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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: ARGENTINA**

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

Phase-out

- Conversion project for replacement of HFC-134a with isobutane (R-600a) / propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment

UNIDO

## PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

## ARGENTINA

## PROJECT TITLE

## BILATERAL/IMPLEMENTING AGENCY

(a) Conversion project for replacement of HFC-134a with isobutane (R-600a) / propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment	UNIDO
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NATIONAL CO-ORDINATING AGENCY	OPROZ
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## LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

## A: ARTICLE-7 DATA (METRIC TONNES, [INSERT YEAR], AS OF [INSERT MONTH AND YEAR])\*

HFCs	mt	n/a
	CO <sub>2</sub> -eq.	n/a

## B: COUNTRY PROGRAMME SECTORAL DATA (METRIC TONNES, [INSERT YEAR], AS OF [INSERT MONTH AND YEAR])\*

HFCs	mt	n/a
	CO <sub>2</sub> -eq.	n/a

\* A total use of 4,567 mt of HFCs including blends (including 1,447 mt of HFC-134a) was estimated in 2015 (Source: "Survey of ODS and ODS alternatives in Argentina", 2017)

HFC consumption remaining eligible for funding	mt	n/a
	CO <sub>2</sub> -eq.	n/a

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US \$	Phase-out ODP tonnes
	(a)	0	0

PROJECT TITLE:	(a)	
HFC-134a used at enterprise	mt	96.55
	mt CO <sub>2</sub> -eq.	138,069
HFC-134a to be phased out through this project:	mt	96.55
	mt CO <sub>2</sub> -eq.	138,069
Alternative to be phased in through this project: R-600a/R-290	mt	48.28
	mt CO <sub>2</sub> -eq.	145
Project duration (months):		24
Initial amount requested (US \$):		2,619,710
Final project costs (US \$):		
Incremental capital cost:		1,105,810
Contingency (10%):		78,300
Incremental operating cost:		656,645
Total project cost:		1,840,755
Local ownership (%):		100
Export component (%):		0
Requested grant (US \$):		1,840,755
Cost-effectiveness	US \$/kg	19.07
	US \$/mt	13.33
	CO <sub>2</sub> -eq.	
Implementing agency support cost (US \$):		128,853
Total cost of project to Multilateral Fund (US \$):		1,969,608
Status of counterpart funding (Y/N):		Y
Project monitoring milestones included (Y/N):		Y

SECRETARIAT'S RECOMMENDATION	For individual consideration
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## Note from the Secretariat

### Background

1. On behalf of the Government of Argentina, UNIDO submitted to the 80<sup>th</sup> meeting a project proposal for conversion from HFC-134a to isobutane (R-600a)/propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment at three enterprises (Briket, Bambi and Mabe-Kronen), pursuant to decision 78/3(g).<sup>1</sup> At the 80<sup>th</sup> meeting, the Executive Committee deferred consideration of the project to the 81<sup>st</sup> meeting.

2. On behalf of the Government of Argentina, UNIDO resubmitted the project proposal that was submitted to the 80<sup>th</sup> meeting, which is attached to the present note from the Secretariat.

### Additional information since the 80<sup>th</sup> meeting

3. In resubmitting the project proposal, UNIDO provided the following additional information:

- (a) Consumption of HFC-134a at the enterprise level for 2017 was not available;
- (b) Funding from the Kigali Cooling Efficiency Program (KCEP) are proposed to be secured to assess improvements and technology optimization of energy efficiency (EE) of the domestic refrigerators; to implement activities to support the Government of Argentina in enacting the minimum energy performance standards and labelling standards for higher EE classes mainly at small-size enterprises; and development of a financial model to assess the financial impact for improving of EE appliances in production lines.

4. With regard to the agreed cost for conversion, UNIDO indicated that funding adjustments in the contingencies, and installation and delivery costs at the three enterprises, maintaining the same funding level of US \$1,840,755 agreed at the 80<sup>th</sup> meeting. The agreed costs for the conversion of refrigeration equipment manufacturing in Argentina, highlighting the proposed costs adjustments, is presented in Table 1.

