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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Sixty-sixth Meeting
Montreal, 16-20 April 2012

PROJECT PROPOSAL: THAILAND

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

Phase-out

- HCFC phase-out management plan (stage I, first tranche) — World Bank

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Thailand

(I) PROJECT TITLE	AGENCY
HCFC phase out plan (Stage I)	World Bank / IBRD (lead)

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2010	1,028.5 (ODP tonnes)

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)									Year: 2010
Chemical	Aerosol	Foam	Fire fighting	Refrigeration		Solvent	Process agent	Lab use	Total sector consumption
				Manufacturing	Servicing				
HCFC-123			0.4	1.0	1.4				2.8
HCFC-124									
HCFC-141b		189.5				21.8			211.3
HCFC-142b									
HCFC-22				472.7	340.3				813.0
HCFC-225ca						0.5			0.5
HCFC-225cb						0.7			0.7

(IV) CONSUMPTION DATA (ODP tonnes)			
2009 - 2010 baseline:	927.6	Starting point for sustained aggregate reductions:	943.20
CONSUMPTION ELIGIBLE FOR FUNDING (ODP tonnes)			
Already approved:	0.0	Remaining:	697.34

(V) BUSINESS PLAN		2012	2013	2014	Total
IBRD	ODS phase-out (ODP tonnes)	0.0	0.0	234.96	234.96
	Funding (US $)	13,450,000	16,812,700	6,030,000	36,292,700

(VI) PROJECT DATA			2012	2013	2014	2015	2016	Total
Montreal Protocol consumption limits			n/a	927.6	927.6	834.8	834.8	n/a
Maximum allowable consumption (ODP tonnes)			n/a	927.6	927.6	834.8	834.8	n/a
Project costs requested in principle(US $)	World Bank / IBRD	Project costs	5,000,000	7,500,000	8,500,000	1,439,270	2,493,252	24,932,522
		Support costs	375,000	562,500	637,500	107,945	186,994	1,869,939
Total project costs requested in principle (US $)			5,000,000	7,500,000	8,500,000	1,439,270	2,493,252	24,932,522
Total support costs requested in principle (US $)			375,000	562,500	637,500	107,945	186,994	1,869,939
Total funds requested in principle (US $)			5,375,000	8,062,500	9,137,500	1,547,215	2,680,246	26,802,461

(VII) Request for funding for the first tranche (2012)		
Agency	**Funds requested (US $)**	**Support costs (US $)**
World Bank / IBRD	5,000,000	375,000

Funding request:	Approval of funding for the first tranche (2012) as indicated above
Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

1. On behalf of the Government of Thailand the World Bank, as the designated implementing agency, has submitted to the 66th meeting of the Executive Committee stage I of the HCFC phase-out management plan (HPMP) at a total cost of US $31,280,110 plus agency support costs of US 2,346,007, as originally submitted, to implement activities that will enable the country to comply with the Montreal Protocol's 10 per cent reduction in HCFC consumption by 2015. The first tranche for stage I being requested at this meeting, as originally submitted, amounts to US $12,512,044 plus agency support costs of US $938,403 for the World Bank. The submission had been delayed by four weeks due to the effect of major floods in Thailand at the end of 2011.

Background

2. Thailand, with a total population of about 40 million inhabitants has ratified all the amendments to the Montreal Protocol.

ODS policy and regulatory framework

3. The Ministry of Industry is responsible for the implementation of the Montreal Protocol, the Department of Industrial Works (DIW) is in charge of enforcing the framework law that controls the import and use of ozone depleting substances (ODS), and the National Ozone Unit (NOU) within the DIW, is responsible for all ODS related tasks.

4. Since 1992, the Government of Thailand has enacted several laws and regulations to control the import/export and use of ODS, including the establishment of an ODS licensing system. In 1995, DIW started issuing import licenses and quotas to CFC importers. Currently, HCFC importers have to register with DIW and apply for an import permit. At present, there are no regulations prohibiting or restricting the use of HCFCs in the manufacturing and servicing sectors.

HCFC consumption and sector distribution

5. All of the HCFCs used in Thailand are imported. The country has no HCFC production, and exports are small and occasional. Between 2005 and 2010, HCFC consumption increased by on average, 2.7 per cent. Most of the growth occurred in HCFC-22 consumption, while HCFC-141b growth has been more moderate in part because of self-funded conversions away from HCFCs in several user sectors. The HCFC baseline for compliance is 927.6 ODP tonnes. HCFC consumption from 2005 to 2010 is shown in Table 1.

Table 1: HCFC consumption reported under Article 7 of the Montreal Protocol

HCFC	2005	2006	2007	2008	2009	2010	Baseline
Metric tonnes							
HCFC-22	11,811.2	11,401.5	12,611.5	12,544.2	11,276.5	14,780.7	13,028.6
HCFC-141b	2,029.1	1,943.4	1,608.7	1,841.6	1,810.4	1,921.5	1,865.9
HCFC-123	64.7	156.1	97.6	145.6	179.3	140.2	159.8
HCFC-124	1.7	0.0	0.0	1.9	0.0	6.8	3.4
HCFC-142b	64.4	39.4	6.5	3.6	3.6	0.0	1.8
HCFC-225*	316.3	329.1	0.0	69.0	68.6	40.7	54.6
Total mt	14,287.5	13,869.4	14,324.3	14,605.9	13,338.4	16,889.9	15,114.0

HCFC	2005	2006	2007	2008	2009	2010	Baseline
ODP tonnes							
HCFC-22	649.62	627.08	693.63	689.93	620.21	812.94	716.6
HCFC-141b	223.21	213.78	176.96	202.57	199.14	211.36	205.3
HCFC-123	1.29	3.12	1.95	2.91	3.59	2.8	3.2
HCFC-124	0.04	0	0	0.04	0	0.15	0.1
HCFC-142b	4.19	2.56	0.42	0.23	0.24	0	0.1
HCFC-225*	22.14	23.03	0	4.83	3.4	1.2	2.3
Total ODP tonnes	900.48	869.57	872.96	900.52	826.58	1,028.45	927.6

* These figures include consumption for HCFC-225, HCFC-225ca and HCFC-225cb.

6. In addition to the reported consumption under Article 7, eligible enterprises in Thailand used an average of 142.5 mt (15.67 ODP tonnes) of HCFC-141b contained in imported pre-blended polyols between 2007 and 2009.

7. HCFC-22 and HCFC-141b represent 99 per cent of total HCFC consumption in Thailand in mt and ODP tonnes. Sixty-six per cent of the total HCFC consumption (in ODP tonnes) is used in the manufacturing sector. HCFC-22 used in manufacturing of refrigeration and air-conditioning (AC) equipment accounts for 43 per cent of total HCFC consumption and HCFC-141b used in manufacturing of polyurethane (PU) foams represents 20 per cent. The refrigeration and air-conditioning servicing sectors account for 34 per cent of total HCFC consumption. The sectoral distribution of HCFCs used between 2009 and 2010 is presented in Table 2.

Table 2: Sectoral distribution by type of HCFC used

Consumption (ODP tonnes)	Substance	2009	2010	Baseline	Share (%)
Refrigeration and air-conditioning manufacturing *	HCFC-22	312.79	484.28	398.5	43
Chillers installation	HCFC-123	1.04	1.04	1.1	0.5
PU foam manufacturing	HCFC-141b	178.09	189.53	183.8	20
Solvents uses (cleaning agent)	HCFC-141b	21.12	21.78	21.5	2
Solvents uses (laboratory application)	HCFC-225	3.41	1.2	2.3	0.5
Total manufacturing		516.45	697.83	607.2	66
Servicing**	HCFC-22	308.71	329.16	318.9	34
	HCFC-123	1.42	1.46	1.5	0
Total servicing		310.13	330.62	320.4	34
Grand total		826.58	1028.45	927.6	100.0

* Air-conditioning equipment production represents 99.6 per cent of HCFC-22 used in manufacturing (84 per cent by non-Article 5 owned enterprises)

** HCFC-124 and HCFC-142b are excluded due to negligible use in servicing

Foam sector

8. The PU foam sector in Thailand is the manufacturing sector with the highest consumption by locally owned enterprises with a 2010 consumption of HCFC-141b of 1,723.0 mt (189.53 ODP tonnes), most of it (1,570.0 mt or 172.70 ODP tonnes) in the form of domestically blended polyols, and only 152.8 mt (16.81 ODP tonnes) pure for blending at the enterprise. Eligible manufacturers in the sector also used an average of 142.5 mt (15.67 ODP tonnes) of HCFC-141b contained in imported pre-blended polyols between 2007 and 2009.

