produces special models locally. Both companies use HFC-134a and R-404A as refrigerants in their manufacturing process. In 2015, the total consumption of FARCO was 3.5 mt of HFC-134a and 0.07 mt of R-404A; however, no information on the consumption of Metalgas was provided.

Enterprise background

5. FARCO was established in 1975 as a manufacturer of stand-alone self-contained commercial refrigeration appliances and is 98 per cent nationally owned. It is the largest manufacturer of commercial refrigeration equipment in the Dominican Republic and produces on average 15,000 units a year, with exports to neighbouring countries, and exports less than five per cent to non-A5 countries.

6. At the 22nd meeting, the Executive Committee approved US \$423,209 for the conversion of 27.0 ODP tonnes of CFC-11 to HCFC-141b and 4.8 ODP tonnes of CFC-12 to HFC-134a in the manufacture of unitary commercial refrigeration equipment at FARCO. The project was completed in June 1999.

HFC consumption by the enterprise

7. The enterprise's average consumption of HFC-134a and R-404A from 2015-2017 were 4.01 mt and 0.15 mt, respectively. The 2013-2017 HFC-134a and R-404A consumption at FARCO is shown in Table 1.

Table 1. Consumption of HFC-134a and R-404A at FARCO (2013-2017)

Refrigerant	Consumption (kg)				
	2013	2014	2015	2016	2017
HFC-134a	3,169	3,521	3,481	4,984	3,552
R-404A	98	496	65	205	172
Total	3,267	4,017	3,546	5,189	3,724

Project overview and funding request*Project description and selection of alternative technology*

8. FARCO operates a single manufacturing line consisting of a dual head foam manufacturing station, a refrigeration manufacturing station and two refrigerant filling stations for HFC-134a and R-404A.

9. The selection of R-290 as the alternative technology was based on cost and energy efficiency for use in its commercial refrigeration equipment. Compared to R-600a (isobutane), R-290 provides more versatility in use for all models produced by FARCO.

10. For the introduction of R-290, the following changes are being made in FARCO:

- (a) Modifications to the assembly line to accommodate a new HC filling line to include charging equipment, sensors, leak detectors and, ultrasonic welding machine;
- (b) Installation of a monitoring and safety system including separation of the cargo area, modifications to electrical grounding, HC leak detection system, ventilation, including the related infrastructure for these modifications and relevant certifications; and
- (c) Product development to include modifications for the use of a flammable refrigerant, testing and trials for certification; and technical assistance.

Project costs

11. The incremental capital costs (ICC) as originally submitted were at US \$659,000 out of which US \$351,000 is requested from the Multilateral Fund, summarized in Table 2.

Table 2. Estimated costs for conversion of one manufacturing line at FARCO

Item	Description	Cost (US \$)	ICC request to MLF (US \$)
Technical support	Refrigeration expert	25,000	25,000
Assembly line conversion	Charging pump, loading machine (x2)	130,000	65,000
	Monitoring system incl. sensors	35,000	0
	HC recovery unit	15,000	0
	Leak detector	15,000	0
	Leak test machine (Helium with recovery unit)	90,000	10,000
	Ultrasonic welding unit	30,000	0
Safety and monitoring systems	Separation of cargo area	10,000	10,000
	Ventilation	15,000	15,000
	R-290 leak detection system	20,000	20,000
	Electrical grounding	10,000	10,000
	Related infrastructure works	70,000	30,000
Trials, testing	Outsourced test chamber testing	20,000	20,000
Model adaptations	25 base models @ 2,000	50,000	50,000

Item	Description	Cost (US \$)	ICC request to MLF (US \$)
Certification of new models	25 base models @ 2,000	50,000	50,000
Safety audit	Independent expert	20,000	20,000
Seminar	Know-how dissemination	10,000	10,000
Subtotal		615,000	335,000
Contingency	10% of Subtotal	44,000	16,000*
Grand Total		659,000	351,000

*10 per cent of the cost of equipment only, at US \$160,000.