**Table 1. Agreed costs for conversion of domestic and commercial refrigeration equipment manufacturing in Argentina (US \$)**

Particulars	Briket	Bambi	Mabe-Kronen	Total
Product design, testing and certification	59,600	42,500	53,900	156,000
Refrigerant storage and supply system	9,000	39,000	24,000	72,000
Assembly line modification and production equipment	115,000	250,000	115,000	480,000
Safety systems	37,000	109,000	94,000	240,000
Technical assistance and training	18,000	21,000	19,000	58,000
Installation and delivery	15,730	20,440	18,640	54,810
Safety audit and certification	15,000	15,000	15,000	45,000
Dissemination of technology	0	0	0	0
<b>Total funding request</b>	<b>269,330</b>	<b>496,940</b>	<b>339,540</b>	<b>1,105,810</b>
Contingency on investment	16,100	38,900	23,300	78,300
<b>Total incremental capital costs (ICC)</b>	<b>285,430</b>	<b>535,840</b>	<b>362,840</b>	<b>1,184,110</b>
Incremental operating costs (6 months)	177,255	238,664	240,727	656,645
Total incremental cost	462,685	774,504	603,567	1,840,755
<b>HFC-134a consumption (mt)</b>	<b>29.50</b>	<b>39.00</b>	<b>28.05</b>	<b>96.55</b>
<b>Cost-effectiveness (US \$/kg)</b>	<b>15.68</b>	<b>19.86</b>	<b>21.52</b>	<b>19.07</b>

<sup>1</sup> UNEP/OzL.Pro/ExCom/80/30

### Secretariat's comments

5. As indicated in paragraph 16 of the project proposal submitted to the 80<sup>th</sup> meeting, at the 26<sup>th</sup> meeting, Briket and Bambi received funding to convert from CFC-11 and CFC-12 to cyclopentane and HFC-134a, respectively, used for the manufacture of domestic refrigeration equipment. As such, the Secretariat considers that this conversion falls under paragraph 18(b) of decision XXVIII/2.

6. As indicated in paragraphs 21 and 32 of the project proposal submitted to the 80<sup>th</sup> meeting, some of the enterprises already had in their baseline equipment required for the conversion to R-600a and R-290. On this basis, the Secretariat sought further information on the status of the conversion at the enterprise. UNIDO clarified that preparatory work at the enterprises is progressing, which were included in the project proposal as counterpart funding; however, they are awaiting a decision from the Multilateral Fund to fully implement the conversion.

7. The Secretariat also sought clarification on status of the funding to be provided by KCEP. UNIDO clarified that final approval of the project by KCEP at a total value of US \$30,000, is expected by the end of May 2018; this project will implement activities relating to EE improvement in domestic refrigerators at the enterprise level, and support EE improvement in refrigeration appliances and clean cooling finance at the national level.

8. UNIDO confirmed that in line with decision 22/38 and subsequent decisions of the Executive Committee, that equipment to be replaced by the project would be destroyed or rendered unusable as part of the project.

9. On request for clarification on whether the project implementation time could be reduced, UNIDO advised that the enterprises would not be in a position to reduce the project duration.

### Recommendation

10. The Executive Committee may wish to consider

- (a) The project proposal for the conversion from HFC-134a to R-600a/R-290 in the manufacture of domestic refrigerators at the three manufacturing facilities in Argentina, in the context of its discussion on HFC stand-alone project submitted to the 81<sup>st</sup> 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 \$1,840,755, plus agency support cost of US \$128,853 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 Argentina had been received by the depositary at the Headquarters of the United Nations in New York, except funding requests relating to enabling activities that is submitted for consideration in the current meeting;
  - (ii) That 96.55 mt (138,069 mt CO<sub>2</sub>-eq) of HFC-134a 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; and
  - (iv) That any remaining funds will be returned to the Multilateral Fund no later than one year after the date of project completion.
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EXECUTIVE COMMITTEE OF  
THE MULTILATERAL FUND FOR THE  
IMPLEMENTATION OF THE MONTREAL PROTOCOL  
Eightieth Meeting  
Montreal, 13-17 November 2017

**PROJECT PROPOSAL: ARGENTINA**

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Phase-out

- Conversion project for replacement of HFC-134a with isobutane (R-600a) / propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment

UNIDO

**PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS****ARGENTINA****PROJECT TITLE(S) BILATERAL/IMPLEMENTING AGENCY**

