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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Seventy-seventh Meeting
Montreal, 28 November - 2 December 2016

PROJECT PROPOSALS: INDIA

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

Phase-out

- HCFC phase-out management plan (stage I, annual progress report) UNDP/UNEP/Germany
- HCFC phase-out management plan (stage II, first tranche) UNDP/UNEP/Germany

PROJECT DESCRIPTION

Background

1. On behalf of the Government of India, UNDP as the lead implementing agency, has submitted to the 77th meeting the annual progress report on the implementation of the work programme associated with the third tranche of the HCFC phase-out management plan (HPMP) and a verification report, in line with decision 75/29(a)¹.

HCFC consumption and verification reports

HCFC consumption

2. The Government of India reported HCFC consumption of 992.54 ODP tonnes in 2015 which is 31.4 per cent lower than the HPMP target of 1,447.4 ODP tonnes for the same year in its Agreement with the Executive Committee, and 38.2 per cent lower than the baseline of 1,608.2. The 2011-2015 HCFC consumption is shown in Table 1.

Table 1. HCFC consumption in India (2011-2015 Article 7 data)

HCFC	2011	2012	2013	2014	2015	Baseline
Metric tonnes						
HCFC-22	10,266.39	15,646.51	8,029.44	8,050.09	11,777.72	10,944.7
HCFC-123	0.00	136.00	196.95	180.82	174.87	176.5
HCFC-124	288.74	69.25	0.00	0.00	0.00	611.8
HCFC-141b	7,924.00	6,400.00	4,568.22	4,112.56	3,028.00	7,868.4
HCFC-142b	645.00	1,308.40	428.94	120.32	126.00	1,903.0
Subtotal (mt)	19,124.13	23,560.16	13,223.55	12,463.79	15,106.59	21,504.4
HCFC-141b in imported pre-blended polyols	n.a.	75.00	0	0	0	755
ODP tonnes						
HCFC-22	564.65	860.56	441.62	442.76	647.77	602.0
HCFC-123	0	2.72	3.94	3.62	3.50	3.5
HCFC-124	6.35	1.52	0.00	0.00	0.00	13.5
HCFC-141b	871.64	704.00	502.50	452.38	333.08	865.5
HCFC-142b	41.93	85.05	27.88	7.82	8.19	123.7
Subtotal (ODP tonnes)	1,484.57	1,653.85	975.94	906.57	992.54	1,608.2
HCFC-141b in imported pre-blended polyols	n.a.	8.25	0	0	0	83.05

3. The decrease in HCFC-141b, HCFC-142b and HCFC-123 consumption between 2013 and 2015 were explained by market fluctuations. The growth in HCFC-22 consumption is due to increased consumption of HCFC-22 in RAC manufacturing and servicing. No HCFC-124 was imported for the past three years and India also banned the import of HCFC-141b contained in imported pre-blended polyols in 2013.

4. India produces HCFC-22, both for feedstock and controlled uses, with the rest of HCFCs being imported. The production of HCFC-22 for controlled uses amounts to 1,743.02 ODP tonnes in 2015.

¹Provisions for the approval states that: “The Government, UNDP, UNEP and Germany were requested to submit progress reports on a yearly basis on the implementation of the work programme associated with the third tranche until the completion of the project, verification reports until approval of stage II, and project completion report to the second meeting of the Executive Committee in 2017” (Annex XII of document UNEP/OzL.Pro/ExCom/75/85).

Verification report

5. The verification report confirmed that India continued to implement its licensing and quota system for HCFC production, imports and exports; the total consumption of HCFCs for 2015 of 992.54 ODP tonnes was below the maximum allowable consumption of 1,447.38 ODP tonnes established in the Agreement with the Executive Committee.

Country programme (CP) implementation report

6. The Government of India reported HCFC sector consumption data under the 2015 CP implementation report that is consistent with the data reported under Article 7 of the Montreal Protocol.

Progress report in implementation of stage I activities*Legal framework*

7. Regulatory measures introduced in stage I include the ban on imports of pre-blended polyols containing HCFCs from January 2013; ban on import of blends containing ODS from January 2013; ban on the establishment of new capacity to manufacture products with HCFCs from April 2014; ban on increase in production capacity of air-conditioning equipment with HCFCs from January 2015; ban on the use of HCFCs to manufacture domestic refrigerators and continuous sandwich panels from January 2015; and ban on the import of HCFC-based air-conditioners from July 2015.

Foam manufacturing sector

8. All 15 enterprises funded under stage I converted to cyclopentane (eight manufacturing insulation foam for domestic refrigeration equipment, two continuous and five discontinuous sandwich panels), and stopped using HCFC-141b by 1 January 2015, phasing out 269.61 ODP tonnes². Five of the enterprises are waiting for few remaining activities to declare the project completion and receive last payments.

9. In addition, technical assistance was provided to 15 system houses that have developed HCFC-free formulations based on HFO-1233zd(E), FEA-1100, methyl formate and pre-blended cyclopentane, can be supplied to downstream PU foam enterprises subject to appropriate commercial conditions.

Refrigeration servicing sector

10. About 50 trainers and 11,276 refrigeration technicians were trained on good refrigeration servicing practices; 72 instructors from Industrial Training Institutes (ITI) were trained; training of 135 staff from the Defence Services and the Indian Railways Services on good servicing practices were organized; training and awareness material was developed and distributed to technicians; 11 toolsets were distributed to training institutions; and a pilot project to promote refrigerant recovery and reclamation was conducted.

Enabling activities

11. Three hundred customs officers were trained and 28 refrigerant identifiers were provided; 12 awareness-raising workshops were organised with over 1,100 participants covering HCFC-related regulations, phase-out commitments, challenges to adopt alternative technologies (including flammability, toxicity) and impact on best operating practices of alternative technologies; awareness material was developed and distributed; a website was developed with information on the activities in the servicing

² In addition, one non-eligible enterprise phased out 8.36 ODP tonnes of HCFC-141b.

sector; Refrigeration and Air-conditioning Servicing Sector Society (RASSS) was established; and National Academy of Customs Excise and Narcotics (NACEN) agreed to include the HCFC phase-out in their regular training courses.

Project Management Unit (PMU)

12. The PMU continued coordinating the implementation of HPMP, facilitating communication among key stakeholders and increasing awareness on ODS issues amongst senior decision makers.

Level of fund disbursement

13. As of October 2016, of the total funds US \$21,294,490 approved, US \$17,087,291 had been disbursed. The remaining US \$4,207,199 will be disbursed by 2017.

Remaining activities

14. The following activities have been initiated and are expected to be completed by the end of the first quarter of 2017: development of amendments for building codes to integrate HCFC-free design and the template for amending curriculum of architectural colleges to include ODS issues; integrating HCFC phase-out in the training curricula of (NACEN); another training to institutional users and additional outreach and awareness activities.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

HCFC consumption and verification report

15. Upon the Secretariat's request, UNDP confirmed that the verification agency was given access to the list of importers/exporters registered with the Ozone Cell, licenses issued by the Directorate General Of Foreign Trade (DGFT), and data on imports/exports by substance (obtained from the Directorate General of Commercial Intelligence and Statistics - DGCIS), noting that import/export data by enterprise is held with DGCIS and is confidential.

