UNITED
NATIONS

EP

United Nations
Environment
Programme

Distr.
GENERAL

UNEP/OzL.Pro/ExCom/60/36
18 March 2010

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Sixtieth Meeting
Montreal, 12-15 April 2010

PROJECT PROPOSALS: PAKISTAN

This document consists of the comments and recommendations of the Fund Secretariat on the following project proposals:

Foam

- Phase-out of HCFC-141b from the manufacturing of insulating PU rigid foam at United Refrigeration Industries, HNR Company (Haier), Varioline Intercool, and Shadman Electronics companies — UNIDO

- Phase-out of HCFC-141b from the manufacturing of insulating PU rigid foam at Dawlance Company — UNIDO

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT
PAKISTAN

PROJECT TITLE(S)	BILATERAL/IMPLEMENTING AGENCY
(a) Phase-out of HCFC-141b from the manufacturing of insulating PU rigid foam at United Refrigeration Industries, HNR Company (Haier), Varioline Intercool, and Shadman Electronics companies	UNIDO
(b) Phase-out of HCFC-141b from the manufacturing of insulating PU rigid foam at Dawlance Company	UNIDO

NATIONAL CO-ORDINATING AGENCY	Ozone Office, Ministry of Environment, Government of Pakistan

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES, 2008, AS OF FEBRUARY 2010)

HCFCs	189.5		

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2008, AS OF FEBRUARY 2010)

ODS					
HCFC-141b	121.2	HCFC 142b	0.0		
HCFC-22	68.3	HCFC 123	0.0	**Total**	**189.5**

CFC consumption remaining eligible for funding (ODP tonnes)	0.0

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US $	Phase-out ODP tonnes
	(a)	1,613,000	20

`

PROJECT TITLE:	**(a)**	**(b)**
ODS use at enterprise (ODP tonnes):	49.2	22.4
ODS to be phased out (ODP tonnes):	49.2	22.4
Project duration (months):	24	24
Initial amount requested (US $):	4,704,943	1,546,711
Final project costs (US $):		
Incremental Capital Cost:	3,238,000	1,166,000
Contingency (10 %):	323,800	116,600
Incremental Operating Cost:	-2,441	-1,110
Total Project Cost:	3,559,359	1,281,490
Local ownership (%):	100	100
Export component (%):	1 % [1]	1% [2]
Requested grant (US $):	3,559,359	1,281,490
Cost-effectiveness (US $/kg) (*):	7.94	6.29
Implementing agency support cost (US $):	266,952	96,112
Total cost of project to Multilateral Fund (US $):	3,826,311	1,377,602
Status of counterpart funding (Y/N):	n/a	n/a
Project monitoring milestones included (Y/N):	Y	Y
SECRETARIAT'S RECOMMENDATION	For Individual Consideration	

(*) The combined cost-effectiveness of the conversion of the five enterprises is US $7.43/kg.

[1] Export to Article 5 countries only
[2] Export to Article 5 countries only

PROJECT DESCRIPTION

1. On behalf of the Government of Pakistan, UNIDO has submitted to the 60th Meeting of the Executive Committee the following two project proposals for the conversion from HCFCs to hydrocarbons in manufacturing domestic and/or commercial refrigeration equipment (foam component) in Pakistan:

(a) Phase-out of HCFC-141b from the manufacturing of insulating polyurethane (PU) rigid foam at United Refrigeration Industries, HNR Company (Haier), Varioline Intercool, and Shadman Electronics companies, at a total cost of US $4,704,943 plus agency support costs of US $352,871. Implementation of the project will result in the phase-out of 49.20 ODP tonnes (448.10 metric tonnes) of HCFC-141b; and

(b) Phase-out of HCFC-141b from the manufacturing of insulating PU rigid foam at Dawalance Company, at a total cost of US $1,546,711 plus agency support costs of US $116,003. Implementation of the project will result in the phase-out of 22.4 ODP tonnes (203.7 metric tonnes) of HCFC-141b.