(a) Conversion project for replacement of HFC-134a with isobutane (R-600a) / propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment	UNIDO
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<b>NATIONAL CO-ORDINATING AGENCY</b>	OPROZ
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**LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT****A: ARTICLE-7 DATA (ODP TONNES, [INSERT YEAR], AS OF [INSERT MONTH AND YEAR])**

HFCs	*
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**B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, [INSERT YEAR], AS OF [INSERT MONTH AND YEAR])**

HFCs	*
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<b>HFC consumption remaining eligible for funding (ODP tonnes)</b>	n/a
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<b>CURRENT YEAR BUSINESS PLAN ALLOCATIONS</b>		<b>Funding US \$</b>	<b>Phase-out ODP tonnes</b>
	(a)	0	0

<b>PROJECT TITLE:</b>	(a)
HFC-134a used at enterprise (mt):	96.55
HFC-134a to be phased out (mt) through this project:	96.55
HFC-134a to be phased out (mt CO <sub>2</sub> equivalent):	138,069
Project duration (months):	24
Initial amount requested (US \$):	2,619,710
Final project costs (US \$):	
Incremental capital cost:	1,105,810
Contingency (10 %):	78,300
Incremental operating cost:	656,645
Total project cost:	1,840,755
Local ownership (%):	100
Export component (%):	0
Requested grant (US \$):	1,840,755
Cost-effectiveness (US \$/kg):	19.07
Implementing agency support cost (US \$):	128,853
Total cost of project to Multilateral Fund (US \$):	1,969,608
Status of counterpart funding (Y/N):	Y
Project monitoring milestones included (Y/N):	Y

<b>SECRETARIAT'S RECOMMENDATION</b>	For individual consideration
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\*A total of 4,988 mt of HFC (including 1,790 mt of HFC-134a) was estimated in 2015 (source: ODS survey).



## PROJECT DESCRIPTION

11. On behalf of the Government of Argentina, UNIDO has submitted a project for conversion of HFC-134a with isobutane (R-600a) / propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment, at a total cost of US \$2,619,710, plus agency support costs of US \$183,380, as originally submitted.

### Project objective

12. The project will eliminate the annual consumption of 96.55 metric tonnes (mt) (138,069 of CO<sub>2</sub> tonnes) of HFC-134a at the three domestic and commercial refrigeration equipment manufacturing enterprises - Briket S.A. (Briket), Talleres Metalurgicos Bambi (Bambi), and Mabe-Kronen Int. SRL (Mabe-Kronen). The energy efficiency of the domestic refrigerators will also increase by at least 20 per cent through changes in the refrigerant, and equipment design and components.

### HFC consumption and sector background

13. In 2015, a consumption of 4,988 mt of HFCs and blends of HFCs was identified in the country, with the refrigeration and air-conditioning (RAC) sector accounting for the vast majority (approximately 91.6 per cent) of that consumption. A small amount of HFCs (8.4 per cent) are consumed in the manufacture of metered-dose inhalers (MDI), in the aerosol and fire-fighting sectors, and in the manufacture of polyurethane foam.

14. Table 1 shows the 2015 consumption of HFC consumption in RAC applications based on ODS alternatives survey. After R-410A, HFC-134a is the second most consumed refrigerant in the country, accounting for approximately 32 per cent of the country's HFC consumption in mt.

**Table 1. Consumption of HFCs in the RAC sector in 2015 (mt)**

Particulars	HFC-134a	R-404A	R-410A	R-407C	Other HFCs	Other HFC blends	Total
<b>Refrigeration</b>							
Manufacturing	157	60					217
Servicing	963	244				501	1,708
<b>Air-conditioning</b>							
Manufacturing	328*		1,816				2,144
Servicing			294	6	14	184	498
<b>Total</b>	<b>1,447</b>	<b>304</b>	<b>2,110</b>	<b>6</b>	<b>14</b>	<b>685</b>	<b>4,567</b>
<b>% of total consumption</b>	<b>31.7</b>	<b>6.7</b>	<b>46.2</b>	<b>0.1</b>	<b>0.3</b>	<b>15.0</b>	<b>100.0</b>

\*Relates to mobile air-conditioning.