16. UNDP also clarified that the annual production quotas for HCFCs are set based on the percentage share of each producer in 2009 and 2010 taking into consideration the HCFC phase-out schedule; the 2016 production quota for HCFC-22 was set at 39,264.55 mt (2,159.55 ODP tonnes) for five producers. There is no specific quota allocated by the Government to importers; the NOU assesses import applications from registered importers against the HCFC consumption limits established in the Agreement and provides a recommendation to the DGFT to issue the import license. No import is allowed without a license.

Annual progress report for 2015

PU foam

17. Regarding the systems houses' commitment to test new developed formulations at a minimum of two downstream small and medium enterprises (SMEs) each, UNDP informed that of the 15 system houses assisted, 14 have already found viable low-global warming potential (GWP) blowing agents compatible with reformulated systems, which have been tested with two downstream users by each system house and found acceptable.

18. UNDP also reported an increased acceptability of alternative PU foam technologies in the last years as a result of awareness raised by the NOU and the Indian Polyurethane Association on the need for mandatory phase-out of HCFC-141b, the demonstrated availability of reformulated polyol systems by the systems houses, and the higher price of HCFC-141b (US \$2.88/kg) compared to some alternatives (i.e. cyclopentane and methyl formate). The large enterprises use cyclopentane (US \$1.76/kg); and small enterprises use methyl formate (US \$2.10 /kg) which require a lower capital cost. Methylal has also found some level of acceptance in the market. The use of HFO as blowing agent has also been tested and found technically feasible, but its use is limited due to the cost (US \$19.35/kg). Further penetration of these alternatives in the market will be subject to commercial factors.

Plan of action

19. UNDP confirmed that UNEP will complete all its activities in 2017, and that project closure of PU foam enterprises including systems houses will take place by the end of 2016. The remaining fund balance of US \$4,207,199 will be fully disbursed in 2016 and 2017.

RECOMMENDATION

20. The Executive Committee may wish to take note of the 2015-2016 progress report on the implementation of the third tranche of stage I of the HCFC phase-out management plan for India and the verification report on the 2015 HCFC consumption, submitted by UNDP.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS
India

(I) PROJECT TITLE	AGENCY
HCFC phase-out plan (Stage II)	UNDP (lead)/UNEP//Germany

(II) LATEST ARTICLE 7 DATA (Annex C Group I)	Year: 2015	992.5 (ODP tonnes)
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(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)								Year: 2015	
Chemical	Aerosol	Foam	Fire fighting	Refrigeration		Solvent	Process agent	Lab Use	Total sector consumption
				Manufacturing	Servicing				
HCFC-123			0.6		2.90				3.5
HCFC-141b	3.0	303.4		16.7		10.0			333.1
HCFC-142b		1.9			6.3				8.2
HCFC-22		19.4		285.0	343.3				647.7

(IV) CONSUMPTION DATA (ODP tonnes)			
2009 - 2010 baseline:	1,608.2	Starting point for sustained aggregate reductions:	1,691.25
CONSUMPTION ELIGIBLE FOR FUNDING (ODP tonnes)			
Already approved:	341.77	Remaining:	1,349.48

(V) BUSINESS PLAN		2016	2017	2018	2019	2020	After 2020	Total
UNEP	ODS phase-out (ODP tonnes)	1.4	0	0	0	0	0	1.4
	Funding (US \$)	585,600	285,000	513,000	513,000	392,000	0.0	2,288,600
UNDP	ODS phase-out (ODP tonnes)	105.1	0	97.5	0	97.5	0	300.1
	Funding (US \$)	9,856,840	0.0	9,152,780	0.0	9,152,780	0.0	28,162,400
Germany	ODS phase-out (ODP tonnes)	3.9	0	11.0	0	0	3.9	18.8
	Funding (US \$)	384,618	0.0	1,084,820	0.0	0.0	384,618	1,854,056

(VI) PROJECT DATA		2016	2017	2018	2019	2020	2021	2022	2023	Total
Montreal Protocol consumption limits										
Maximum allowable consumption (ODP tonnes)										
Project costs requested in principle (US\$)	UNDP	Project costs								
		Support costs								
	UNEP	Project costs								
		Support costs								
	Germany	Project costs								
		Support costs								
Total project costs requested in principle (US \$)										
Total support costs requested in principle (US \$)										
Total funds requested in principle (US \$)										

(VII) Request for funding for the first tranche (2015)		
Agency	Funds requested (US \$)	Support costs (US \$)
UNDP		
UNEP		
Germany		

Funding request:	Approval of funding for the first tranche (2016) as indicated above
Secretariat's recommendation:	For individual consideration

PROJECT DESCRIPTION

21. On behalf of the Government of India, UNDP as the lead implementing agency, has submitted to the 77th meeting stage II of the HCFC phase-out management plan (HPMP) at a total cost of US \$110,477,805 consisting of US \$89,060,524, plus agency support costs of US \$6,234,237 for UNDP, US \$1,875,500, plus agency support costs of US \$216,305 for UNEP and US \$11,784,900, plus agency support costs of US \$1,306,339 for the Government of Germany, as originally submitted³. The implementation of stage II of the HPMP will phase out 788.81 ODP tonnes of HCFCs (213.18 ODP tonnes of HCFC-22 and 575.63 ODP tonnes of HCFC-141b) to assist India in reducing 60 per cent of HCFC consumption from the baseline by 2022⁴, as originally submitted.

22. The first tranche for stage II of the HPMP being requested at this meeting amounts to US \$41,325,048, consisting of US \$35,921,589, plus agency support costs of US \$2,514,511 for UNDP, US \$331,500, plus agency support costs of US \$38,233 for UNEP, and US \$2,267,830, plus agency support costs of US \$251,386 for the Government of Germany, as originally submitted⁵.

Status of implementation of stage I of the HPMP

23. Stage I of the HPMP for India was approved at the 66th meeting to meet 10 per cent reduction from the baseline by 2015 and phase out 341.77 ODP tonnes of HCFC at the amount of US \$21,294,490 plus agency support costs. The third and final tranche of stage I was approved at the 75th meeting. The details of the progress report of stage I of the HPMP is presented in paragraphs 1 to 20 of the present document.

Stage II of the HPMP

Remaining consumption eligible for funding

24. After deducting 341.77 ODP tonnes of HCFCs associated with stage I of the HPMP, the remaining consumption of HCFCs eligible for funding amounts to 1,349.48 ODP tonnes, as shown in Table 2.