9. Thailand's domestic refrigeration manufacturers and large panel producers already replaced the use of HCFC-141b as a foam-blowing agent by converting to cyclopentane. Most flexible foam producers converted from CFCs directly to water blown technologies or methylene chloride. The part of the country's foam sector still using HCFC-141b is comprised of 215 small and medium-sized enterprises (SMEs) producing PU rigid foam (97.4 per cent), integral skin and flexible foam in 14 different applications (2.6 per cent). Most of the producers consume less than 20 mt of HCFC-141b, and 53 "micro-enterprises" consume less than 1 mt. The largest application of HCFC-141b in Thailand is in ice box production, with 602.8 mt used in 2010 (32 per cent), followed by spray foam with 349.1 mt (18.5 per cent), sandwich panels with 332.2 mt (17.6 per cent) and commercial refrigeration with 147.5 mt (7.8 per cent). Table 3 shows the HCFC-141b consumption in Thailand's foam sector by application.

Table 3: Distribution of HCFC-141b use the foam manufacturing sector

Sector/Application	No. of enterprises	HCFC-141b Consumption*				Share 2010 (%)
		2007 (mt)	2008 (mt)	2009 (mt)	2010 (mt)	
Rigid PU foam						
Box foam	4	44.7	61.4	70.2	60.1	3.2
Commercial refrigeration**	14	110.4	136.6	132.8	147.5	7.8
Steel/fibreglass door	6	29	32.6	32.5	28.5	1.5
Ice box	44	592.3	604.4	634.1	602.8	32.0
Pipe section/pipe-in-pipe insulation	6	41.3	39.3	50.4	62.7	3.3
Pipe section and sandwich panel***	3	32.8	38.3	40.6	38.4	2.0
Refrigerated truck, reefer, fishery vessel	13	43.2	59.3	59.7	70.3	3.7
Sandwich panel	25	242.7	275.4	246.9	332.2	17.6
Spray foam	30	295.9	330.1	298.6	349.1	18.5
Thermoware	7	46.6	54.5	47.9	45.7	2.4
Wood imitation	6	27.6	32.2	39.2	49	2.6
Others thermoware	44	41.8	58.4	66.2	48	2.5
Sub-total rigid PU foam	202	1,548.20	1,722.60	1,719.10	1,834.40	97.4
Flexible PU foam	5	21.6	25	27.9	25.1	1.3
Integral skin	8	19.3	28	24.3	24.1	1.3
Total foam sector	215	1,589.10	1,775.60	1,771.30	1,883.60	100.0

* Includes HCFC-141b consumed as per the Montreal Protocol definition and HCFC-141b contained in imported polyols

** Represents the foam component only

*** Enterprises that manufacture both types of products

10. Foam manufacturers purchase HCFC-141b pure and in pre-blended polyols from seven systems houses and 13 polyols suppliers (seven of which are the same systems houses). Systems houses also provide technical assistance on formulations. The entire HCFC-141b contained in imported pre-blended polyols is imported by one local distributor. For each enterprise in the foam sector, the HPMP has identified the proportions used of pure HCFC-141b, HCFC-141b in locally pre-blended polyols and HCFC-141b in imported pre-blended polyols. A total of 44 enterprises included in stage I are using HCFC-141b in imported pre-blended polyols. An overview of the different ways HCFC-141b is used in Thailand is presented in Table 4.

Table 4: Total use of HCFC-141b pure and in polyols

Sector	No. of Enter-prises	HCFC-141b in bulk (mt) 2010		HCFC-141b in imported pre-blended polyols (mt). avg. 2007-2009	Total Baseline (mt)
		Pure	Locally pre-blended		
Included in stage I of the HPMP					
Eligible enterprise with investment activity	131	117.9	1,250.4	135.0	1,503.3
Eligible enterprise with technical assistance component	53	0.3	1.1	3.0	4.4
Non-eligible enterprise	1		9.3		9.3
Sub-total stage I	185	118.2	1,260.8	138.0	1,517.0
To be included in the stage II of the HPMP (exclusively spray foam)	30	34.6	309.6	4.5	348.7
Total foam sector	215	152.8	1,570.4	142.5	1,865.7
Share (%)		8	84	8	100

Refrigeration and air-conditioning manufacturing

11. The HCFC consumption in the air-conditioning manufacturing sector is with 47 per cent (ODP weighted) the largest contributor to the HCFC consumption of Thailand in 2010. However, since Thailand is a major hub for both domestic and international manufacturers of residential air-conditioners, the consumption related to manufacturing enterprises with 50 per cent or more by Article 5 ownership is only 68.09 ODP tonnes or 6.6 per cent of the countries consumption. Thailand is the second largest producer of residential air-conditioning in the East Asia Region with a total annual production of approximately 10 million units of which about 10 per cent are sold in the domestic market. Air-conditioners and components are produced by multinational enterprises (from China, Japan, and the Republic of Korea) and by 14 locally-owned enterprises. Although most of the products manufactured by multinationals do not enter the Thai market, their consumption of HCFC-22 counts in line with Montreal Protocol definitions. The difference between these two groups is related to the scale of production, level of technical capacity and possession of state-of-the art technologies and equipment, and target consumers. Locally owned producers manufactured nearly 538,000 units with an associated consumption of 1,239 mt of HCFC-22. The domestic manufacturers of residential AC also produce larger air-conditioning systems for commercial purposes.

12. For all applications in residential and commercial air-conditioning, about 95 per cent of the refrigerant used is HCFC-22. HFC-410A and HFC-407C are also used but in much smaller quantities.

Table 5: Consumption in and production of AC equipment

Manufacturer	Consumption* (baseline; mt)	Consumption* (2010; mt)	Manufacturing of AC products since	Article 5 ownership (%)
Unico Consumer Products Co. Ltd.	124.0	138.0	1998	100
Better Living	5.0	6.0	1967	100
Bitwise	53.5	66.2	1989	100
Pan – Tycoon Co., Ltd.	39.5	36.0	1990	100
C.N.E. Industry Group Co. Ltd.	203.0	202.9	1992	100
Eminent Air (Thailand) Co., Ltd.	64.0	70.4	1982	100
Thrub-Thong Hou Co. Ltd	77.0	81.0	2001	100

Manufacturer	Consumption* (baseline; mt)	Consumption* (2010; mt)	Manufacturing of AC products since	Article 5 ownership (%)
B.Grimm Airconditioning Limited; Link Manufacturing	25.5	27.3	1967	80
Subsuksiri Co., Ltd.	8.0	10.4	2005	100
Saijo Denki International Co. Ltd	106.0	110.6	1987	100
PPJ Engineering Co., Ltd. (Starr Holding Group)	160.0	157.6	1995	100
Trane Amair Limited	121.5	136.3	1991	51
TTC Air Conditioning Co. Ltd.	126.0	159.0	2005	100
United Technology Co. Ltd. (Uni-Aire Corporation Co., Ltd.)	33.0	36.4	1972	100
Total	**1,146.0**	**1,238.0**	**-**	**-**

* Excludes HCFC consumption for after sales service (during warranty)

Industrial and commercial refrigeration manufacturing sector

13. Of the more than 250 refrigeration enterprises in the sector that used CFC-12 in the past, only few are using HCFC-22. The sector consumed an estimate of 300 mt of HCFC-22 in 2010. Many commercial refrigeration enterprises are using R-404a and R-507 due to technical advantages for their particular applications. Most SMEs in the commercial refrigeration sector converted from CFC-12 to HFC-134a through a MLF project coordinated by Kulthorn Kirby, a compressors producer. The only commercial refrigeration enterprises identified as consuming HCFC-22 are also consuming pre-blended HCFC-141b and are listed in Table 6 below.

Table 6: Commercial refrigeration enterprises consuming HCFCs as per foam survey

Commercial refrigeration enterprises with no prior support from the MLF	Commercial refrigeration enterprise with prior support from the MLF for conversion to HFC-134a
H.I.M. Engineering Co. Ltd	Arco Gamko Co. Ltd.
Lucky Star Universal Co. Ltd.	Pattana Intercool Part Ltd.
Patkol Public Co. Ltd.	Rattanakosin Cooling Co. Ltd.
Sahapattana Cooling Part Ltd.	System Form Co. Ltd
Smart Budget Service Co. Ltd.	Thaipradit Cooling Mart Co. Ltd.
Songserm Commercial Refrigeration Ltd	Thermedez Co. Ltd.
Sunhui Co. Ltd	
The Cool	

14. HCFC-22 is used in relatively small amounts in industrial refrigeration equipment in the cold storage and ice making sub-sectors. Finally, consumption of HCFC-22 is still present in the installation and servicing of refrigeration systems in supermarkets in Thailand. However, newly installed capacity is rapidly decreasing because of the corporate non-ODS policy of the major supermarket chains in Thailand.

Refrigeration and air-conditioning servicing sector

15. The servicing sector consumes about 40 per cent of the HCFC-22. Consumption in the sector is devoted mostly to servicing residential air-conditioning equipment, estimated at 10 to 12 million units, with nearly 1 million units added per year. The installed AC capacity comprises a wide variety of equipment in terms of quality, with annual leakage rates fluctuating between 10 and 30 per cent. As most of the HCFC-22-based equipment manufactured in Thailand is for export, there is no direct relation between newly manufactured equipment and local installed capacity. HCFCs in particular HCFC-22 and HCFC-123 are also used in maintenance of commercial refrigerators and, to a lesser degree, in industrial refrigeration, supermarkets, and chillers.