15. The domestic and commercial refrigeration manufacturing sector consists of six medium-sized enterprises, the three enterprises participating in the project, Autosal, Pilisar<sup>2</sup>, and the non-Article 5-owned Electrolux-Frimetal S.A., and some very small manufacturers. The 2015 consumption of HFC-134a in the sector was 153 mt; a further 15 mt of R-600a was consumed by Autosal and Pilisar. The total market for the sector is estimated at 1.1 million units; exports from the country are negligible. Autosal and Pilisar manufactured approximately 240,000 R-600a units in 2015, a 20 per cent increase from their

<sup>2</sup> Autosal received funding from the Multilateral Fund to convert from CFC-11 and CFC-12 to cyclopentane and R-600a in 1997. Pilisar is manufacturing R-600a-based domestic refrigerators; however the enterprise has not received funding from the Fund.

2014 manufacturing level. Imports accounted for approximately 10 per cent of units sold on the market; data is not available on the relative proportion of HFC-134a-based and R-600a-based imports.

#### Enterprise background

16. Briket and Bambi are 100 per cent locally-owned and Mabe-Kronen is 100 per cent Article 5-owned. Both Briket and Mabe-Kronen have one assembly line with capacity of 60 units/hour, while Bambi has three assembly lines with a total capacity of 100 units/hour. Briket and Bambi manufacture domestic refrigerators, freezers, bottle coolers, chest freezers and display cabinets, while Mabe-Kronen only manufactures domestic refrigerators and freezers.<sup>3</sup> Briket and Bambi received funding from the Multilateral Fund to convert from CFC-11 and CFC-12 to cyclopentane and HFC-134a in 1997, while Mabe-Kronen received funding from the Multilateral Fund to convert from HCFC-141b to cyclopentane in 2012<sup>4</sup> under stage I of the HPMP.

#### HFC consumption by enterprise

17. The 2014-2016 HFC-134a consumption at the enterprises is shown in Table 2.

**Table 2. Consumption of HFC-134a (mt) at Briket, Bambi, and Mabe-Kronen (2014-2016)**

Year	2014	2015	2016
Briket	23.70	27.30	29.50
Bambi	31.00	43.00	39.00
Mabe-Kronen	27.9	31.00	28.05
<b>Total (mt)</b>	<b>82.60</b>	<b>101.30</b>	<b>96.55</b>
<b>Total (CO<sub>2</sub> tonnes)</b>	<b>118,118</b>	<b>144,859</b>	<b>138,067</b>

#### Selection of alternative technology

18. R-600a was selected as the alternative technology for domestic refrigerators, freezers and bottle coolers while R-290 was selected for display cabinets. Both refrigerants are cheaper than HFC-134a in terms of the refrigerant charge per appliance (26 per cent), and have a higher coefficient of performance and energy efficiency ratio compared to HFC-134a; there is no need to recycle or reclaim the refrigerant on the repair line or at the end of life of the appliances, if safely released, due to low GWP; and the technology is well-proven and components are widely available.

#### Project description

19. Given the flammability of R-600a and R-290, changes are foreseen to the production process at the three enterprises and the end-products, as well as modifications to their testing laboratory to work with hydrocarbon-based (HC) refrigerants. The conversion at each enterprise includes the following five components:

- (a) Product development includes: ventilation and safety for the laboratory for development and testing; redesign, prototyping, trials and test per model; and certification of models;

<sup>3</sup> The three enterprises manufacture equipment that use hermetic compressors of 250 rated watts and below, which are classified as belonging to the domestic refrigeration sub-sector, in line with decision 26/36.

<sup>4</sup> At the time of approval of the stage I HPMP for Argentina, the enterprise had 48.4 per cent non-Article 5 ownership. That non-Article 5 ownership was purchased by an Article 5-owned conglomerate in 2016.

- (b) Modifications to the charging area include: assembly line modifications; refrigerant charging stations suitable for flammable refrigerants; introduction of ultrasound sealing of the refrigeration system; post-charge leak detectors; antistatic flooring; a recovery machine for the repair zone; and installation of a safety and ventilation system in the charging area (US \$268,000);
- (c) Modifications to the refrigerant storage and supply equipment include: a storage stand for sufficient refrigerant cylinders and automatic change-over valves; refrigerant transfer pump; and a safety and ventilation system (US \$110,000);
- (d) Common infrastructure includes: a fire extinguisher sprinkler system, and hand-held HC leak detectors for the storage area and laboratory (US \$72,700); and
- (e) General activities include installation, delivery, training, and safety certification (US \$142,629).

20. In addition to the above costs, US \$20,000 for international consultants and US \$8,000 for dissemination of technology was requested for each enterprise.