Table 2. Overview of the remaining HCFC consumption eligible for funding in India

HCFC	Starting point	Reduction in stage I	Remaining for stage II	Reduction in stage II	Remaining for stage III
Metric tonnes (mt)					
HCFC-22	10,944.70	568.00	10,376.70	3,876.00	6,500.70
HCFC-123	176.50	-	176.50	-	176.50
HCFC-124	611.80	-	611.80	-	611.80
HCFC-142b	1,903.00	-	1,903.00	-	1,903.00
HCFC-141b	7,868.40	2,823.00	5,045.40	5,233.00	(187.60)
HCFC-141b (polyols)*	755.00	-	755.00	-	755.00
Total (mt)	22,259.40	3,391.00	18,868.40	9,109.00	9,759.40
ODP tonnes					
HCFC-22	602.00	31.24	570.76	213.18	357.58
HCFC-123	3.50	-	3.50	-	3.50

³ During the project review it was noted that additional US \$2,909,705, plus agency support cost of US \$203,679 for UNDP was requested under stage II for technical assistance and a demonstration project in the PU foam sector. These funds were inadvertently omitted in the total request. Including this amount, the total amount of funds requested would be US \$113,591,189 (the UNDP portion would be US \$91,970,229, plus agency support cost of US \$6,437,916).

⁴ As of the time of issuance of this document, a draft Agreement between the Government of India and the Executive Committee had not been received.

⁵ These values include corrections made by the Secretariat to the support costs for UNEP and the Government of Germany.

HCFC	Starting point	Reduction in stage I	Remaining for stage II	Reduction in stage II	Remaining for stage III
HCFC-124	13.50	-	13.50	-	13.50
HCFC-142b	123.70	-	123.70	-	123.70
HCFC-141b	865.50	310.53	554.97	575.63	(20.66)
HCFC-141b (polyols)*	83.05	-	83.05	-	83.05
Total (ODP tonnes)	1,691.30	341.77	1,349.48	788.81	560.72

(*) HCFC-141b contained in imported pre-blended polyols.

HCFC consumption and sector distribution

25. Table 4 presents the consumption of HCFCs by sector as reported in the CP data for 2015.

Table 4. Distribution of HCFCs use by sector and substance in 2015

HCFC	Sector	HCFC use			
		mt	mt (%)	ODP tonnes	ODP tonnes (%)
Manufacturing					
HCFC-22	RAC	5,183.37	34.3	285.09	28.7
	Foam	352.16	2.3	19.37	2
HCFC-141b	RAC	151.4	1.0	16.65	1.7
	Foam	2,758.21	18.3	303.40	30.6
	Aerosol	27.55	0.2	3.03	0.3
	Solvent	90.84	0.6	9.99	1.0
HCFC-142b	Foam	29.37	0.2	1.91	0.2
HCFC-123	Fire-fighting	31.18	0.2	0.62	0.1
Subtotal		8,624.08	57.1	640.07	64.5
Servicing					
HCFC-22	RAC	6,242.19	41.3	343.32	34.6
HCFC-123		143.69	1.0	2.87	0.3
HCFC-142b		96.63	0.6	6.28	0.6
Subtotal		6,482.51	42.9	352.48	35.5
Total		15,106.59	100	992.54	100

HCFC consumption in manufacturing sectors

PU foam manufacturing sector

26. Stage I included the conversion of 16 PU foam enterprises (including one non-eligible) to hydrocarbon (HC) technology: the consumption of HCFC-141b was completely phased out in domestic refrigeration and continuous sandwich panels subsectors and five of the largest enterprises manufacturing discontinuous sandwich panels were addressed. Accordingly, the Government established a ban on the use of HCFC-141b in manufacturing of domestic refrigeration and continuous sandwich panels from 1 January 2015. The Government also issued a ban on the manufacturing of other foam products using HCFCs from 1 January 2020.

27. The survey conducted in the preparation of stage II identified 446 enterprises in the PU foam sector and one in the XPS foam sector. The distribution of the HCFC use among foam enterprises by subsector as originally submitted is presented in Table 5.

Table 5. Distribution of HCFC-141b consumption in the foam sector (2014) (mt)

Subsector	Large enterprises*		Medium enterprises*		Small enterprises*		Total
	Consumption (mt)	Number	Consumption (mt)	Number	Consumption (mt)	Number	
Commercial Refrigeration	50.6	1	139.4	4	561.7	159	751.7
Continuous panels	564.6	3	0.0	0	0.0	0	564.6
Discontinuous panels	504.4	7	478.8	15	452.5	69	1,435.7
General insulation	253.3	3	339.9	10	137.8	35	731
Integral skin	100.0	2	27.5	1	121.6	24	249.1
Spray foam	320.0	5	0.0	0	109.2	21	429.2
Thermoware	102.5	1	271.2	9	165.6	41	539.3
Water heaters	295.0	3	42.5	1	162.2	32	499.7
XPS foam	0.0	0	33.0	1	0.0	0	33.0
Grand Total	2,190.4	25	1,332.3	41	1,710.6	381	**5,233.3

* Small enterprises with consumption below 20 mt, medium: between 21 to 50 mt and large: above 50 mt.

**HCFC used in the PU foam sector in 2014 according to the CP implementation report is 3,746.13 mt.

28. HCFC-141b is supplied by few chemical suppliers and 20 systems houses, including five multinationals, producing and supplying customized polyols for several applications. The 15 locally owned systems houses received technical assistance during stage I (at a total cost of US \$4,296,500) to develop low-GWP based formulations and test them in PU foam downstream users.

Extruded polystyrene (XPS) foam manufacturing sector

29. The 2015 CP report indicates a consumption of 19.37 ODP tonnes of HCFC-22 and 1.91 ODP tonnes of HCFC-142b in the foam sector. This consumption is assumed to be in the XPS foam sector. The results of the survey as submitted had indicated a consumption of 33.00 mt of HCFC-141b by one XPS foam enterprise (as shown in Table 5); however, this enterprise was later removed from the HCFC-141b consumption estimation as HCFC-141b is not used in the sector.

Refrigeration and air-conditioning (RAC) manufacturing sector

30. Consumption in the RAC manufacturing sector in 2015 was 285.1 ODP tonnes by 316 enterprises, comprising 34 large, 28 medium-, and 254 small-sized enterprises. Large-sized enterprises dominate the manufacturing of room AC, commercial ducted systems, and chillers. Small- and medium-sized enterprises (SMEs) tend to manufacture process chillers, equipment for sub-zero and positive temperature refrigeration applications. SMEs also are contract manufacturers for large-sized enterprises for room AC.

31. The AC market has approximately 37 enterprises that manufacture about 4.5 million AC units per year, with room air-conditioning units accounting for approximately 77 per cent of the sector consumption. Of the 37 enterprises, approximately 20 enterprises are large-sized enterprises, six of which are non-Article 5 owned. There are also approximately 22 SMEs in the market.

32. There is a growing number of alternatives (principally R-410A but also HFC-32 and HC-290) used in the production of split air-conditioners. HCFC-22 is also used to manufacture precision and telecommunication air-conditioners and chillers. There is also some consumption of HCFC-123 for chillers, that is expected to remain stable in the coming years. In commercial refrigeration, HCFC-22 is used for the production of large capacity water coolers, and for small systems in the industrial refrigeration and cold storage. There are small amounts of HCFCs consumed for the defence sector and marine maintenance (Table 6).