2. The levels of HCFC consumption in 2009 and the estimated costs of conversion for each of the manufacturing enterprises, as submitted, are summarized in the table below.

Domestic and commercial refrigeration enterprises covered by the project

Enterprise	HCFC-141b consumption		Funding (US$)
	Tonnes	ODP tonnes	
United Refrigeration Industries	294.9	32.4	1,898,496
HNR Company (Haier)	69.9	7.7	1,054,151
Varioline Intercool Pakistan	47.7	5.2	1,048,138
Shadman Electronics	35.6	3.9	704,158
Dawlance	203.7	22.4	1,546,711
Total	651.8	71.7	6,251,654

3. The five companies selected cyclopentane as the replacement for HCFCs, since it is a natural substance with far lower global warming potential (GWP) than HCFC-141b and any other HFC-based alternatives, and makes it possible to avoid the use of a high global warming gas. Introduction of HFC-245fa technology would have resulted in only limited changes in the production line, while introduction of HFC-365/227 technology would require the installation of a polyol storage tank. However, the issues associated with HFC-based technologies are their high prices (i.e., higher operating costs), availability, and high GWP values. Therefore, HFC-based technologies were not selected by the enterprises.

4. The description of the foam operations and conversion requirements of each manufacturing enterprise are presented below.

United Refrigeration Industries Limited

5. United Refrigeration Industries Limited (URIL) is a locally owned enterprise established in March 1980, manufacturing different types and sizes of refrigeration equipment, with a total production of 373,000 units in 2009. The enterprise has two foaming lines in one location and an additional one, 0.5 km apart. Two lines are for the cabinets and doors, and include two high-pressure 80 kg/min foam dispensers (Krauss Maffei) serving four mixing heads altogether, and pre-mixing systems including tanks. The other line is mainly used for cabinets, and includes one high pressure foam dispenser serving two mixing heads, and pre-mixing systems including tanks. Conversion to cyclopentane involves installation of three new high-pressure dispensers (US $300,000 each including safety equipment and installation

costs). It also includes two 20 m³ cyclopentane storage tanks (US$150,000 each), two pre-mixers (US $40,000 each), jigs retrofit (US $114,000) and safety-related equipment (US $389,000). Incremental operating savings have been estimated at US $7,800 for a two-year period.

Dawlance

6. Dawlance Private Limited, is locally-owned enterprise manufacturing refrigerators and freezers established in January 1991, with an annual production of 239,000 units in 2009. The enterprise has three assembly lines in two different locations, 2.0 km apart. One line is for cabinets and includes a high-pressure 40 kg/min foam dispenser (Krauss Maffei) with one mixing head, and pre-mixing systems including tanks, and the other line is for doors and includes 40 kg/min foam dispenser (Krauss Maffei) with one mixing head, and pre-mixing systems including tanks. The third assembly line is for cabinets and doors and includes a high-pressure 102 kg/min foam dispenser (Krauss Maffei) with one mixing head, a low-pressure foam dispenser, and pre-mixing systems including tanks. Conversion to cyclopentane involves installation of two new high-pressure dispensers (US $300,000 each including safety equipment and installation costs); two 20 m³ cyclopentane storage tanks (US$150,000 each), two pre-mixers (US $40,000 each), jigs retrofit (US $75,000) and safety-related equipment (US $406,000). Incremental operating savings have been estimated at US $5,389 for a two-year period.

HNR

7. HNR Private Limited, is a joint venture between Ruba Group of Pakistan (70 per cent shares) and Haier Group of China (30 per cent). The enterprise, was established in November 2001 and manufactures refrigerators and freezers, with an annual production of 75,000 units in 2009. The enterprise has one foaming line for cabinets and includes a high-pressure 90 kg/min foam dispenser (Cannon) with one mixing head, and another foaming line for doors, which includes a low-pressure 34 kg/min foam dispenser (Wuhan Light Industries, China) with one mixing head and a pre-mixing system including tanks. Conversion to cyclopentane involves installation of two new high-pressure dispensers (US $300,000 each including safety equipment and installation costs); one 10 m³ cyclopentane storage tanks (US$100,000), one pre-mixer (US $40,000), jigs retrofit (US $42,000) and safety-related equipment (US $203,000). Incremental operating savings have been estimated at US $ 1,849 for a two-year period.