21. As the baseline equipment varied by enterprise, the requested funding varied by enterprise. For example, in 2016, Briket purchased a dual-use HFC-134a/R-600a charging machine and a HC recovery machine although the enterprise currently only manufactures with HFC-134a, while Mabe-Kronen is currently using a helium leak detection system which could be used for HC and HFC-134a. The enterprises did not request funding for equipment already in their baseline. In addition, the following equipment that would be used in the HC manufacturing processes were considered counterpart input by the three enterprises: pneumatic refrigerant booster pump; antistatic flooring; a dedicated building for refrigerant storage with a fly-open roof and windows, explosion-proof lights, and transfer pipes; emergency diesel generator; and marketing.

22. The incremental operating costs (IOC) were estimated based on the cost of raw materials, considering safety and rearrangement of electric components, and improvement in energy efficiency. The price of HFC-134a and R-600a was reported at US \$6.45/kg and US \$9.50/kg, respectively. The average charge of HFC-134a per unit varied between 112 g/unit and 191 g/unit, depending on the mix of equipment manufactured by the enterprise. Components included in the IOCs were the compressor, filter, thermostat, explosion-proof fans, and light; the costs of each component varied depending on the mix of equipment manufactured by the enterprise. IOCs were requested for six months.

23. The enterprises decided to use the opportunity of conversion to improve by at least 20 per cent the energy efficiency of their products by *inter alia* optimizing the insulation foam formulation and foam density; improving the condenser and evaporator tubes; selecting higher efficiency compressors; redesigning the internal air flow to improved air circulation; improved temperature controls; and the use of light-emitting diode bulbs. Only some of the changes related to the refrigerant conversion are requested to be funded by the Multilateral Fund; all other costs will be borne by the enterprise.

24. On that basis, the total request to the Multilateral Fund is US \$2,619,710 as reflected in Table 3. The duration of the project is 24 months.

**Table 3. Estimated costs for conversion at Briket, Bambi, and Mabe-Kronen, as submitted (US \$)**

Particulars	Briket	Bambi	Mabe-Kronen
<b>Product development</b>			
Ventilation and safety system for laboratory	9,000	9,000	9,000
Redesign, prototyping, trials and tests	24,538	25,800	19,750
Certification of models	64,000	40,000	56,000
<b>Sub-total</b>	<b>97,538</b>	<b>74,800</b>	<b>84,750</b>
<b>Charging area equipment</b>			
Assembly line modification	10,000	20,000	10,000
Charging machine	-	110,000	75,000
Safety and ventilation system	-	65,000	65,000
HC leak detector	22,000	44,000	44,000
Ultrasonic welding machine	-	-	64,000
Recovery machine for R-600a refrigerant, Ex proof	-	10,000	5,000
Helium leak testing equipment	134,000	134,000	-
<b>Refrigerant storage and supply equipment</b>			
Storage stand for refrigerant cylinders with valves	9,000	9,000	9,000
Refrigerant transfer pump	-	30,000	15,000
Safety and ventilation system	-	14,000	24,000
<b>Common infrastructure</b>			
Fire extinguisher sprinkler system	30,000	30,000	10,000
Hand-held leak detector for HCs	900	900	900
<b>Sub-total</b>	<b>205,900</b>	<b>466,900</b>	<b>321,900</b>
Contingency	20,590	46,690	32,190
<b>Other costs</b>			
Installation	8,236	18,676	12,876
Training	5,000	8,000	5,000
Delivery	6,177	14,007	9,657
Safety certification (TÜV Süd)	15,000	25,000	15,000
<b>Sub-total</b>	<b>34,413</b>	<b>65,683</b>	<b>42,533</b>
<b>Total ICCs</b>	<b>358,441</b>	<b>654,073</b>	<b>481,373</b>
<b>Grand total ICCs</b>		<b>1,493,887</b>	
Average charge (g/unit)	191.0	168.1	112.4
Incremental refrigerant cost (US \$/unit)	(0.27)*	(0.21)	(0.19)
Incremental component cost (US \$/unit)	5.84	3.23	2.46
IOC per unit (US \$/unit)	5.57	3.02	2.27
IOC per kg (US \$/kg)	29.06	17.96	20.19**
<b>IOC for six months (US \$)</b>	<b>428,604</b>	<b>350,257</b>	<b>262,963</b>
<b>Grand total IOCS</b>		<b>1,041,824</b>	
International consultant	20,000	20,000	20,000
Dissemination	8,000	8,000	8,000
<b>Total incremental cost</b>	<b>815,045</b>	<b>1,032,330</b>	<b>772,336</b>
<b>Consumption (mt)</b>	<b>29.50</b>	<b>39.00</b>	<b>28.05</b>
<b>Cost-effectiveness (US \$/kg)</b>	<b>27.63</b>	<b>26.47</b>	<b>27.53</b>

\* Actual value is US \$ 0.32/kg with corrected average charge per unit of 191 g.