16. Servicing is provided by an estimated 3,500 workshops. Most AC equipment manufacturers and suppliers provide servicing through their network during the one-year warranty period; subsequently many users contract less expensive local technicians. Many commercial refrigeration suppliers offer annual contracts for servicing while chiller owners have their own technicians. Small, independent shops repair both commercial and domestic refrigeration equipment and hence are familiar with various refrigerants. However, their capacity is limited, particularly in terms of retrofitting equipment to alternative refrigerants and handling flammable substances such as iso-butane R-600a.

Other sectors

17. The solvents sector accounts for only 2 per cent of total HCFC consumption. HCFC-225 is used as a solvent for a specific application in a laboratory, and HCFC-141b is used by a large number of small enterprises as a cleaning agent for several applications including refrigeration equipment and as a solvent for high precision parts. In the fire fighting sector, there is anecdotal evidence that HCFC-123 was imported for unconfirmed use in fire protection in 2009 and 2010; however, the identification of related users was not possible during the survey preparation. This sector will be investigated further during the preparation of stage II of the HPMP.

Forecast of future HCFC consumption

18. The Government of Thailand provided a business-as-usual scenario indicating demand for HCFCs as shown in Table 7 below. According to the projections in the HPMP, Thailand would need to reduce 208 ODP tonnes of HCFC consumption in 2012 to achieve the baseline freeze level of 927.6 ODP tonnes in 2013, and an additional reduction of 92.8 ODP tonnes would be required to achieve the 10 per cent reduction in 2015.

Table 7: HCFC consumption forecast

Sector/Application	2011	2012	2013	2014	2015	Avg. growth rate (%)
Air-conditioning manufacturing HCFC-22	8,897	9,548	10,248	10,999	11,805	7
Commercial refrigeration manufacturing HCFC-22	315	331	347	365	383	5
Chillers installation HCFC-22	5	5	5	6	6	5
Sub-total manufacturing HCFC-22	9,217	9,884	10,601	11,369	12,194	7
Servicing HCFC-22	6,283	6,368	6,442	6,502	6,546	1
Chillers installation HCFC-123	55	58	60	63	67	5
Servicing HCFC-123	90	92	93	95	97	2
Servicing others	7	7	7	7	7	0
PU foam manufacturing HCFC-141b	1,828	1,939	2,058	2,183	2,316	6
Solvents HCFC 141b	210	223	237	251	267	6
Solvents 225	41	42	42	42	43	1
Sub-total solvents	252	265	279	294	309	5
Total mt	17,732	18,613	19,540	20,513	21,537	5
Total ODP tonnes	1,083	1,136	1,196	1,257	1,321	5
Montreal Protocol consumption target			927.6	927.6	834.8	

HCFC phase-out strategy

19. Stage I of the HPMP as submitted will reduce HCFC consumption by 301.2 ODP tonnes composed of an estimated 208.4 ODP tonnes to achieve the freeze at the baseline level and 92.8 ODP tonnes to meet the 10 per cent reduction target in 2015. The Government of Thailand is requesting

financial assistance to reduce 221.0 ODP tonnes of HCFCs (73 per cent of the estimated reduction for stage I), and will address the remaining 27 per cent through Government regulation. The overall strategy will be to address first conversions in the foam sector excluding spray foam, and of a select group of air-conditioning manufacturers representing 15 per cent of this sector's consumption in 2010.

20. Stage I of the HPMP includes the following components:

(a) *Investment projects in the foam sector (except spray foam) and the residential air-conditioning local manufacturers:* In total 185 enterprises in the foam sector and 14 in the residential air-conditioning sub-sector will be converted in stage I to non-HCFC technologies (i.e. hydrocarbon (HC) water-blown technology and reduced-HFC formulations in the foam sector, and HFC-410A technology for air-conditioning producers);

(b) *Technical assistance activities to support the conversion to alternative technologies:* Assistance will be provided to foam systems houses and polyol suppliers to facilitate the transition to alternative technologies and to phase out 4.4 ODP tonnes in 53 micro-enterprises, to a compressor manufacturer to develop low global warming potential (GWP) compressors for the commercial refrigeration sector; and to the air-conditioning sector to help implement Thailand's energy efficiency initiatives in buildings; and

(c) *Policy and regulatory activities:* It is planned to undertake the following activities: implementation of the import quota system from 2013; voluntary agreements with polyol suppliers and systems houses to phase-out HCFC-141b in all sub-sectors and applications except spray foam by the end of 2015; a ban in the use of HCFC-141b in foam manufacturing and the import of pre-blended polyol containing HCFC-141b (except in spray foam uses) as of 1 January 2016; a ban on the use of HCFC-22 in air-conditioning manufacturing and imports of all HCFC based air-conditioning up to a size of 14.5 kW as of 1 January 2017; and a ban on sales of HCFC-22-based AC units as of 31 December 2017.

Investment project foam sector

21. The Government of Thailand decided to include in stage I all 185 enterprises in the PU rigid foam, flexible moulded foam and integral skin sectors, consuming 81.5 per cent of the total HCFC consumption in foams. An additional 30 enterprises in the spray foam sub-sector will be only included in stage II due to the absence of suitable alternative technologies for this application. Out of the 185 enterprises included in the plan, 132 will be assisted by investment projects and 53 micro-enterprises will be assisted through the technical assistance component of the HPMP. Table 8 shows the enterprises included in stage I classified by size and whether or not they use imported pre-blended polyol.

Table 8: Enterprises included in stage I by size and type of HCFC-141b used

Size of enterprise	**No. of enterprises**	**HCFC-141b Baseline (mt)**			
		Pure	In locally pre-blended polyol	In imported pre-blended polyol	Total
Medium (above 20 mt)	23	63.8	539.0	80.4	683.2
Small (between 1 and 20 mt)	109	54.1	720.7	54.7	829.4
Micro (below 1 mt)	53	0.3	1.1	3.0	4.4
Total	185	118.2	1,260.8	138.1	1,517.0

22. Data from the 132 enterprises included for investment projects was collected with the assistance of the polyols suppliers. A representative total of 18 enterprises consuming 20 per cent of HCFC-141b were selected from various applications and baseline conditions, leading to visits and a detailed conversion cost analysis for these enterprises. The resulting cost templates were subsequently applied to determine funding needs of the remaining foam enterprises, taking into account individual baseline conditions available from the nation-wide survey and choice of alternative technology.

Selection of technology

23. The technical and economic aspects of all of the available technologies for the replacement of HCFC-141b as a foam-blowing agent were discussed with systems houses and enterprises. Based on these considerations, the foam sector plan will introduce the following technologies summarized in Table 9:

(a) HC technology for the PU rigid foam sector in all enterprises manufacturing box foam and enterprises in other applications with HCFC-141b consumption above 20 mt per year;

(b) HFC-based solution in a reduced formulation (mostly HFC-245fa, followed by HFC-365/HFC-227 or combinations) for the rest of the rigid foam enterprises with HCFC-141b consumption below 20 mt per year, and for four integral skin producers; and

(c) Water-blown (CO_2) technology for one integral skin producer and four flexible moulded foam enterprises still using HCFC-141b.

Table 9: Technologies proposed for the foam sector plan

Sector	Hydrocarbon		HFC-based solution		Water blown		Total	
	No. of enterprises	HCFC-141b (mt)	No. of enterprises	HCFC-141 b (mt)	No. of enterprises	HCFC-141b (mt)	No. of enterprises	HCFC-141b (mt)
Rigid foam	25	694.5	98	768.9	--	--	123	1,463.3
Flexible foam	--	--	--	--	4	25.1	4	25.1
Integral foam	--	--	4	16.5	1	7.7	5	24.2
Total	25	694.5	102	785.4	5	32.8	132	1,512.6
Share (%)	19	46	77	52	4	2	100	100

Incremental costs for the conversion of foam enterprises

24. The incremental capital costs (ICC) requested for the conversion to HC technology in all applications except box foam are related to: retrofitting of high-pressure (HP) foam dispensers (US $60,000 to US $80,000 depending on baseline) or replacement of low-pressure (LP) dispensers by same capacity HP dispensers (US $140,000 to US $180,000); pre-mixing system (US $92,000 to US $112,000); retrofit of jigs (US $5,000 to US $10,000/press); safety related equipment (US $162,000 to US $213,000); and trials, training, testing and certification (US $15,000 to US $25,000).

25. Conversion of box foam enterprises to HCs include polyols/cyclopentane/isocyanate mixing system (US $7,500 to US $14,000); grounded rails (US $1,500 to US $ 2,500); retrofit of the foam boxes (US $2,000 to US $3,000); safety related equipment (US $40,000 to US $66,500); and technology transfer support, trials and testing, training and safety certification/audits (US $60,000). For all conversions to HC technology, incremental operating costs (IOC) were calculated based on baseline prices and formulations from the enterprises at an average of US $1.70/ kg, out of which US $1.60/kg are requested for funding. All conversions to HCs will start in 2013 and be completed in December 2015.