Table 6. Consumption of HCFC-22 and HCFC-123 in the RAC manufacturing sector (mt)

Subsector	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
HCFC-22						
Room air-conditioners	2,747	3,218	3,136	2,985	3,069	3,112
Ducted split units	743	691	646	610	587	572
Chillers (HCFC-22)	137	139	102	78	51	46
Telecom and precision	128	45	58	90	31	41
Industrial refrigeration	61	61	67	73	81	79
Commercial refrigeration	56	63	69	65	64	72
Cold chain	41	45	50	57	65	81
Rail coach	8	9	11	13	8	0
VRF	9	13	9	0	0	0
Transport refrigeration	36	44	26	30	0	0
HCFC-123						
Chillers	n.a.	n.a.	20	19	21	25
Total	3,966	4,328	4,194	4,021	3,977	4,027

Other sectors (solvent, aerosol and fire-fighting sector)

33. HCFC-141b is also used as a solvent and cleaning agent during manufacturing of metal, electronic and medical equipment and as a component of formulated propellants in the manufacture of aerosols for industrial cleaning applications. HCFC-123 is used as a blend component for portable fire extinguishing systems.

HCFC consumption in the refrigeration servicing sector

34. HCFC-22 is a predominant refrigerant in the servicing sector and is expected to increase at least for the next five to six years. HCFC-123 is used mainly for centrifugal chillers and will continue to be used until the total phase-out of HCFCs. HCFC-142b use in blends in industrial refrigeration applications is decreasing.

35. The challenges being faced in this sector are: the large rates in the manufacturing sectors, which will increase the demand for HCFC for servicing in future years; the size of the market with an estimated of 200,000 technicians; and the uncertainty about the future technology alternatives for different subsectors.

Proposed activities in stage II of the HPMP

36. The activities to be implemented during stage II include regulatory actions; conversion of the PU foam sector; phase-out activities in the AC manufacturing sector; technical assistance activities; assistance to the servicing sector and enabling programme; and implementation and monitoring.

Regulatory actions

37. The key regulatory actions include controlling and monitoring the supply of HCFCs; supporting policies to discourage the demand of HCFCs and development of an action plan for the effective enforcement of the ban on imports of pre-blended polyols containing HCFCs effective from January 2013 (US \$50,000).

PU foam manufacturing sector

38. Stage II of the HPMP includes the complete phase-out of 4,814 mt (529.94 ODP tonnes) of HCFC-141b in the foam manufacturing sector by 1 January 2023, through the following activities:

- (a) *Conversion of all manufacturing enterprises:* Including 24 large enterprises to cyclopentane and HFO (US \$12,047,508); 33 medium sized enterprises to cyclopentane, HFO and methyl formate (US \$12,294,715); and 150 SMEs to HFO and methyl formate (US \$20,311,615);
- (b) *Technical assistance (TA):* Workshops on emerging low-GWP alternatives targeting SME and dissemination of technical material, in cooperation with the industry associations (IPUA) and systems houses (US \$450,000); and
- (c) *Demonstration component:* Development and evaluation of spray foam polyol systems with HFOs for building insulation in the regions with high ambient temperatures in the country. The project will be carried out by a system house that will develop polyols systems; provide technical support and laboratory tests for its clients; assists with technology adoption; and supply of foam sheets for building insulations to end-users. (The total funding requested for this component US \$2,459,705).

39. Out of 446 PU foam enterprises identified⁶, funds are being requested for the conversion of 207 eligible enterprises. Only 150 out of the 365 eligible SMEs have been selected to receive incremental capital cost (ICC) based on their size, adequate infrastructure and technical capability to undertake the conversion. ICC for the conversion to cyclopentane included the installation of HC storage and mixing stations, replacement of foam dispensers where applicable, safety related equipment, and training, trials and safety audit. ICC for the conversion to HFO and methyl formate included, depending on the application, foam dispensers, jigs, fixtures and moulds, premixing stations, safety related equipment.

40. Incremental operating costs (IOC) were calculated based on the blowing agent selected and the cost of baseline and alternative formulations. IOC for HFO and methyl formate varied depending on the amount of each blowing agent being introduced, with the maximum level of US \$13.03/kg in case of spray foam where HFO is the only alternative. In case of cyclopentane, there are incremental savings of US \$1.01/kg

41. The TA component includes 24 workshops on emerging low-GWP alternatives (US \$240,000), implementation support to association (US \$110,000), experts (US \$60,000) and information material (US \$40,000). The demonstration project includes ICC for a foam dispenser machine (US \$110,000), a spray foam sheet production line (US \$1,954,732), jugs moulds and fixtures (US \$100,000), test rooms (US \$30,000), training, trials and testing (US \$58,500), and contingencies for ICC (US \$206,473).

42. The cost for the conversion of enterprises, technical assistance and the demonstration project is presented in Table 7 (including XPS foam request).

Table 7. Total cost for the PU foam sector plan

Description	HCFC-141b phase-out		Total ICC US \$	Total IOC US \$	Total US \$	CE US \$/kg
	mt	ODP tonnes				
Commercial refrigeration	703.64	77.40	4,103,000	1,198,812	5,301,812	7.53
Continuous panel	564.64	62.11	4,666,200	(568,031)	4,098,169	7.26
Discontinuous panel	1,279.52	140.75	11,883,300	269,231	12,152,531	9.50
General insulation	648.80	71.37	1,677,500	1,206,963	2,884,463	4.45
Integral skin	197.30	21.70	1,644,500	80,581	1,725,081	8.74
Spray foam	422.67	46.49	2,041,600	3,752,231	5,793,831	13.71
Thermoware	473.02	52.03	5,641,900	4,446,239	10,088,139	21.33
Water heater	491.40	54.05	2,774,200	(131,191)	2,643,009	5.38
XPS	33.00	3.63	-	(33,198)	(33,198)	(1.01)
Sub total	4,814.00	529.54	34,432,200	10,221,638	44,653,838	9.28
Technical assistance	0.00	0.00			450,000	

⁶ A total of 33 enterprises are not eligible as they started manufacturing after the cut-off date of 21 September 2007.

Description	HCFC-141b phase-out		Total ICC US \$	Total IOC US \$	Total US \$	CE US \$/kg
	mt	ODP tonnes				
Demonstration project	0.00	0.00			2,459,705	
Grand total	4,814.00	529.54			47,563,543	9.88

AC manufacturing sector

43. Stage II proposes to phase out 1,376.04 mt (75.68 ODP tonnes) of HCFC-22 in nine enterprises manufacturing room AC (70.47 ODP tonnes) and in three of those nine enterprises also manufacturing ducted AC (5.21 ODP tonnes) by 1 January 2023. HFC-32 (and possibly R-290 for one enterprise, Voltas Ltd.) is proposed as an alternative. Six of the nine enterprises are large-consuming enterprises, with a manufacturing capacity of 100,000 units or more, and have the technical and financial capacity to convert their facility and to provide co-funding. The three small-sized enterprises are contract manufacturers for large-sized enterprises for room AC. All the enterprises are 100 per cent locally owned, were established prior to the cut-off date, and do not export to non-Article 5 Parties. While there was no change in HCFC-22 manufacturing capacity in the enterprises, consumption in the RAC manufacturing sector increased 46 per cent between 2014 and 2015.