\*\* Based on average consumption per unit.

## SECRETARIAT'S COMMENTS AND RECOMMENDATION

### COMMENTS

#### *Eligibility*

25. The Secretariat reviewed the project proposal based on the current policies and decisions of the Multilateral Fund, similar approved conversion projects for CFC phase-out (i.e., conversion of refrigerant

component from CFC-12 to R-600a involving product and manufacturing process redesign) and approved projects to phase-out ODS with flammable alternatives.

26. This project has been submitted in line with decisions 78/3(g) and 79/45. It included an official letter from the Government with the commitment required in decision 78/3(g). In line with decision 79/45, the endorsement letter from the Government of Argentina indicates it would make every effort to ratify the Kigali Amendment as soon as possible, confirmed that it is aware that no further funding would be available until the instrument of ratification of the Kigali Amendment had been received by the depositary at the United Nations Headquarters in New York, if this project would be approved by the Executive Committee; and acknowledged that in case this project is approved, any HFC reduced would be deducted from its starting point (which may be agreed in the future). The Secretariat also notes with appreciation that this proposal was submitted without preparation funding.

27. UNIDO also explained that the enterprises and the Government are strongly committed to implementing this project and the results of the project are expected to encourage adoption of energy efficient R-600a-based equipment in Argentina and in the region.

28. Noting that the project proposed conversion of the production lines in three manufacturing enterprises, the Secretariat requested clarification on the need for conversion project at multiple enterprises as decision 79/45 indicates stand-alone investment projects in individual enterprises. UNIDO emphasized that the enterprises have different product types, manufacturing processes, and layouts, and as such will provide information to understand the incremental costs associated with the conversion of different products at different types of enterprises. The Secretariat concurs that the incremental cost of conversion at the three enterprises are likely to be different and notes that decision 79/45 refers to “enterprises” rather than “enterprise,” and considers it likely that the project would provide information on the incremental costs different enterprises that manufacture a range of products might experience.

#### *Regulatory framework*

29. The Secretariat requested clarifications on how sustainability of production of HC-based refrigeration equipment of the three beneficiaries would be achieved, noting that there is at least one medium-sized local enterprise that could still produce HFC-134a-based refrigerators after the project is completed and domestically-produced HC-based refrigeration equipment would need to also compete with imported HFC-134a-based equipment. UNIDO clarified that the Government plans to put in place other measures such as the mandatory energy efficiency labeling for domestic refrigerators that will help faster adoption of HC-based refrigeration equipment; however, the Government at this stage is not in a position to enact a ban on HFC-based domestic refrigerators. It is expected that the economic situation in the country would continue to drive growth in refrigerator market, both HFC- and HC-based equipment. While noting with appreciation the willingness of the Government to consider measures that would help faster adoption of HC-based refrigeration equipment, identification of specific measures that will be put in place could provide additional assurance of the sustainability of the conversion and ensure that market disparity on account of products with different technologies at different prices is avoided.

#### *Proposed costs*

30. The Secretariat requested clarifications on the need for product redesign and certification for all models; the costs of key equipment items which were at higher levels than similar equipment in other projects such as refrigerant charging machines, helium leak detectors, ultrasonic welding machine, HC leak detector, and HC recovery machine, and the costs for safety verification, technical assistance, and information outreach.

31. UNIDO explained that the requested modifications were necessary to implement the conversions, and agreed to adjust costs of several of the equipment items based on comparable costs of

similar equipment of other projects. The Secretariat noted that some of the cost reductions achieved (i.e., costs related to technical assistance and certification) reflected savings that could be achieved through efficient scheduling and procurement practices, in particular by implementing the activities at the three enterprises in a coordinated manner.