Varioline Intercool

8. Varioline Intercool is a joint venture between Varioline Pakistan (60 per cent shares) and Songserm Intercool Thailand (40 per cent). The enterprise, was established in September 1995 and manufactures visi/chest cooler and chest freezers , with an annual production of 79,000 units in 2009. The enterprise has one foaming line for cabinets and one foaming line for doors, and includes two high-pressure 60 kg/min foam dispenser (Krauss Maffei) each with one mixing head, and pre-mixing systems including tanks. Conversion to cyclopentane involves installation of two new high-pressure dispensers (US $300,000 each including safety equipment and installation costs); one 10 m³ cyclopentane storage tank (US$100,000), one pre-mixer (US $40,000), jigs retrofit (US $36,000) and safety-related equipment (US $203,000). Incremental operating savings have been estimated at US $1,262 for a two-years period.

Shadam Electronics

9. Shadam Electronics is locally-owned enterprise established in June 1981, manufacturing ice cream cabinets with an annual production of 31,000 units in 2009. The enterprise has one foaming line for cabinets and doors, and includes a high-pressure 80 kg/min foam dispenser (Elastogram) with one mixing head, and a pre-mixing system including tanks. Conversion to cyclopentane involves installation of one new high-pressure dispenser (US $300,000 including safety equipment and installation costs); one 5 m³ cyclopentane storage tank (US$75,000), one pre-mixer (US $40,000), jigs retrofit (US $48,000) and

safety-related equipment (US $203,000). Incremental operating savings have been estimated at US $942 for two-year period.

10. The proposed time for project implementation is two years.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

11. The Secretariat reviewed the projects in the context of the policy paper on the revised analysis of relevant cost considerations surrounding the financing of HCFC phase-out submitted to the 55th Meeting (UNEP/OzLPro/ExCom/55/47), relevant decisions adopted on HCFC phase-out, as well as relevant guidelines and policies relating to approval of foam projects under the Multilateral Fund.

12. The conversion from HCFCs to hydrocarbons in the five enterprises manufacturing domestic and/or commercial refrigeration equipment in Pakistan was submitted under one project proposal at a total cost of over US $6.25 million, eight weeks in advance of the Meeting of the Executive Committee. In light of decision 20/7 (i.e., projects over US $5 million should be submitted twelve weeks in advance), the Secretariat advised UNIDO that it will begin reviewing the project only after all documents for the 60th Meeting have been finalized, and requested UNIDO's deferral of the project to the 61st Meeting. Subsequent to this request, UNIDO divided the proposal into two covering the same five enterprises, with each proposal at a funding level below US $5.0 million. The Secretariat reviewed both project proposals. The Secretariat has raised this issue in the Overview of issues identified during project review document (UNEP/OzL.Pro/ExCom/60/15).

Projects previously approved for conversion from CFC-11 to HCFC141b

13. At its 25th Meeting, the Executive Committee approved a project for the phase-out of 11.5 ODP tonnes of CFC-11 (foam) and 4.0 ODP tonnes of CFC-12 (refrigerant) by converting to HCFC-141b and HFC134a in the manufacture of commercial refrigeration equipment at Shadman Electronic Industries P. Ltd. Funding of US $236,936 was approved for the replacement of a low-pressure foam dispenser by a high-pressure unit, refrigerant evacuation and charging equipment, vacuum pumps. The project was successfully completed in August 2000.