44. There is one manufacturer of rotary compressors in the country, which also manufactures rotary compressors for HFC-32. The AC manufacturers purchase compressors from this manufacturer or import from other countries. Some enterprises in India already manufacture AC equipment based on HC-290 and HFC-32; the international standard IEC 60335-2-40 is being used to regulate the use of flammable refrigerants.

45. ICC include: system, component and process redesign; modifications to heat exchangers, sheet metal processing, and assembly line (including charging area, pressure testing, refrigerant charging equipment, safety-related equipment, leak detectors, pinching and sealing machine, gas bank for storage of HFC-32 with water jet spray for cooling, vacuum pumps); quality inspection, product certification, prototype manufacturing and testing, training, and technical assistance. IOC are based on the additional cost of compressors, savings or costs due to the amount of copper used in manufacturing heat exchangers, and costs associated with the refrigerant, accounting for a 25 per cent reduction in refrigerant charge with HFC-32 and possibly HC-290. IOC were adjusted as necessary to US \$6.30/kg in accordance with decision 74/50.

46. The cost for the AC sector also includes the procurement of refrigerant identifiers as part of enabling component and equipment for servicing sector. The cost for the conversion of enterprises and the additional funding request are presented in Table 8.

Table 8: Total funding request for the AC sector plan

Component	HCFC-22 consumption		Cost (US \$)			CE
	Mt	ODP tonnes	ICC	IOC	Total	
Conversion of 9 enterprises, room AC	1,281.27	70.47	17,887,024	6,701,268	24,588,292	19.19
Conversion of 3 enterprises, ducted AC	94.77	5.21	7,079,965	489,329	7,569,294	79.87
Subtotal	1,376.04	75.68	24,966,989	7,190,597	32,157,586	23.37
Procurement of refrigerant identifiers*	0	0	n.a.	n.a.	137,500	n.a.
Procurement of equipment for servicing sector*	0	0	n.a.	n.a.	2,111,600	n.a.
Subtotal	0	0	n.a.	n.a.	2,249,100	n.a.
Total for UNDP	1,376.04	75.68	24,966,989	7,190,597	34,406,686	25.00

*UNDP will procure equipment on behalf of UNEP and the Government of Germany for non-investment activities (servicing sector plan and enabling programme).

Technical assistance

47. Stage II proposal includes a request for funding for technical assistance at the total cost of US \$8,000,000. No cost details were included for the activities foreseen under this component.

Activities in the refrigeration servicing sector

48. Stage II proposes to phase out 2,500 mt (137.5 ODP tonnes) of HCFC-22 used in the refrigeration servicing sector at the amount of US \$11,784,900⁷ (excluding US \$2,111,600 for the equipment included in the funding request for the AC sector plan) through the following activities:

- (a) Equipment provision to training centres, and training of 45-50 new trainers and 60,375 technicians on alternatives as per schedule presented in the Table 9 (US \$10,276,800);

Table 9. Schedule of technicians training in stage II

Component	Year							Total
	2017	2018	2019	2020	2021	2022	2023	
Number of workshops	90	360	405	405	405	405	345	2,415
Number of technicians	2,250	9,000	10,125	10,125	10,125	10,125	8,625	60,375

- (b) Support to industrial training institutes (ITI) through inclusion of alternatives in RAC syllabus; training of instructors on the updated syllabus and development of material for RAC e-training modules; and trainings for the Defence Services and Indian Railways Services and possibly other institutions (US \$122,300);
- (c) Technicians certification programme, initially on a pilot scale in selected city(ies) to be further introduced in the country, if successful (US \$51,800);
- (d) Equipment provision to service technicians as post-training support (funding request of US \$2,111,600 included in the AC sector plan);
- (e) Establishment of a RAC training centre(s) for training on RAC equipment, designing servicing tools and developing synergies between manufacturing and servicing (US \$27,000);
- (f) Workshops targeting end-users on technical and safety aspects of the use of alternatives and best practices (US \$95,800);
- (g) Monitoring and evaluation, including an annual monitoring of on-going training programmes and an impact assessment of the training activities on HCFC reductions (US \$171,800); and
- (h) PMU for the servicing sector (US \$1,029,400).

Enabling component

49. Enabling activities will be implemented with the assistance of UNEP at a total cost of US \$1,875,500 and include:

- (a) *Policy and enforcement framework*: Strengthening of HCFCs licensing and quota system and electronic licensing; development of national standards for RAC sector;

⁷ Adding all components of the servicing sector plan as submitted brings the total figure to US \$11,774,900, different from the total figure submitted (US \$11,784,900).

strengthening the use of i-PIC⁸; training of 450 and refresher training for 140 customs officers; border dialogue on illegal ODS trade; and provision of 25 refrigerant identifiers (US \$285,000, excluding the cost of identifiers requested under the AC sector plan);

- (b) *Sector-based ODS policy development*: Promotion of public procurement of alternatives through capacity building of procurement agencies; awareness and development of bid evaluation tools and criteria; inclusion of flammable and other alternative refrigerants in the building codes; capacity building for architecture colleges; awareness raising on alternatives in the cold chain sector and energy efficiency (US \$320,000);
- (c) *Standards for flammable HCFC alternatives*: Update of the national standards in accordance with the international ones; establishment of partnership with the Bureau of Indian Standards and other stakeholders; consultation and workshops on HCFC alternatives; and awareness activities (US \$100,000);
- (d) *Strengthening of the RAC servicing sector society (RASSS)*: Opening of RASSS chapters in 10 states with high HCFC consumption; awareness workshop on e-learning and certification system; collaboration with the industry and servicing sector (US \$240,000);
- (e) *Awareness, outreach and communication*: 70 awareness workshops on flammable refrigerants and energy efficiency; development of outreach material, including on flammable refrigerants; annual industry roundtables and technology exhibitions; maintenance of the website developed in stage I (US \$630,500); and
- (f) PMU for the enabling component (US \$300,000).

Implementation and monitoring activities

50. The PMU, established during the implementation of stage I of the HPMP, will be responsible for project initiation procedures; verification of all enterprises to be assisted in stage II; coordination of stage II implementation with all stakeholders; consultants recruitment; preparation and implementation of the annual plans; development of relevant reports; financial management; development and maintenance of project management information system; facilitation of project evaluation; organization of meetings and workshops with stakeholders; and supervision and evaluation of conversion projects with the assistance from technical experts. The total cost of this component is US \$1,950,000, including project staff (US \$1,100,000), operational costs (US \$150,000), monitoring visits (US \$200,000); coordination meetings (US \$100,000) and verification (US \$400,000).

Total cost of stage II of the HPMP

51. The total cost of stage II of the HPMP for India has been estimated at US \$105,630,628, as originally submitted (excluding support costs). The proposed activities will result in the phase-out of 788.81 ODP tonnes of HCFCs at a total cost-effectiveness of US \$12.16/kg based only on the consumption eligible for funding of 742.72 ODP tonnes (or US \$11.60/kg including the additional reductions proposed in the PU foam sector). Detailed activities and cost, as originally submitted, are shown in Table 10.