12. Incremental operating costs (IOC) are being requested and calculated based on the differences in the price of the raw materials, the higher compressor costs, and increased costs in some components. IOC for conversion of HFC-134a and R-404A was calculated at US \$22,025, and US \$1,095, respectively; this amounts to US \$23,120 for phasing out 4.16 mt of HFC-134a and R-404A. The details are presented in Table 3 as submitted:

Table 3. Incremental operating costs from HFC-134a and R-404A to R-290

Parameters	HFC-134a to R290	R-404A to R-290
Price of HFC (US \$/kg)	6.50	5.61
Price of R-290 (US \$/kg)	9.80	9.80
Charge of HFC (kg/unit)	0.785	0.60
Charge of R-290 (kg/unit)	0.314	0.21
Cost for HFC (US \$/unit)	5.10	3.37
Cost for R-290 (US \$/unit)	3.08	2.07
IOC (US \$/unit)	-2.03	-1.30
IOC ultrasonic welding (US \$/unit)	0.50	0.50
Compressor costs (US \$/unit)	4.00	8.00
IOC (US \$/unit)	2.47	3.20
Average production (2015-2017)	8,900	342.00
IOC (US \$)	22,025	1,095
Cost for HFC (US \$/unit)	5.10	3.37

13. The total cost of the project amounts to US \$374,120, plus agency support costs, with a cost-effectiveness of US \$131/kg, excluding co-financing by the enterprise, as submitted. The project would be implemented over a period of 24 months.

14. The enterprise has already begun its modification activities to convert its refrigeration manufacturing activities to hydrocarbons. It relocated the manufacturing line to allow the inclusion of a new, R-290-based filling station while maintaining the HFC-134a charging equipment. FARCO purchased/installed a helium leak detection system with recovery unit, an R-290 charging unit, an ultrasonic welding machine, and a ventilation system with gas detectors. Some civil works have also been completed to accommodate this new equipment. However, production using R-290 has not commenced yet.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Eligibility

15. The Secretariat reviewed the project proposal based on similar conversion projects for CFC phase-out so far approved albeit with a different HC refrigerant (i.e., conversion of refrigerant component from

CFC-12 to R-600a involving product and manufacturing process redesign); and in light of decision 78/3(g) which is primarily to gain experience in the ICCs and IOCs that might be associated with phasing down HFCs in Article 5 countries.

Regulatory framework

16. The Secretariat noted that with the conversion of FARCO, a significant portion of commercial refrigeration manufacturing in the country would be converted to R-290, and asked UNDP to consider discussing with the Government the possibility of putting in place regulatory measures that will prohibit the manufacture of commercial refrigerators using HFC-134a and R-404A-based commercial refrigerators to support the sustainability of the conversion, and the phase-down in consumption of HFC-134a in the local market. UNDP advised that the Government is committed to implement the project at FARCO; however, at this time it is not considering issuing regulations relating to limiting the use of HFC-134a and R-404A in commercial refrigeration manufacturing.

Selection of enterprise

17. The Secretariat notes that FARCO received funding from the Multilateral Fund in 1997 to convert from CFC-11 as a blowing agent and CFC-12 as a refrigerant to HCFC-141b and HFC-134a, respectively, for the manufacture of unitary commercial refrigeration equipment. As such, the Secretariat considers that this conversion falls under paragraph 18(b) of decision XXVIII/2.

Incremental cost calculation

18. The Secretariat noted that FARCO had already purchased equipment items needed for the conversion of the manufacturing line (i.e., helium leak detection system with recovery unit, one R-290 refrigerant charging unit, ultrasonic welding unit, ventilation system with gas detectors); therefore, those items should be part of the baseline. UNDP clarified, however, that these equipment items that had been purchased have not yet been installed, and production for R-290-based products have not been started. On this basis, it was agreed to calculate the eligible ICC based on the HC evacuation system, R-290 leak detector, ventilation system (i.e., fan and ducting), certification, testing and trials, model adaptations and certifications, and technical assistance. The costs of several of those items were adjusted and agreed as follows:

- (a) The HC evacuation system and leak detector was adjusted from US \$30,000 to US \$17,500 based on costs for similar projects;
- (b) Modifications to the safety and monitoring systems including a safety audit was adjusted from US \$95,000 to US \$60,000 (lump sum) to include all components of the system (i.e., ventilation, explosion proof fans, sensors and controls) based on other projects;
- (c) Product and model adaptations and certification of new models was adjusted from US \$100,000 to US \$32,000 through the rationalisation of the number of base models that required modifications (i.e., from 25 to eight at a unit cost of US \$4,000 per model);
- (d) Trials and testing from US \$20,000 to US \$4,000; and
- (e) Technical assistance and training, including dissemination of results, at US\$30,000.