26. Conversion to HFC or water-based technology includes: provision of 50 per cent the cost of a HP dispenser for enterprises using hand-mixing (US $40,000); replacement of LP dispensers by HP dispensers (US $80,000); retrofit of existing HP dispensers (US $5,000 to US $10,000 depending on the baseline); cooling equipment (US $8,500), pre-mixing tank (US $40,000) and building modifications for enterprises blending HFCs *in situ* (US $2,500); and technical assistance, training and trials (US $15,000 to US $25,000). IOCs were calculated based on baseline prices and formulations from the enterprises at US $4.72/kg for PU rigid foam enterprises converting to HFC, and US $3.82/kg for the ones converting to water blown technology. For integral skin enterprises the IOCs are US $11.47/kg for conversion to HFCs and US $4.43/kg for conversions to water. For flexible moulded foam enterprises converting to water IOC are US $3.65/kg. Funds requested for IOCs will be limited to US $1.40/kg for integral skin applications, and US $1.60/kg for all other applications.

27. Conversion projects to HFC technology will start by 2014 to allow sufficient time for systems houses to develop HFC formulations for all applications, and for prices of HFC-based polyol to become more competitive. Although water-blown technology is already available in Thailand, conversions to this technology will be implemented at the same time as the conversions to HFCs given the similarity of the enterprises converting to both technologies. Project completion for enterprises converting to HFC or water-blown technology is expected by the end of 2015.

28. The cost for the conversion of the foam enterprises covered under stage I of the HPMP amounts to US $13,708,911, with an overall cost effectiveness of US $9.04/kg as shown in the table below.

Table 10: Overall cost for the foam sector plan

Sector	No. of enterprises	Detailed Investment Cost (US $)				
		ICC (US $)	IOC (US $)	Total (US $)	Maximum funding based on threshold (US $)	Funding requested from MLF (US $) *
Investment activity						
Rigid polyurethane						
Box foam	4	830,000	96,187	926,187	588,542	588,542
Commercial refrigeration	14	1,205,000	233,243	1,438,243	1,210,032	1,210,032
Steel/fibreglass door	4	315,000	45,464	360,464	222,487	222,487
Ice box	39	5,470,000	941,340	6,411,340	5,221,094	5,221,094
Pipe section and pipe-in-pipe-insulation	6	830,000	100,359	930,359	534,447	534,447
Pipe section and sandwich panel	3	540,000	61,021	601,021	343,885	343,885
Refrigerated truck, reefer, fishery vessel	12	770,000	111,332	881,332	544,832	544,832
Sandwich panel	22	4,130,000	529,772	4,659,772	3,000,106	3,000,106
Thermoware	7	315,000	70,601	385,601	345,504	345,504
Wood imitation	3	550,000	78,332	628,332	788,604	628,332
Others	9	690,000	73,757	763,757	360,947	360,947
Sub-total rigid polyurethane foam	123	15,645,000	2,341,406	17,986,406	13,160,481	13,000,209
Flexible polyurethane	4	285,000	40,076	325,076	527,871	325,076
Integral skin	5	345,000	38,627	383,627	439,262	383,627
Sub-total investment activity	132	16,275,000	2,420,108	18,695,108	14,127,614	13,708,911

* The cost effectiveness for the PU rigid foam is US $8.88/kg, for the flexible moulded foam is US $12.95/kg and for the integral skin is US $15.85/kg.

Investment project residential air-conditioning manufacturing sector

29. The World Bank proposed to address within stage I of the HPMP all 14 manufacturers of the residential air-conditioning sector in Thailand which are fully or by majority owned by Article-5 countries. The 14 enterprises vary from very small operations to mid-scale air-conditioning manufacturers. The project proposal included for each of the enterprises a detailed description about ownership, products and exports, baseline equipment, as well as consumption of HCFC-22 and production of air-conditioning equipment, and a customized approach of the support needed for the conversion. The World Bank requested, for the conversion of a production capacity of 538,000 units per year and a consumption of 1,239 mt (68.15 ODP tonnes) of HCFC-22, incremental cost of US $6,929,600, including costs for after-sales support conversion costs of US $312,000 and IOCs of US $7,797,953, leading to a total request for funding of US $14,727,553.

30. The HPMP for Thailand assesses a number of different technology options and comes to the conclusion that, for all air-conditioning manufacturers to be converted, the technology choice would be HFC-410A. The main reason for this choice is the predominance of multinational manufacturers in terms of manufacturing capacity in Thailand, producing a multiple of the national market per year for export. These manufacturing operations of multinationals are presumed to convert in the future from HCFC-22 to HFC-410A technology. The national manufacturers perceive themselves to be under significant market pressure resulting from the technology choice by the multinationals. Another critical element in the decision for HFC-410A technology was the current availability of the necessary components for the production of the air-conditioners, and the known acceptance of this technology in the market. A Global Environment Facility-supported (GEF) energy efficiency programme to be implemented in the near future as well as energy efficiency efforts by the Government of Thailand regulating minimum energy efficiency standards for air-conditioning equipment are meant to alleviate disadvantages in the overall CO_2 emissions of the equipment which may result from the use of a replacement technology with, on a kilogramme by kilogramme basis, a higher GWP than HCFC-22.

31. The funding required included costs for redesign to compensate for the lower thermo dynamic efficiency, i.e. lower inherent energy efficiency of HFC-410A as compared to HCFC-22, product development and certification, changes to the production lines such as retrofitting or replacing refrigerant charging equipment and vacuum pumps. The HPMP also requested funding for after-sales service facilities to allow installation and warrantee on non-HCFC technology to be introduced into the market. Also requested were costs to convert the heat exchanger production in several of the facilities to different dimensions of the tubing used to manufacturer heat exchangers. The overall cost of the air-conditioning sector plan for the HPMP, as requested, is provided in Table 11.

Table 11: Overall cost of the air-conditioning sector plan

Cost type	Cost (US $)
ICC of air conditioning manufacturing	3,086,600
ICC heat exchanger	3,531,000
ICC after-sales-service	312,000
Sub-total	6,929,600
IOC	7,797,953
Total requested funding	14,727,553
Cost-effectiveness (US $/kg)	11.90

32. The conversions in the air-conditioning sector will be undertaken predominantly before the year 2015; however, the manufacturers have the possibility to continue using HCFC-22 as long as they do not purchase it from the market, with the associated increase in overall consumption. Instead, it is foreseen that the manufacturers will establish a stockpile before 2015, sufficient to allow continued manufacture of equipment well beyond 1 January2015.

Technical assistance component

33. A technical assistance programme requested at a cost of US $862,600 is included in stage I to:

(a) Familiarize the Bangkok Metropolitan Administration (BMA) officials of emerging low-GWP air-conditioning systems and influence them to develop building codes which will prevent installations of HCFC-based AC systems, as part of the "green energy for low-carbon growth" project in Thailand to which BMA will provide about US $9.5 million plus an US $3.5 million are expected from GEF (US $100,000);

(b) Enable Kulthorn Kirby, a Thai compressor enterprise, to develop and test natural refrigerant compressors, in order to establish local supply of CO_2 and R-290 compressors for the implementation of stage II in the commercial refrigeration sector (US $512,600); and

(c) Assist systems houses to develop formulations with suitable alternative technologies by bringing together experts, chemical suppliers and equipment suppliers, and assist 53 micro-enterprises to phase-out 4.4 ODP tonnes of HCFC-141b, through technology transfer and training provided by their polyols supplier (US $250,000).

34. The work of the Project Management Unit (PMU) will include assisting the implementation and, monitoring it. It will also include a number of further activities, such as:

(a) Undertaking awareness activities to outreach HCFC consuming enterprises and consumers to inform them on the need to protect the ozone layer and climate; advise on the potential impact of the Montreal Protocol phase-out schedule for HCFCs on future supply of HCFCs; and about the availability of HCFC-free products manufactured by beneficiaries of stage I;

(b) Encouraging production and penetration of high energy performance of new air-conditioning equipment efforts to improve the climate impact of introducing HFC-410A, in coordination with the green building programme by the Government;

(c) Promoting the introduction of non-HCFC based equipment by developing a financial plan and securing financial support from the on-going energy efficiency subsidy programme administered by the Government;

(d) Providing assistance to at least 150 enterprises participating in stage I to prepare sub-project proposals for financial assistance; and

(e) Hiring a technical consulting team to work closely with participating enterprises.

The total costs associated with activities under the PMU was requested at a level of US $1,981,046.

Overall cost of stage I of the HPMP

35. The total cost of stage I of the HPMP to meet the Montreal Protocol's HCFC compliance targets up to and including the 10 per cent reduction by 2015 has been estimated at US $31,280,110. The overall cost of the HPMP of Thailand including stage I and future stages is presented in Table 12.