32. The Secretariat also noted that some of the enterprises already had some of the requested equipment in their baseline equipment and therefore did not request funding for it, and that the enterprises would co-finance some of the requested costs, such as charging machines, ultrasonic welding machines, and safety infrastructure.

33. The IOC had been estimated at US \$2.27 per unit (Mabe), US \$5.57 per unit (Briket), including US \$2.00 per compressor for two enterprises (Briket and Bambi) and US \$1.00 per compressor for Mabe-Kronen. Upon request for clarifications on variations of the IOC for components across the enterprises, UNIDO explained that Mabe-Kronen has negotiated lower procurement costs for some of the components as compared to the other two enterprises. The Secretariat recalled that the evaluation of requests for financing incremental costs of a given project shall take into account several principles, including that the most cost-effective and efficient option should be chosen. Taking into account the national industrial strategy proposed by the Government of Argentina to convert three of the local manufacturers of domestic and commercial refrigeration equipment from HFC-134a to HC technology, it considered the need to rationalise the incremental cost of the components to be same for all enterprises, i.e., US \$1 per unit for compressors for domestic refrigerators, and US \$2.17 per unit for compressors for freezers, bottle coolers, chest freezers and display cabinets. Further to consultations, UNIDO agreed to this approach resulting in a request of US \$656,645 determined based on the product mix at each enterprise.

34. In concluding the discussion on technical and cost-related matters, the agreed costs of the conversion of the domestic and commercial refrigeration equipment manufacturing at the three enterprises amounts to US \$1,840,755 to phase-out 96.55 mt (138,069 CO<sub>2</sub>-equivalent tonnes) of HFC-134a, with a cost-effectiveness of US \$19.07/kg, as summarized in Table 4.

**Table 4. Agreed costs for conversion of domestic and commercial refrigeration equipment manufacturing in Argentina (US \$)**

Particulars	Briket	Bambi	Mabe-Kronen	Total
Product design, testing and certification	59,600	42,500	53,900	156,000
Refrigerant storage and supply system	9,000	39,000	24,000	72,000
Assembly line modification and production equipment	115,000	250,000	115,000	480,000
Safety systems	37,000	109,000	94,000	240,000
Technical assistance and training	18,000	21,000	19,000	58,000
Installation and delivery	18,270	18,270	18,270	54,810
Safety audit and certification	15,000	15,000	15,000	45,000
Dissemination of technology	0	0	0	0
<b>Total funding request</b>	<b>271,870</b>	<b>494,770</b>	<b>339,170</b>	<b>1,105,810</b>
Contingency	26,100	26,100	26,100	78,300
Total ICC	<b>297,970</b>	<b>520,870</b>	<b>365,270</b>	<b>1,184,110</b>
IOC (6 months)	177,255	238,664	240,727	656,645
Total incremental cost	<b>475,225</b>	<b>759,534</b>	<b>605,997</b>	<b>1,840,755</b>
<b>HFC-134a consumption (mt)</b>	<b>29.50</b>	<b>39.00</b>	<b>28.05</b>	<b>96.55</b>
<b>Cost-effectiveness (US \$/kg)</b>	<b>16.11</b>	<b>19.48</b>	<b>21.60</b>	<b>19.07</b>

35. The Secretariat notes that the purpose of implementing projects under decision 78/3(g) is to gain experience in the incremental capital costs and IOCs that might be associated with phasing down HFCs. Based on available information 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 might change as more

information becomes available, and according to the specific characteristics of the enterprises. The Secretariat, therefore, considers that the agreed costs above would not constitute a precedent.

36. The enterprises have committed to stop using HFC-134a in producing domestic refrigerators upon project completion by December 2019, leading to a reduction of 96.55 mt of the HFC-134a used in domestic refrigerator manufacturing in the country.

#### **2017-2019 Business plan**

37. This project does not fall under the regular business plans submitted to the Secretariat and presented to the Executive Committee as it falls under the purview of decisions 78/3(g) and 79/45.

#### **RECOMMENDATION**

38. The Executive Committee may wish to consider the project for conversion of HFC-134a with isobutane (R-600a) / propane (R-290)-based refrigerant in the manufacture of domestic and commercial refrigeration equipment for Argentina, in the context of its discussion of the proposals for HFC-related projects described in the document on Overview of issues identified during project review (UNEP/OzL.Pro/ExCom/80/22).

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