⁸ iPIC is a voluntary mechanism of information exchange between trade partners on intended trade in ODS and ODS-containing products and equipment prior to issuing import/export licenses

Table 10. Total cost of stage II of the HPMP for India

Sector	Substance	Phase-out eligible for funding		Total phase-out		Funds requested (US \$)	CE (US \$)	
		mt	ODP t	mt	ODP t		Funded	Overall
PU foam	HCFC-141b	4,814	529.54	5,233	575.63	*47,563,543	9.88	9.08
AC manufacturing	HCFC-22	1,376	75.68	1,376	75.68	**34,406,686	25.00	25.00
Refrigeration servicing		2,500	137.50	2,500	137.50	11,784,900	4.71	4.71
Enabling component		0	0	0	0	1,875,500	n.a.	n.a.
Technical assistance		0	0	0	0	8,000,000	n.a.	n.a.
Regulatory measures		0	0	0	0	50,000	n.a.	n.a.
PMU		0	0	0	0	1,950,000	n.a.	n.a.
Total		8,690	742.72	9,109	788.81	105,630,628	12.16	11.60

* This amount includes US \$2,909,705 for demonstration project and technical assistance, excluded from the total cost calculations. Savings associated with the phase-out at the XPS foam enterprise of US \$33,198 were deducted from the funds requested in the PU foam sector.

**Including procurement of refrigerant identifiers and equipment for non-investment components (servicing sector and enabling programme).

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

52. The Secretariat reviewed stage II of the HPMP for India in light of stage I, the policies and guidelines of the Multilateral Fund, including the criteria for funding HCFC phase-out in the consumption sector for stage II of HPMPs (decision 74/50), and the 2016-2018 business plan of the Multilateral Fund.

Overarching strategy for stage II

53. The Secretariat noted the comprehensive strategy proposed by the Government of India to phase out 788.81 ODP tonnes (213.18 ODP tonnes of HCFC-22 and 575.63 ODP tonnes of HCFC-141b), to reduce HCFC consumption by 60 per cent of the baseline by 2023. However, adding HCFC reductions funded under stage I (341.7 ODP tonnes) and those proposed in stage II, India would have received funding to reduce HCFC consumption by 70 per cent from the baseline. Based on the 2015 consumption of 992.54 ODP tonnes of HCFCs (i.e., 38 per cent below the baseline), India would only need to phase out 349.26 ODP tonnes of HCFC to achieve the 60 per cent reduction proposed in stage II. On this basis, the Secretariat questioned the need for all the activities included in stage II.

54. UNDP clarified that there had been a reduction in HCFC consumption in 2014 and 2015 due to a number of reasons, in particular market forces, and that the economic situation was likely to improve in 2016 as the market was recovering. The complete phase out of HCFC-141b in the PU foam sector in 2020 is required as per existing regulations; and the conversion of AC enterprises is required to avoid the introduction of high-GWP alternatives in this sector.

PU foam manufacturing sector

HCFC to be phased out

55. The PU foam sector plan includes a request for funds to phase out a consumption of 4,814 mt of HCFC-141b at a cost of US \$47,563,543 and cost-effectiveness of US \$9.88/kg. However, HCFC-141b consumption in the PU foam sector in the last three years was lower (4,161.00 mt in 2013, 3,746.13 mt in 2014 and 2,758.21 mt in 2015, as reported under the CP implementation report⁹). In line with existing

⁹ Decision 34/18(a) requests the Secretariat and the implementing agencies not to submit project proposals which showed inconsistencies between project data and the latest reported sectoral consumption data; and decision 41/16 requests implementing

policies the project proposal should be based on either the last year consumption (2,758.21 mt) or the average consumption of the last three years (3,555 mt)(i.e., 2013, 2014, 2015). The Secretariat in its calculation of cost used as reference the last year's consumption as it does not include any consumption by enterprises included in stage I, which phased out 2,523 mt of HCFC-141b 1 January 2015. Upon discussion on this subject, the Government of India considered that the basis for calculation of costs should be the average HCFC-141b consumption of the last three years. If the average consumption of the last three years is used as the basis for calculating cost, the HCFC-141b consumption in 2013 and 2014 of enterprises assisted under stage I should be deducted to avoid funding the same enterprises twice.

Assistance to systems houses in stage I and SMEs in stage II

56. The Executive Committee approved, as part of stage I of the HPMP, a technical assistance project for 15 systems houses at US \$4,296,500, noting that “the costs of converting the SMEs (estimated at US \$16 million) can be reduced by up to 50 per cent, and substantial savings can also be realized in the remaining non-SMEs when converted at future stages. It is also expected that upon successful completion of the systems house component, many enterprises will choose to convert to one of the customized formulations even before stage II commences, depending on the timeframes”¹⁰. Notwithstanding this understanding at the time of the approval of stage I, the SME component of the PU foam sector plan in stage II is proposed at US \$20 million, without giving due consideration to the strategy established in stage I (based on the financial and technical assistance provided directly to the systems houses).

57. UNDP explained that while systems houses assisted under stage I have developed formulations based on HCFC-free alternatives, their penetration is determined by commercial factors and other considerations. For small enterprises with low risk-taking ability, it may take some more time for expansion and acceptance of developed pre-blended formulations. Taking into consideration the successful completion of the technical assistance provided to systems house in stage I, the Secretariat is of the view that the expected savings in converting SMEs should be taken into consideration in the calculation of cost for stage II.

Enterprise baseline and eligibility data

58. The calculation of incremental costs was based on the baseline information from the enterprises. However, no information on enterprise eligibility and baseline equipment was received. During the project review process UNDP provided additional information on larger enterprises; however, time was not sufficient to properly assess it. UNDP also explained that as the survey results did not provide details on the equipment for all the small enterprises surveyed, ICC were calculated based on the common equipment used, i.e. foam dispensing machines, jigs, fixtures, moulds and premixing tanks. The Government of India indicated in its endorsement letter its intention to ensure that a detailed inventory of equipment is undertaken before assistance is provided to small enterprises and perform due diligence before entering into a financial commitment with the enterprises approved for funding from the Multilateral Fund.

59. Acknowledging the difficulty of collecting data from very small enterprises at the preparatory stage, the Secretariat suggested, in the event that an agreement is reached, in line with paragraph 7(c) of the Agreement between the Government and the Executive Committee, that UNDP submit with each tranche a report on the validation of eligibility of PU foam enterprises receiving assistance from the Multilateral Fund, as they are incorporated in the implementation of the HPMP. This information would be reported to the Executive Committee. The list would be updated ensuring that funding will only be provided to eligible enterprises and lines. Funding associated with enterprises found to be non-eligible would be returned to the Multilateral Fund.

agencies to ensure that they had verified with the NOU the consistency of Article 7 data, the country programme implementation data and the project phase-out data, prior to transmitting projects to the Secretariat for review.