Table 12: Cost of stage I of the HPMP

Activity/sector	Overall HPMP		Stage I		HPMP (remaining stages)		
	Baseline consumption (mt)	Estimated funding demands (US $)	Phase-out amount (mt)	Funding request (US $)	Phase-out amount (mt)	Funding request (US $)	Overall counterpart funding (US $)
Foam sector	1,865.70	17,121,813	1,517.00	13,708,911	348.70	3,412,901	4,986,197
AC sector	6,881.00	17,727,553	1,239.00	14,727,553	5,642.00	3,000,000	n/a
Commercial and industrial ref sector	259.00	3,939,390	0.00	0	259.00	3,939,390	*
Solvent sector	249.50	4,922,635	0.00	0	249.50	4,922,635	*
Servicing sector	6,054.00	27,243,000	0.00	0	6,054.00	27,243,000	*
Sub-total	15,309.20	70,954,391	2,756.00	28,436,464	12,553.20	42,517,926	*
Technical assistance		5,464,393		862,600			
PMU, Financial Agent, Technical Firm		1,631,046		1,981,046		4,251,793	
Total		78,049,830		31,280,110		46,769,719	

* To be determined

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

36. The Secretariat reviewed the HPMP for Thailand in the context of the guidelines for the preparation of HPMPs (decision 54/39), the criteria for funding HCFC phase-out in the consumption sector agreed at the 60th meeting (decision 60/44), subsequent decisions on HPMPs and the 2012-2014 business plan of the Multilateral Fund (MLF).

Starting point for aggregate reduction in HCFC consumption

37. The Government of Thailand agreed to establish as its starting point for sustained aggregate reduction in HCFC consumption the baseline of 927.6 ODP tonnes, calculated using actual consumption of 826.6 ODP tonnes and 1,028.5 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol, plus 15.7 ODP tonnes of HCFC-141b contained in imported pre-blended polyol systems (average 2007-2009), resulting in 943.2 ODP tonnes.

Technical and cost-related issues associated to the foam manufacturing sector

38. The Secretariat discussed the following issues with the World Bank concerning the phase-out activities in the foam manufacturing sector outlined in stage I of the HPMP: second-stage conversion (in the context of decisions 60/44 and 62/16); selection of alternative technologies; technical and cost-related issues at the enterprise level (including counterpart funding); and technical assistance to systems houses.

39. Noting that all conversions in the foam sector will only be completed by the end of 2015, the Secretariat questioned to what extent the foam sector plan would contribute to the achievement of the 2013 and 2015 reduction targets. The World Bank explained that it was necessary to implement the foam sector plan during stage I in order to achieve sustained reductions as early as possible. The earliest these projects can be completed is the end of 2015 as conversion to HC technology would take three years, and conversions to HFCs, that take two years could only start in 2014, which is the earliest time when HFC polyols can be introduced in the local market. However, the HCFC import quota system will restrict and reduce imports of HCFC-141b as of 1 January 2013 to the limits consistent with stage I of the HPMP and the associated agreement. Voluntary agreements will be maintained between the Government, systems houses and polyols suppliers to ensure that the foam enterprises can continue to operate through stockpiling HCFC-141b and/or importing HCFC-141b in pre-blended polyols during project implementation until 1 January 2016. At that date, all conversions will be completed and the bans on the use of HCFC-141b in foams and the import of HCFC-based pre-blended polyols (except for spray foam) will enter into force. The country would not be in the position to commit to undertake the reduction of access to bulk HCFC-141b for the foam sector, and, in particular, to closing the alternative supply route through HCFC-141b contained in imported pre-blended polyols in 2016 if the foam sector conversion (less spray foam) would not be undertaken under stage I of the HPMP. Further to the explanation provided, the Secretariat noted that by converting the entire foam sector (except for spray foam) there should be no impediment for the Government of Thailand to enact the bans on time as planned. Both the completion of the foam sector plan and the entry into force of the bans will take place within the duration of the agreement for stage I, which allows for proper monitoring before the last tranche is released in 2016.

Second-stage conversions

40. The foam sector plan includes 51 enterprises that have already received assistance from the MLF to convert from CFC-11 to HCFC-141b (i.e., second-stage conversions). Of those, 49 request full incremental cost and two are included in the technical assistance component for micro-enterprises. In justifying the need to include these enterprises in stage I of the HPMP, the World Bank explained that the Government of Thailand gave priority to the phase-out HCFCs with the highest ODP value. Accordingly, the foam sector plan was designed to address the consumption of HCFC-141b in all foam enterprises, with the exception of spray foam applications where there are no cost-effective alternatives currently available in the local market. As such, second-stage conversions constitute a fundamental component of the overarching phase-out strategy. Stage I proposes to phase out 151.5 ODP tonnes of HCFC-141b used by 185 enterprises. Of this amount, 54.7 ODP tonnes are used by enterprises requiring second-stage conversion. Table 13 below presents the proportion of HCFC consumed by enterprises that received assistance from the MLF for CFC phase-out, as a percentage of total HCFC consumption, total HCFC consumption in the manufacturing sector, and total consumption of HCFC-141b in the foam sector.

Table 13: Information requested by decision 62/16 (a)

	Consumption of HCFCs (ODP tonnes)	Proportion of HCFC consumption by enterprises previously assisted and included in project proposal (%)
Total baseline HCFC consumption	927.6	6
HCFC consumption in manufacturing sector	697.8	8
HCFC-141b consumption in foam sector	189.5	29
HCFC-141b consumption by enterprises included in stage I	151.5	36
HCFC-141b consumption by enterprises previously assisted and included in stage I	54.7	100

41. Table 14 below shows the estimated cost-effectiveness of the proposed enterprises requiring second-stage conversion as compared to the estimated cost-effectiveness of phasing out HCFC consumption in other manufacturing enterprises in all sectors in Thailand.

Table 14: Cost-effectiveness of enterprises requiring second-stage conversion compared to other manufacturing enterprises

Manufacturing sector	HCFC	Consumption (ODP t)	C/E (mt)	C/E (ODP t)
RAC foreign-owned enterprises (non-eligible)	HCFC-22	387.8	8.83	160.55
RAC locally-owned enterprises (eligible)	HCFC-22	68.1	8.83	160.55
Commercial refrigeration manufacturing	HCFC-22	28.4	7.00	127.27
Solvents sector (cleaning agent)	HCFC-141b	21.8	5.12	46.55
Solvents sector (laboratory)	HCFC-225	1.2	5.12	73.14
Chillers installations	HCFC-123	1.0	7.00	350.00
Foams first-stage enterprises (included in stage I)	HCFC-141b	97.0	9.46	86.00
Spray foam first-stage assisted enterprises (not included in stage I)	HCFC-141b	34.3	9.79	89.00
Foams second-stage conversions (included in stage I)	HCFC-141b	54.7	8.45	76.82
Spray foam second-stage conversions (not included in stage I)	HCFC-141b	3.5	9.79	89.00
Total manufacturing sector		697.8		
Total first-stage conversions		639.6		
Total first-stage conversions eligible		251.8		
Baseline		927.6		
35 per cent reduction		324.7		
HCFC-141b in imported pre-blended polyols				
Foams first-stage enterprises (included in stage I)	Polyols*	4.8	9.46	86.00
Foams second-stage conversions (included in stage I)	Polyols*	10.4	8.45	76.82

*HCFC-141b contained in imported pre-blended polyols. These amounts are additional to pure HCFC-141b reflected in previous lines.

42. Based on the established HCFC baseline for compliance (927.6 ODP tonnes), Thailand would have to reduce its HCFC consumption by 324.7 ODP tonnes to meet the 2020 reduction target. This amount is higher than the 251.8 ODP tonnes used by eligible first-stage enterprises. Accordingly, Thailand would need an additional reduction of 72.9 ODP tonnes to meet the 2020 compliance target. As the HCFC consumption associated with second-stage conversions included in stage I of the HPMP accounts for 54.7 ODP tonnes, it is necessary to include them in order to adhere to the 2020 control target.

Consequently, they are eligible to receive full incremental cost. Furthermore, if the second-stage conversion enterprises are not included in stage I, Thailand would not be able to address the majority of HCFC-141b consumption and introduce the intended ban on importation of HCFC-141b in pre-blended polyols and use of HCFC-141b in foam manufacturing (except spray foam) from 2016.

43. In order to allow a ban on the use of HCFC-141b in all foam manufacturing applications (except spray foam), those that use locally pre-blended polyols need to undertake a conversion; this includes the 34 enterprises with a second-stage conversion using locally pre-blended polyols. The remaining 17 enterprises that are meant to undergo a second-stage conversion use HCFC 141b in imported pre-blended polyols (10.4 ODP tonnes), but not exclusively so. All of those 17 are also using locally pre-blended polyols containing HCFC-141b, making it impossible to create a clear barrier between the use of locally pre-blended polyols versus the use of imported ones. Further, the share of imported pre-blended polyols versus locally pre-blended ones is consistently shifting for each enterprise. It appears therefore meaningful, when establishing whether to fund second stage conversion enterprises using a combination of imported and locally pre-blended polyol, to take them fully into account.