19. The total ICC agreed based on the adjustments amounts to US \$157,850.

20. The Secretariat also recalculated the IOC costs based on the overall consumption of the enterprise, changes to the refrigerant charge size, the price US \$3.10/kg of HFC-134a and US \$3.22/kg of R-404A as

reported in the country programme implementation report; adjusted the compressor costs at US \$2.17/unit as used in a similar project, and used US \$1.12/unit for other components. These changes resulted in an agreed IOC of US \$25,645 (i.e., IOC for HFC-134a to R-290 was US \$24,608; and IOC for R-404A to R-290 was US \$1,037).

21. Based on the analysis of the ICC and IOC, the final agreed cost of the project amounted to US \$183,495, plus agency support costs. After adjusting for non-Article 5 ownership of two per cent, the total cost was US \$179,825 plus agency support costs, with a cost-effectiveness of US \$43.2/kg, as shown in Table 4.

Table 4. Agreed costs for conversion of domestic refrigerator manufacturing line at FARCO Industries

Description	As submitted (US \$)	Agreed costs (US \$)
Assembly line conversions (HC evacuation system and leak detector)	75,000	17,500
Safety and monitoring systems including safety audit	85,000	50,000
Safety audit	20,000	10,000
Model adaptations and certifications	100,000	32,000
Trials and testing	20,000	4,000
Technical assistance	35,000	30,000
Sub-total	335,000	143,500
Contingency costs (10 per cent)	16,000*	14,350
Total ICC	351,000	157,850
IOC	23,120	25,645
Total cost of the project	374,120	183,495
Less 2 per cent for non-Article 5 ownership		(3,670)
Total requested		179,825
Cost-effectiveness (US \$/kg)		43.23

*10 per cent of the cost of equipment only, at US \$160,000

22. 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 enterprises. The Secretariat, therefore, considers that approval of the project at the levels proposed above would not constitute a precedent.

Climate benefits

23. The project is expected to result in emissions reduction of 6,328.6 mt CO₂-eq with the reduction of 4.01 mt of HFC-134a and 0.15 mt of R-404A and the expected introduction of R-290. No estimates of indirect emission savings associated with energy efficiency were provided.

Business plan 2018 -2020

24. This project is included in the 2018–2020 business plan of the Multilateral Fund at a value of US \$227,644 for UNDP, including agency support costs, to phase out 4.16 mt of HFC. The Secretariat notes that after the adjustments to the costs, the proposal is US \$28,435 less than what has been included into the business plan.

RECOMMENDATION

25. The Executive Committee may wish to consider:

- (a) The project proposal for the conversion of a commercial refrigerator manufacturing line at Fábrica de Refrigeradores Comerciales, SRL (FARCO) from HFC-134a and R-404A to propane (R-290) as refrigerant, Dominican Republic, in the 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 \$199,209, consisting of US \$99,825, plus agency support costs of US \$8,984 for UNDP, and US \$80,000, plus agency support costs of US \$10,400 for the Government of Canada, 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 Dominican Republic had been received by the depositary at the Headquarters of the United Nations in New York;
 - (ii) That 4.01 mt (5,734.3 mt CO₂-eq.) of HFC-134a and 0.15 mt of R-404A (588.3 mt CO₂-eq.) 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 UNDP, and a comprehensive completion report with detailed information on the eligible incremental capital costs for all equipment including those not funded under the project, 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; and,
 - (iv) That any remaining funds will be returned to the Multilateral Fund no later than one year after the date of project completion.