¹⁰ (UNEP/OzL.Pro/ExCom/66/38)

Demonstration project

60. When approving funds for 15 systems houses in stage I, a commitment was reached that no further assistance from the Multilateral Fund would be provided to the systems houses in India (decision 66/45(d)). On this basis, the Secretariat considers that the demonstration project included in stage II, to be implemented by a local systems house, is not eligible. UNDP clarified that the enterprise has a consumption of 55 mt in spray foam that can be phased out under the proposed demonstration project. While the project could be considered as an investment project as part of the spray foam sector, it would be necessary to receive more information on the baseline equipment, as the spray foam sheet production line requested (US \$1,954,732) seems to be a major technology upgrade.

XPS foam

61. Noting that the proposal for the XPS foam sector was for the phase-out of HCFC-141b and had a negative cost, the Secretariat requested that it be removed from stage II and that additional work be undertaken to identifying eligible enterprises consuming HCFC-22 and/or HCFC-142b in the sector. The Secretariat and UNDP agreed to discuss a proposal to address XPS foam submitted in line with the Multilateral Fund guidelines at a future stage, if there were eligible enterprises.

Incremental costs

62. UNDP included a methodology to calculate incremental costs for enterprises conversions, taking into account subsector, technology(ies) selected and enterprise sizes. The Secretariat used UNDP' model to calculate incremental cost based on the last year consumption (2,758.21 mt), and costs approved under stage I and costs of previous projects in other countries. The resulting cost was US \$19,125,156.

63. UNDP provided a number of technical clarifications in response to the Secretariat's cost calculation and more detailed information on the enterprises' eligibility and the calculation of incremental costs. As this information was received on 3 November, the Secretariat did not have the opportunity to properly assess it. However, it was noted that while the original proposal for the PU foam was calculated at US \$45 million, the revised information submitted by UNDP estimated a cost of around US \$54 million for the large and medium-sized enterprises, not including SMEs. It was also noted that some of the enterprises included might not be eligible for funding (e.g., Jindal Mectec appears to have inaugurated its continuous panels plant in April 2008, after the cut-off date; Isolloyd Engineering, which is requesting assistance for discontinuous panels, was already assisted in stage I for discontinuous panels). However, this would require further discussion.

64. The Secretariat also explored an alternative method to estimate the incremental costs for the PU foam sector, consisting of using the cost-effectiveness level of stage I of the HPMP for India, as submitted (US \$7.58/kg) applied to the 2015 consumption. This brings the total value of the PU foam sector plan to US \$20,907,232. While a higher figure for cost-effectiveness could be considered given the larger proportion of SMEs in stage II, the technical assistance project approved in stage I to systems houses for US \$4,296,500 should generate substantial savings in the implementation of stage II (see paragraph 56 and 57 of the present document).

65. The Secretariat considers that the cost-effectiveness of stage I is an appropriate reference to estimate the cost-effectiveness for stage II, rather than applying the cost-effectiveness threshold (US 9.79/kg and US \$10.96/kg for SMEs), as suggested by UNDP. Applying the threshold as a reference would assume that the incremental cost is above the threshold in all cases for all technologies and all enterprises, and that there are no enterprises, consumption or equipment that are ineligible for funding. This has not been the case in any HPMP reviewed so far.

66. The Secretariat presented the alternative calculation to UNDP for its consideration, with the following understanding:

- (a) The Government of India confirms that it is possible to provide financial assistance to the enterprises in the continuous panels sector that are in non-compliance with the Government of India's prohibition on the use of HCFCs in manufacturing of domestic refrigerators and continuous sandwich panels from 1st January 2015;
- (b) UNDP would submit with each tranche a report on the validation of eligibility of PU foam enterprises receiving assistance from the Multilateral Fund in India, as they are incorporated into the implementation of the HPMP. This information would be reported to the Executive Committee. The list would be updated, ensuring that funding would only be provided to eligible enterprises and lines. Funding associated with enterprises found to be non-eligible would be returned to the Multilateral Fund; and
- (c) The complete phase-out of HCFC-141b in the foam manufacturing sector is to be implemented by 1st January 2020 in accordance with the ODS rules amended in 2014 as per the endorsement letter received from the Government of India.

67. The Secretariat received a response on 11 November 2016 indicating that the Government of India did not agree with the Secretariat's proposal for the PU foam sector.

AC manufacturing sector

68. The Secretariat noted that India's 2015 consumption is already below the 2020 compliance target and that the AC sector plan, as originally submitted, was considerably less cost-effective than similar plans approved by the Executive Committee. Given the cost effectiveness, other activities proposed in stage II for India, and that the AC sector plan is not required to ensure India's compliance with the 2020 Montreal Protocol control target, the Secretariat suggested to consider in stage II a limited set of conversions in the AC sector to help limit the introduction of high-GWP alternatives in the AC sector by facilitating acceptance into the marketplace of lower-GWP alternatives.

69. The Secretariat noted that the original proposal lacked the necessary information to determine the incremental costs of the conversion; in particular, the 2015 consumption of the enterprises; the price of HCFC-22, HFC-32 and HC-290 and cost of compressors; the number of manufacturing lines at the enterprises, including whether the enterprises already manufacturer non-ODS equipment; the cooling capacity of the units manufactured; whether the enterprises manufacture heat exchangers in-house; details and basis for calculations of number of items, and some further enterprise-specific information. The Secretariat also noted the variation of cost for the same items across enterprises, with the cost-effectiveness of the conversions, as submitted, varying between US \$8.66/kg and US \$52.19/kg in the room air-conditioning sub-sector, and between US \$48.30/kg and US \$94.17/kg in the ducted air-conditioning sub-sector.

70. UNDP provided a comprehensive response to the Secretariat's questions and, in light of additional analysis, a new proposal. The following specific information was provided: the cost of refrigerants; the 2013-2015 consumption for the enterprises that will participate in stage II; the number of manufacturing lines and breakdown by capacity of the number of units manufactured and charge per unit at the enterprises; clarification on the technology selection by Voltas Ltd (i.e., HFC-32 and not HC-290); confirmation that all enterprises except Voltas Ltd. have in-house heat exchanger manufacturing; and clarification on individual items for which funding is requested.

71. In its new proposal, the Government of India agreed to defer the conversion of the ducted AC subsector, to remove the procurement of identifiers and equipment to support the servicing component

from the AC sector plan, to remove the three smaller residential AC enterprises (namely, Beeco Electrical, Birla Aircon, and B.A. International), and proposed to only convert 10 of the 17 lines at the six large-sized enterprises (Table 11) to phase-out 48.15 ODP tonnes of HCFC-22 at a cost of US \$19,670,286.

Table 11: Consumption and lines to be converted to HFC-32

Enterprise	Consumption (MT)			Lines at enterprise	Lines to be converted	Remarks
	2013	2014	2015			
Blue Star Ltd.	153	199	199	3	2	Remaining 1 line to be considered for conversion in the next stage of HPMP
E Vision	161	156	226	4	2	Remaining 2 lines to be considered for conversion in the next stage of HPMP
Lloyd Electric	112	105	235	5	3	Remaining 2 lines to be considered for conversion in the next stage of HPMP
Voltas Ltd.	412	479	530	2	1	Remaining 1 line to be considered for conversion in the next stage of HPMP
Videocon Industries	112	105	163	1	1	None
Zamil Air Conditioners	122	111	75	2	1	Remaining 1 line to be considered for conversion in the next stage of HPMP

72. Regarding the new proposal, the Secretariat noted that the requested funding for four out of the six enterprises was increased relative to the original proposal by a total of US \$4,149,669, and that the revised proposal was less cost-effective than the original (US \$22.47/kg versus US \$19.19/kg per the original). In addition, under the new proposal, only some but not all of the manufacturing lines at the enterprises would be converted, with the remaining lines continuing to manufacture HCFC-22-based equipment. The Secretariat stressed the need to ensure that the enterprises are able to manufacture and sell equipment based on the new technology, and the need to avoid an increase in the consumption of HCFC-22 in the line(s) that were not converted.