Selection of alternative technologies

44. It was noted that the enterprises included in the foam sector plan were mostly SMEs, the majority of which consume low levels of HCFC-141b (i.e., 109 of the 132 enterprises consume less than 20 mt per year). In addition, a large variety of applications and baseline conditions exist, varying from several hand-mix operations to a larger proportion of enterprises having one or more low- and/or high-pressure foam dispensers. Given these facts, the Secretariat questioned the technical feasibility and long-term sustainability of the selection of HC and HFC-245fa as alternative technologies, and whether other cost-effective low-GWP alternatives included in other previously-approved HPMPs were considered for Thailand.

45. In response to the questions raised by the Secretariat, the World Bank explained that all potential alternatives were discussed with all stakeholders during the HPMP preparation. It was noted that methyl formate could not be considered at this time due to the need for reformulation based on the different applications, and that enterprises were concerned that it was only supplied by one enterprise. Similarly, HFOs, such as HBA-2 or FEA-1100, are still not available for use by local systems houses. Therefore HCs, HFC-245fa and water-based systems were selected as the most cost-effective proven technologies based on the prevailing situation of the foam sector in Thailand. The World Bank confirmed that HC technology had been proposed for enterprises that have the technical and managerial conditions to safely operate a flammable blowing agent. The World Bank applies a stringent safeguard policy that assesses the potential social and environmental impact of conversion including safety concerns prior to implementation. In the event that an enterprise fails to meet the safeguard policy, an alternative technology and its associated funding adjustments will be proposed and submitted for Executive Committee consideration. For enterprises where it is not possible to use HCs (i.e. due to small size and/or lack of technical conditions to operate using HC) or water (i.e. insulating requirements), reduced formulations of HFC-245fa would be used considering that it is a proven and non-flammable technology, and that systems houses would be in position to introduce it in the local market in a short period of time. It is aimed to introduce reduced formulations (in combination with other blowing agents) to minimize operating costs and CO_2-equivalent emissions.

Technical and cost related issues

46. During the preparation of the foam sector plan, the World Bank visited 18 enterprises and sent questionnaires via the systems houses to an additional 114 enterprises. The information collected included, among other things, the date of establishment of enterprises and production lines, enterprise ownership, baseline equipment, and levels of production including consumption of HCFC-141b and HCFC-141b in imported pre-blended polyols. Based on the information gathered and analyzed, the World

Bank prepared the foam sector plan including enterprises eligible for funding based on the enterprise establishment cut-off date (i.e., established prior to 21 September 2007) and ownership (i.e., deduction of foreign ownership component). Given the large number of enterprises included in stage I, several of which were not visited during the preparation of the HPMP, the Secretariat proposed that, upon project implementation, the World Bank verify the eligibility of all enterprises, and that the funding associated with any enterprise found to be partially or totally ineligible will be returned to the MLF. A standard clause to this effect has been included in the draft Agreement between the Government of Thailand and the Executive Committee.

47. Given that all the foam enterprises using HCFC-141b as a blowing agent in Thailand are categorized as SMEs and that several of them have one or more LP or HP foam dispensers in their baselines, the estimated incremental cost of US $12.35/kg was above the US $9.79/kg threshold. During the project review process, the Secretariat noted that the costs of major pieces of equipment, such as HC storage systems; buffer tanks, ventilation and safety systems for HC, audits and technical assistance were similar to or below those estimated in other approved enterprises.

48. The foam sector plan proposed the provision of an HP foam dispenser to all enterprises with LP dispensers and funding for 50 per cent of the cost of an HP dispenser for enterprises with hand-mixing operations, constituting technology upgrades. Accordingly, the Secretariat discussed the criteria to determine the foam dispenser to be provided (new or retrofit) at the enterprise level with the World Bank. As a result, it was agreed that only in the cases of introduction of HCs, or where thermal insulation is a critical parameter (i.e., commercial refrigeration and ice box applications), the use of an HP dispenser was essential to maintain the same insulation quality achieved with the baseline equipment. Funding will be provided for retrofitting the HP and/or LP dispensers available at the enterprises converting to the alternative technology selected. In cases of enterprises using hand-mixing techniques, only 50 per cent of the cost of an LP dispenser will be provided for all applications, except for commercial refrigeration and ice box, where 50 per cent of the cost of an HP will be provided. During the discussions, the World Bank also agreed to reduce the cost of HP dispensers for HC technology in the largest enterprises (with an average consumption of 31 mt of HCFC-141b) to a maximum of US $150,000, and adjust the cost of retrofit of LP and HP dispensers to a maximum of US $9,000.

49. As a result of the discussions, the level of funding was agreed at US $16,429,873 with an overall cost-effectiveness of US $10.93/kg as shown in Table 15 below. Given that the cost-effectiveness values are above the thresholds (US $6.23/kg, US $7.83/kg, US $16.86/kg, and an additional 25 per cent for the introduction of low-GWP technologies), the Government of Thailand is requesting US $12,227,938 with an overall cost effectiveness of US $8.13/kg. The remaining funding will be provided by the enterprises.

50. The World Bank explained that through the technical assistance component of the HPMP, enterprises that require counterpart funding will be able to apply for loans with grace periods for interest and concessional interest rates through a financial agent already identified. Furthermore, the conversion to HC will result in lower raw material costs of US $65,000 per year in comparison with enterprises that selected HFC-245fa. With the estimated savings, small foam enterprises could receive their return on investment in three to four years, which is affordable by industry standards. All conversions are expected to be completed by December 2015, consistent with the Government policy to ban the use of HCFC-141b in foam manufacturing and the import of pre-blended polyols containing HCFC-141b (except for spray foam uses) starting 1 January 2016.

Issues related to technical assistance for systems houses

51. The Secretariat noted that the technical assistance component for foams will result in the phase-out of 4.4 ODP tonnes of HCFC-141b in 53 micro-enterprises by providing them with assistance in introducing new polyols through their polyols supplier, and it will also allow systems houses to quickly introduce polyols for HFC-245fa to facilitate the implementation of the foam sector plan. It was agreed

that the technical assistance will also provide information to systems houses on low-GWP alternatives, so systems houses could introduce them when they become technically and economically feasible. If low-GWP alternatives become available during project implementation at a competitive price and comply with technical requirements to be applied in the conditions of Thailand, they would be offered.

Agreed level of funding for HCFC phase-out activities in the foam sector during stage I of the HPMP

52. The total cost of the activities in the foam sector included in stage I of the HPMP for Thailand has been agreed at US $12,466,240 (US $12,227,939 for technology conversion plus US $238,301 for technical assistance) with a cost effectiveness of US $8.22/kg as shown below.

Table 15: Total agreed cost of phase-out activities in the foam sector included in stage I of the HPMP

Sector	No. of enter-prises	HCFC-141b baseline consumption				Calculation of funding requested (US $)			
		HCFC-141b (2010) (mt)	In imported pre-blended (Avg. 07-09) (mt)	Total (mt)	Total ODP tonnes	Incremental cost with non-Article-5 deduction	Maximum funding based on threshold (US $)	Funding requested from MLF (US $)	C/E
BY TECHNOLOGY									
Total HC	23	559.3	80.4	639.6	70.36	8,690,516	6,261,816	6,261,816	
Total HFC-245fa technology	103	776.6	54.4	831.0	91.41	7,500,046	6,655,407	5,726,811	
Total water blown technology	5	32.4	0.3	32.7	3.60	239,311	356,225	239,312	
Total agreed funding	131	1,368.3	135.0	1,503.3	165.36	16,429,873	13,273,448	12,227,939	
BY SUB SECTOR									
Rigid PU foam									
Hydrocarbon technology	23	559.3	80.4	639.6	70.36	8,690,516	6,261,816	6,261,816	9.79
HFC-245fa technology	99	760.1	54.4	814.5	89.59	7,255,655	6,377,314	5,482,420	6.73
Sub-total rigid PU foam	122	1,319.3	134.8	1,454.1	159.95	15,946,171	12,639,130	11,744,236	8.08
Flexible foam									
Water blown technology	4	24.8	0.3	25.0	2.76	176,076	195,055	176,076	7.03
Sub-total flexible foam	4	24.8	0.3	25.0	2.76	176,076	195,055	176,076	7.03
Integral skin foam									
HFC-245fa technology	4	16.5	0.0	16.5	1.81	244,391	278,093	244,391	14.82
Water blown technology	1	7.7	0.0	7.7	0.85	63,236	161,169	63,236	8.27
Sub-total integral skin foam	5	24.1	0.0	24.1	2.66	307,627	439,262	307,627	12.74
Total agreed funding	131	1,368.3	135.0	1,503.3	165.36	16,429,873	13,273,448	12,227,939	8.13
ADDITIONAL REDUCTIONS									
Technical assistance to convert 53 micro-enterprises and to systems houses	53	1.3	3.1	4.4	0.48	238,301	n/a	238,301	
Non-eligible enterprise	1	9.3		9.3	1.02	unknown		0	
TOTAL FUNDING AND REDUCTIONS	185	1,378.9	138.1	1,517.0	166.87	16,668,174		12,466,240	8.22

Technical and cost-related issues associated to the air-conditioning manufacturing sector

53. The Secretariat discussed the following issues with the World Bank concerning the phase-out activities in the air-conditioning manufacturing sub-sector outlined in stage I of the HPMP: Selection of alternative technology; technical and cost-related issues at the enterprise level; technical assistance to compressor manufacturers; funding of the conversion of heat exchanger manufacturing as part of the overall conversion process; relevance of the phase-out in the air-conditioning sector to the 2015 compliance target.