14. Subsequently, at its 42nd Meeting, the Executive Committee approved funding of US $1,126,855 for the phase-out of CFC-11 (foam) and CFC-12 (refrigerant) in the manufacture of refrigeration equipment at Dawlance, United Refrigeration, Ice Age, and 29 small enterprises. Conversion of Dawlance to non-CFC technologies included the retrofit of a high pressure foam dispenser and batch premixing (foam component), and vacuum pumps (refrigeration component) at a total cost of US $120,020. Conversion of United Refrigeration included the installation of a batch premixing station (foam component) and HFC-134a charging unit, vacuum pumps and leak detectors (refrigerant component). The 29 SMEs covered by the project were converted by providing manual charging machines, portable leak detectors and vacuum pumps (no foam operations).

15. Additionally, UNIDO provided a brief description of the status of the other 10 investment projects for the conversion of CFC-11 to HCFC-141b in the domestic and commercial refrigeration sectors that were also approved by the Committee.

HCFC phase-out strategy in Pakistan

16. The Government is proposing to submit the HPMP to the 61st Meeting of the Executive Committee. Based on the surveys conducted so far, the 2009-2012 HCFC consumption for each HCFC current use in Pakistan has been estimated, as shown in the table below.

Forecasted 2009-2012 HCFC consumption in Pakistan

Substance	2009		2010		2011		2012	
	m tonnes	ODP tonnes	m tonnes	ODP tonnes	m tonnes	ODP tonnes	m tonnes	ODP tonnes
HCFC-22	1,915.0	105.3	2,029.9	111.6	2,151.7	118.3	2,280.8	125.4
HCFC-141b	1,219.0	134.1	1,292.1	142.1	1,369.7	150.7	1,451.9	159.7
Total	3,134.0	239.4	3,322.0	253.7	3,521.4	269.0	3,732.7	285.1

17. Based on the figures presented in the above table the estimated HCFC baseline for compliance is 246.6 ODP tonnes. From the extrapolated consumption of 285.1 ODP tonnes in 2012, the Government of Pakistan would need to phase-out 38.5 ODP tonnes of HCFCs to meet the 2013 freeze and an additional 24.7 ODP tonnes of HCFCs to meet the 2015 compliance target (or 63.2 ODP tonnes in total). The total volume of HCFC-141b currently (2009) used by the five manufacturing plants covered under the project is 71.7 ODP tonnes (or 79.7 ODP tonnes forecasted in 2012). This could result in the phase-out of 16.5 ODP tonnes (150 metric tonnes) of HCFC-141b over the total amount needed to meet the 2013 and 2015 compliance targets.

18. With regard to the reasons for submitting the five domestic and commercial refrigeration projects, and its impact on meeting the 2013 and 2015 HCFC consumption levels, UNIDO responded by indicating that the projects were prepared according to the country's priorities to meet the first two HCFC phase-out control levels. Through the survey undertaken for the preparation of the HPMP, two first-conversion refrigeration manufacturing enterprises (NHR, Varioline) were identified for early conversion to non-HCFC technologies. The second-stage conversion enterprises (i.e., United, Dawlance and Shadam) were also included in the proposal, taking into consideration the ongoing discussions on relevant HCFC policy issues, and the fact that the project will assist Pakistan to meet the 2013 freeze and the 2015 10 per cent reduction in HCFC consumption.

19. Upon a request for further clarification, UNIDO confirmed that foam systems are mixed *in situ* by each enterprise.

Cost and other related issues

20. The Secretariat raised a number of capital cost related issues. These included the request for new foam dispensers for the use of hydrocarbon rather than retrofitting the dispensers in the baseline, and the high cost of new foam dispensers and storage tanks for cyclopentane as compared to similar requests in projects approved so far. It was also noted that the same specifications were used for several equipment items irrespective of the baseline equipment and the production capacities of the enterprises. After the discussions, retrofitting of most of the foam dispensers in the baseline for the use of cyclopentane was agreed, including replacing only those that were more than 10 years old with similar capacity equipment. Costs of storage tanks for cyclopentane and ancillary equipment, and safety related equipment were adjusted according to the production levels and sizes of the enterprises. Conversion to cyclopentane technology resulted in incremental operating savings of US $3,552, mainly due to the lower price of cyclopentane (US $1.75/kg) compared to HCFC-141b (US $2.03/kg). The total cost of the project as agreed amounts to US $4,840,849, with a cost-effectiveness of US $7.43/kg, with the following distribution by manufacturing plant:

Enterprise	Cost (US$)		
	Capital	Operating	Total
United Refrigeration Industries	1,464,100	(1,607)	1,462,493
HNR Company (Haier)	757,900	(381)	757,519
Varioline Intercool Pakistan	825,000	(260)	824,740
Shadman Electronics	514,800	(194)	514,606
Dawlance	1,282,600	(1,110)	1,281,490
Total	4,844,400	(3,551)	4,840,849

21. The overall cost effectiveness of the two projects of US $7.43/kg, is below the thresholds of US $13.76/kg for domestic refrigeration and US $15.21/kg for commercial refrigeration. Furthermore, in cases where hydrocarbon-based technologies were chosen to replace CFCs in domestic refrigeration projects, the numerator should be discounted by up to 35 per cent when calculating the cost-effectiveness value. The Secretariat notes that projects in the refrigeration sector have historically addressed the phase-out of ODS used as blowing agent (CFC-11 or HCFC-141b) and as refrigerant (CFC-12). Accordingly, in the overview of issues identified during project review document (UNEP/OzL.Pro/ExCom/60/15), the Secretariat is presenting an issue on the cost-effectiveness of projects for the conversion of domestic and/or commercial refrigeration enterprises where the total HCFC consumption is in foam blowing (such as the projects in Pakistan).

Impact on the environment

22. The Secretariat attempted to make a preliminary calculation of the impact on the climate of the phase-out of HCFC consumption through the five domestic and commercial refrigeration manufacturing enterprises in Pakistan, based only on the GWP values of the blowing agents and their levels of consumption before and after conversion. According to this methodology, once the project is completed, a total of 71.7 ODP tonnes (651.8 metric tonnes) of HCFC-141b will be phased out, 391.1 tonnes of cyclopentane will be phased in, and 454,956 tonnes of CO_2 that would have been emitted into the atmosphere will have been avoided.

Substance	GWP	Tonnes/year	CO2-eq (tonnes/year)
Before conversion			
HCFC-141b	713	651.8	464,733
After conversion			
Cyclopentane	25	391.1	9,777
Net impact			-454,956

(*) Based on a HCFC-141b:cyclopenatne ratio of 1.00:0.60.

RECOMMENDATIONS

23. Recalling its decision 55/43(b), by which the Executive Committee invited bilateral and implementing agencies to prepare and submit project proposals to the Secretariat for those HCFC uses addressed in paragraphs (c), (d), (e) and (f) of the decision so that it could choose those that best demonstrated alternative technologies and facilitated the collection of accurate data on incremental capital cost and incremental operating costs or savings, as well as other data relevant to the application of the technologies, the Executive Committee may wish:

(a) To consider approving the project for the phase-out of HCFC-141b from the manufacturing of insulating polyurethane rigid foam at United Refrigeration, Dawlance, HNR Company, Varioline Intercool and Shadman Electronics companies at a total cost of US $4,840,849 and agency support costs of US $363,064 for UNIDO;

(b) To request UNIDO and the Government of Pakistan to deduct 71.7 ODP tonnes (651.8 metric tonnes) of HCFCs from the starting point for sustained aggregate reductions in eligible consumption to be established by Pakistan's HCFC phase-out management plan (HPMP); and

(c) To request UNIDO to provide to the Secretariat, at the end of each year of the projects' implementation period, progress reports that address the issues pertaining to the collection of accurate data in line with the objectives of decision 55/43(b), and to include these reports in the implementation reports of the HPMP, once it is approved.