73. In light of the additional information provided and revised strategy for the sector, and recognizing that a limited set of cost-effective conversions (complemented by appropriate policy measures and activities in the servicing sector) could help send a clear signal to the market and encourage a broader transition to lower-GWP alternative, the Secretariat proposed two options for consideration of the Government of India:

- (a) *Option 1:* The conversion of nine manufacturing lines to phase out 815.47 mt of HCFC-22 at five enterprises at a total cost of US \$7,983,510 on the understanding that:
 - (i) The lines in the enterprises still manufacturing HCFC-22-based equipment after the conversion would not increase their consumption of HCFC-22; and
 - (ii) Enterprises would not convert the remaining HCFC-22 manufacturing lines until stage III unless it was to HFC-32 or a low-GWP alternative; or
- (b) *Option 2:* The conversion of all the manufacturing lines at three enterprises, resulting in the conversion of eight manufacturing lines to phase out 928.75 mt of HCFC-22 at a total cost of US \$7,535,497.

74. The options above were proposed by the Secretariat making changes to the cost of a number of items in the new proposal submitted by UNDP (largely based on precedent from previously approved projects), in particular: system, component and process redesign; heat exchanger conversion; sheet metal processing modifications; charging area modifications, fire safety equipment and alarm system; pressure testing equipment; vacuum pumps; leak detectors; quality inspection; product certification; prototype manufacturing, trials and testing; and training. The Secretariat also expected savings in the cost of refrigerant considering publicly available prices of HCFC-22 and HFC-32; the price of HCFC-22 reported

by the Government of India in its CP report¹¹; and the reduction in refrigerant charge that can vary between 25-40 per cent.¹² However, given limited information, the Secretariat proposed to set the incremental savings associated with the change in refrigerant to zero.

75. The Secretariat received a response on 11 November 2016 indicating that the Government of India did not agree with the Secretariat's proposal for the RAC manufacturing sector.

Overall cost proposal

76. In addition to the proposals on PU foam and AC manufacturing, the Secretariat proposed revised size and costs for other components:

- (a) *Refrigeration servicing sector/enabling component*: Based on existing policies on the prioritization of sectors, and the tonnage already addressed by the PU foam and RAC manufacturing sectors, the Secretariat proposed a reduced refrigeration servicing sector/enabling component at US \$6 million to phase out 1,250 mt (68.75 ODP tonnes) of HCFC-22, taking into consideration the cost-effectiveness threshold of US 4.8/kg as per decision 74/50.
- (b) *PMU*: The Secretariat noted that stage II included an overall PMU component for UNDP at US \$2,000,000 for a period of six years and a PMU for the Government of Germany in refrigeration servicing sector (US \$1,029,400). In addition, a technical assistance and enabling programme components without any associated direct HCFC reductions are being proposed for an amount of US \$8,000,000 for UNDP and US \$1,875,500 for UNEP (including a PMU for US \$300,000) respectively. It is noted that the refrigeration servicing sector also has its own PMU. Based on the PMU costs in stage I and the characteristics of stage II, the value to be recommended in stage II could be increased to US \$1,700,000.

77. A summary of the costs proposed by the Secretariat for stage II of the HPMP is presented in Table 12. With the activities, HCFC reductions and funds proposed the Secretariat suggested a commitment from the Government of India to achieve a reduction of 58 per cent of its baseline by 2022.

Table 12. Secretariat's cost proposal for stage II of the HPMP

Sector	US \$	Eligible phase-out		CE US \$/kg	Non-funded reductions		Total		CE US \$/kg
		mt	ODP		mt	ODP	mt	ODP	
PU foam sector	20,907,232	2,758.00	303.38	7.58	2,278.36	250.62	5,036.36	554.00	4.15
AC sector*	7,983,497	815.47	44.85	9.79			815.47	44.85	9.79
Servicing sector	6,000,000	1,250.00	68.75	4.80			1,250.00	68.75	4.80
PMU	1,700,000								
TOTAL	36,590,729	4,823.47	416.98	7.59	2,278.36	250.62	7,101.83	667.60	5.15

*Option 1. Option 2 has a different cost and phase-out.

78. The Secretariat received a response on 11 November 2016 indicating that the Government of India did not agree with the Secretariat's proposal and offering a new counter-proposal as presented in Table 13, as submitted. The Secretariat was unable to assess this new proposal.

¹¹ The Government of India reported a price of US \$10.50/kg for HCFC-22 in 2015.

¹² The incremental costs associated with the change in refrigerant proposed by UNDP appear to be in error. Based on the reported price of refrigerants (HCFC-22: US \$4.00/kg; HFC-32: US \$6.50/kg) and the proposed reduction in charge (25 per cent), the additional cost for the refrigerant would be US \$0.88/kg rather than US \$1.88/kg, as submitted.

Table 13. UNDP's revised cost proposal for stage II of the HPMP as submitted on 11 November 2016

Sectors	US \$ (1,000)	HCFC-141b and HCFC-22 (mt)	CE (US \$/kg)
PU foam	34.80	3,555.00	9.79
RAC sector	17.19	875.47	19.63
Servicing	6.00	1,250.00	4.80
PMU	5.35		
Total	63.34		

2016-2018 draft business plan of the Multilateral Fund

79. Insufficient time was available for the Secretariat and UNDP to finalize their discussions on the total cost of stage II. Nonetheless the Secretariat notes that the total level of funding and amounts of HCFCs to be phased out according to the 2016-2018 business plan (BP) of the Multilateral Fund are US \$21,862,412 and 217.57 ODP tonnes, respectively. The level of funding requested for the implementation of stage II of the HPMP for the period 2016 to 2018 is US \$78,108,061 (excluding support cost), as originally submitted, which is US \$56,245,649 above the amount in the business plan.

Other components of the project proposal for stage II

80. Due to the time limitations for discussing conversion and other activities included in stage II and their related costs, the Secretariat and UNDP did not have an opportunity to discuss and finalize the following: impact on the climate associated with the conversion of the manufacturing enterprises to be included in stage II; the level of co-financing; and the draft Agreement between the Government of India and the Executive Committee.

Remark

81. The Secretariat and UNDP undertook several rounds of constructive exchanges on different components of stage II, including the total phase-out of HCFC-141b in the PU foam sector, conversions in the room AC sector and assistance to the servicing sector. Due to the time constraints the discussions could not be finalized.

RECOMMENDATION

82. Pending.