Relevance of phase-out in the air-conditioning sector to the 2015 compliance target

54. The HPMP informed that the air-conditioning manufacturers to be converted in stage I, i.e. those which are predominantly belonging to Thai owners, relate to only 15 per cent of the consumption in the air-conditioning manufacturing sector. While the other enterprises in the sector, with none or a minority level of Thai ownership predominantly manufacture for export, are selling some products in the national market. A number of the manufacturers to be addressed in stage I of the HPMP cater to the low-cost end of the air-conditioning market in Thailand with low margins, and could not compete if their production cost would increase as is expected in case of conversion to HFC-410A without the market as a whole increasing the prices. As a consequence, the economic survival of those enterprises is linked to the near-simultaneous conversion of the air-conditioning manufacturing industry in the country. However, according to the HPMP the sector as a whole is currently not in a position to change to an alternative technology. Therefore, the Government believes a ban on the manufacturing of HCFC-22 air-conditioners for the local market or of import of such air-conditioners cannot be undertaken before 2015. The HPMP proposed converting the air-conditioning manufacturers under stage I only during 2015 and 2016, to be ready to produce non-HCFC-22 units at the end of 2016. In order to have an effect on the consumption of the country in 2015, the enterprises to be converted in stage I would individually stockpile HCFC-22 prior to 31 December 2014, and would then cease to purchase this substance, thus reducing the consumption of the country in 2015 and beyond.

55. The World Bank advised that the implementation was planned in a way that the enterprises would install new equipment and upgrade their facilities before 2015 to handle non-ODS refrigerant, but would only cease to use HCFC-22 once the market conditions would so allow, but no later than January 2017. Only then replaced equipment dedicated for HCFC-22 will be removed from the production lines, and destroyed under supervision. For the purpose of clarity, the Secretariat uses in this document the time when the production switches completely and sustainably to non-HCFC as the time of conversion, despite the fact that in reality the conversion under this concept is likely to be a gliding one over a period of two years.

56. The Secretariat in its analysis of the situation recalled that the concept of stockpiling to ensure equipment production after 2015 was introduced previously in discussions of the HPMP of Bahrain at the 65th meeting. At that time the concept was discussed as a possible way forward in cases where use of HCFCs could not be addressed in time to have an impact on the compliance in a given year. However, such an approach remains exceptional; and without additional provisions appears inconsistent with the approach of a performance-based agreement since significant reductions rely on activities which take place after the duration of stage I of the HPMP. In this particular case, these activities are:

(a) The issuing of a ban in the year 2017 on manufacturing and marketing of all HCFC-22 based air-conditioners below 14.5 kW destined for the Thai market, which is a pre-condition for the conversion of the manufacturing enterprises;

(b) The strict adherence to the exclusive use of HCFC-22 stockpiled by the manufacturers for producing HCFC-22 units beyond 1 January 2015, to ensure that the consumption reductions needed for compliance with the 2015 compliance target actually take place and are sustained thereafter; and

(c) The actual conversion of those enterprises before 1 January 2017.

57. The Secretariat discussed these points intensively with the World Bank. The World Bank confirmed the country's commitment to issue a ban on manufacturing and marketing of all HCFC-22 based air-conditioners under 50,000 BTU (14.5 kW refrigeration capacity) destined for the Thai market in 2017. Air-conditioning units of up to 14.5 kW consumed in 2010 more than 80 per cent of the HCFC-22 used in manufacturing of air-conditioners in the 14 enterprises under stage I of the HPMP. It appears to

the Secretariat that this ban will provide sufficient certainty to ensure that the enterprises and the market as a whole switch to non-HCFC technology, since maintaining a minority technology production of larger HCFC-22 units is not economically sustainable.

58. The Secretariat and the World Bank agreed that the subcontracts with AC manufacturers will include provisions to cease buying HCFC-22 after 2014. Release of the last payment would be conditional upon confirmation that no HCFC-22 was procured after 1 January 2015. As some AC manufacturers sometimes may import HCFC directly, none of them will be able to obtain import licenses from the Government after 2014. In addition, the Thai HCFC importers will be informed that the 14 manufacturers are not allowed to buy HCFC-22 after 31 December 2014. The manufacturers are fully aware that any HCFC-22 required after 2014 would have to be procured and stockpiled by them before 31 December 2014 to continue the manufacturing of air-conditioning units beyond 1 January 2015.

59. The World Bank informed that in Thailand, the bottling of HCFC, i.e. the transfer of refrigerant from import containers and holding tanks to bottles of different sizes is undertaken at the importers level. Importers sell quantities foreseen for the service sector in small bottles (normally mainly 13 kg capacity) and for relatively high costs due to the handling and cleaning needs of these bottles. Larger users such as manufacturers buy their refrigerant in larger containers (for small manufacturers from 45 kg onwards, up to 1 tonne for mid size and 20 tonne for large manufacturers); delivered in those containers, costs of refrigerant are substantially lower. Bottled refrigerant for service is then sold to wholesalers, while larger quantities are directly sold to manufacturers. The large amounts of refrigerants needed for manufacturing increase the visibility of continued purchases of HCFC-22 by a manufacturer, while an elaborated effort to obtain HCFC-22 through the service market would possibly influence the markets significantly enough to raise attention, lead to substantially increased refrigerant cost and to higher handling cost at the manufacturers site due to frequent bottle changes. The importers have a reporting obligation under the licensing scheme on the sale of imported HCFC; the accurate reporting is a pre-condition for obtaining future import licences. The Government agreed to make these reports accessible to the verifiers as part of the annual verification report. The Secretariat believes that the information obtained during the verification, in combination with the performance contract with the manufacturing enterprises should be sufficient safeguard to prevent consumption by air-conditioning manufacturers under stage I of the HPMP beyond 1 January 2015.

60. The timely conversion of the manufacturing enterprises will be reported by the World Bank as part of the annual progress reporting, which will last until the implementation of activities under the HPMP are complete. The World Bank already indicated that they will seek stage II of the HPMP either in 2014 or early 2015. The HPMP submission informed that the legislation banning manufacturing and marketing of HCFC-22 based air-conditioners destined for the Thai market would be prepared during the preparation of stage II of the HPMP (2014/2015). The Secretariat and the World Bank agreed that the enactment of such legislation or regulation could be a pre-condition for disbursement of funding for stage II of the HPMP. This would at the same time provide additional assurance that the enterprises included in stage I would be converted within the agreed timeframe.

61. The HPMP suggested for stage II a request for funding of those enterprises in the air-conditioning manufacturing sector with a minority stake of Article-5 ownership. The Secretariat pointed to an apparent inconsistency related to the fact that stage I should contain measures related to 2015 compliance, where air-conditioning manufacturers will be addressed in stage I but will only be converted once stage II with the related support to other enterprises is approved. The Secretariat opined that this would suggest transferring the air-conditioning manufacturers to be addressed under stage I into stage II, and so covering the whole air-conditioning sector as part of stage II. The Secretariat was also concerned that an approval of the 14 enterprises in the air-conditioning sector in stage I of the HPMP would imply a condition on stage II of the HPMP to fund additional manufacturers of air-conditioning equipment, despite the fact that funding conditions for stage II are not determined at this point in time. The World Bank pointed to the fact that without their inclusion in the HPMP stage I, the 14 manufacturers of air-conditioners could not

commit to cease their HCFC consumption by 1 January 2015, and the related measures would not be effective for the reduction in consumption needed to be achieved in 2015. The Bank and the Secretariat agreed the decision would include a clause which would de-link the enactment of a ban on HCFC-22 based manufacturing in the air-conditioning sector from any possible support that might be stipulated in stage II of the HPMP for the remainder of the air-conditioning sector in Thailand.

Technology selection

62. For the conversion of the 14 manufacturers in the air-conditioning sector, the World Bank proposed the use of HFC-410A as an alternative. As the main reason, the Bank cites the fact that HFC-410A is uniquely accepted and used in air-conditioning products globally, and that technology and components are fully available; this is distinctively different for any other alternative. Secondly, the local air-conditioning manufacturers to be converted as part of stage I of the HPMP see themselves in a position where they can compete with the larger, mainly foreign-owned enterprises only by using the same technology; it is assumed that the remaining manufacturers, related to 85 per cent of the HCFC-22 consumption in air-conditioning manufacturing in Thailand, will convert to HFC-410A. The World Bank reported that it discussed with the enterprises the use of HFC-290, propane, and HFC-32; although these alternatives are flammable to some degree, both have a substantially lower GWP than HCFC-22 or HFC-410A. However, concerns related to existing building codes disfavouring the use of flammable refrigerants in air-conditioning, perceived competitive disadvantage and potential negative advertisements by competitors targeting the flammability led the manufacturers addressed in stage I to the uniform decision to opt for HFC-410A as a replacement technology.

63. In order to offset the climate impact of the conversion to HFC-410A, which, due to the slightly worse performance and higher GWP than HCFC-22 is significant, the World Bank proposed additional activities to be funded from outside the MLF. The World Bank assumes that it will be possible to upgrade the energy efficiency of the air-conditioners as part of the conversion. Demand for more energy efficient air-conditioners would be increased through a planned GEF project (see below) and efforts from the Government of Thailand, including possible increases in minimum energy efficiency required. These movements towards energy efficiency and, therefore, lower energy consumption should, in the opinion of the World Bank, in terms of climate impact more than offset the slightly lower energy efficiency of HFC-410A and its higher GWP as compared to HCFC-22. The HPMP consequently presented HFC-410A as a climate-friendly alternative to HCFC-22. While the Secretariat could not agree with this assessment, the difference in opinion has no impact on the review process of this document.

Funding of after-sales servicing departments of manufacturers and associated phase-out

64. For each of the 14 manufacturers in the air-conditioning sector to be converted as part of stage I of the HPMP, the project proposal included funding for the after-sales servicing departments; the funding foreseen for each of the manufacturers was US $24,000, plus contingencies of 10 per cent. The Secretariat advised that the servicing departments should be considered as part of the overall servicing sector approach and should be addressed under a servicing sector plan. The World Bank pointed to the need to install non-HCFC air-conditioning units and to provide service during the warranty period, which, in the opinion of the World Bank is a service directly related to the conversion of the manufacturer. In addition, addressing the after sales service separately as a service sector approach might create an incorrect perception in that sector regarding the timing for support to the whole sector, which is actually only foreseen at a later stage. The World Bank and the Secretariat agreed to include the funding for the servicing and after-sales departments of the manufacturers at the proposed level as part of the conversion of the air-conditioning manufacturers, and to associate with the related activities a phase-out calculated on the basis of US $4.50/kg.

Costs for heat exchangers

65. At the 61st meeting, the Executive Committee took decision 61/45(c), requesting the Secretariat to prepare a document on the level of incremental cost related to retooling for manufacturing of tube and fin heat exchangers. The discussion of this particular topic has not been concluded to date, and is under Agenda item 11 also discussed at this meeting. The proposal submitted by the World Bank included a request for provision of cost related to the retooling of heat exchanger production in seven of the 14 enterprises to be converted under stage I of the HPMP. The total amount requested was US $3,531,000. The Secretariat advised the Bank that currently the Executive Committee has not formed a final opinion on the necessary support for possible conversions of heat exchanger manufacturing, and therefore, the Secretariat would at this point in time only be able to recommend funding in line with the arguments provided in document UNEP/OzL.Pro/ExCom/66/51, Attachment I, containing a study of fin and tube coil manufacturing changes for conversion from R-22 to R-410A. The support for costs related to the adaptation of heat exchangers and their production and testing methodologies to the use of HFC-410A would be in total, US $594,000. The Secretariat and the World Bank agreed that the issue of heat exchanger conversion would be left open until the Executive Committee has made a related decision advising on how to determine such costs. The World Bank also provided technical information which was included with document UNEP/OzL.Pro/ExCom/66/51 as Attachment III for consideration of the Executive Committee during the discussion of Agenda item 11. The Secretariat introduced a proviso for the heat exchanger cost into the proposed decision for the Executive Committee to consider.

Agreed costs for the air-conditioning sector

66. The Secretariat and the World Bank agreed on the costs for the different enterprises in the air-conditioning sector, based on their 2010 consumption. Table 16 provides an overview of the agreed costs. The table also provides information on the requested costs for heat exchanger conversion, and the costs proposed for the same purpose by the Secretariat based on the results of the study contained in Attachment I of document UNEP/OzL.Pro/ExCom/66/51.

Table 16: Agreed cost for conversion of 14 air-conditioner manufacturers, and requested and proposed cost for heat exchanger manufacturing conversion

Manufacturer	**ICC (US $)**	**After sales service (US $)**	**Contin-gency (US $)**	**IOC (US $)**	**Share Article 5 owner-ship (%)**	**Eligible cost (US $)**	**Heat exchanger costs (US $)**	
							Secretariat's proposal	World Bank proposal
Unico Consumer Products Co. Ltd.	167,900	24,000	19,190	869,419	100	1,080,509	99,000	510,000
Better Living	77,800	24,000	10,180	37,800	100	149,780		
Bitwise	260,600	24,000	28,460	416,997	100	730,057	99,000	510,000
Pan – Tycoon Co., Ltd.	201,800	24,000	22,580	226,896	100	475,276	66,000	510,000
C.N.E. Industry Group Co. Ltd.	102,300	24,000	12,630	1,277,949	100	1,416,879		
Eminent Air (Thailand) Co., Ltd.	191,300	24,000	21,530	443,395	100	680,225	99,000	510,000
Thrub-Thong Hou Co. Ltd	93,800	24,000	11,780	510,369	100	639,949		
B.Grimm Airconditioning Limited; Link Manufacturing	141,600	24,000	16,560	172,148	80	283,446		
Subsuksiri Co., Ltd.	124,800	24,000	14,880	65,306	100	228,986		
Saijo Denki International Co. Ltd	257,600	24,000	28,160	696,706	100	1,006,466	99,000	510,000
PPJ Engineering Co., Ltd. (Starr Holding Group)	217,800	24,000	24,180	992,578	100	1,258,558	99,000	510,000
Trane Amair Limited	263,300	24,000	28,730	858,829	51	599,178		

Manufacturer	ICC (US $)	After sales service (US $)	Contin-gency (US $)	IOC (US $)	Share Article 5 owner-ship (%)	Eligible cost (US $)	Heat exchanger costs (US $)	
							Secretariat's proposal	World Bank proposal
TTC Air Conditioning Co. Ltd.	155,300	24,000	17,930	1,001,360	100	1,198,590		
United Technology Co. Ltd. (Uni-Aire Corporation Co., Ltd.)	258,600	24,000	28,260	229,232	100	540,092	33,000	471,000
Total	2,514,500	336,000	285,050	7,798,981	n/a	10,287,991	594,000	3,531,000

Technical assistance component

67. The Secretariat discussed with the World Bank the volume and phase-out associated with the activities under the technical assistance component at a funding level request of US $862,600, and its relation to individual sectors. The World Bank agreed to provide assistance to systems houses and to 53 micro-enterprises as part of the foam sector implementation; the comments of the Secretariat regarding these activities are below.

68. The first of the remaining activities can be described as promotion of non-HFC refrigerant for large and small air-conditioners; it is related to the conversion in the air-conditioning sector, but not narrowly so. The World Bank described in the HPMP a project on “green energy for low-carbon growth” in Thailand, for which support will be requested from GEF. That project aims to scale up efficient and low-carbon energy use at national and local levels, and to provide policy and implementation support to a green low-carbon city in Bangkok; it has a total expected volume of US $13 million; and includes a demonstration project to retrofit selected buildings owned by the BMA. The funding foreseen under the HPMP is to develop building codes which will prevent installation of HFC-based air-conditioning systems in existing and new buildings, and uses the opportunity of the GEF-supported project for maximum impact. The World Bank proposes to establish the basis for low-GWP, non-HFC technologies as replacement for current HCFC technologies, such as the use of ammonia or hydrocarbons in air-conditioning, or of absorption systems. This would be undertaken in particular through influencing building codes. This might partially relate to the type of air-conditioning units addressed in the conversion activities in the air-conditioning sector, but predominantly focuses on larger air-conditioning systems. Consequently, the results are meant to benefit future stages of the HPMP, where the long-term use of HCFC-22 for servicing needs to be curbed *inter alia* by installing more non-HCFC systems; and those should ideally employ the most climate-friendly technologies applicable. The component is therefore meant to contribute to the basis for low-climate impact transfer from HCFC-use in future stages. At the same time, it could link the phase-out of HCFCs to the above mentioned GEF/Government project. The activity has the potential to substantially benefit the selection of climate-friendly air-conditioning technologies when replacing HCFC-22. Upon prompting, the World Bank provided a concept on how the activity could be implemented if the GEF funding would be slow to materialise, or would not materialise at all. The Secretariat discussed with the World Bank the funding foreseen, and agreed on a reduced budget of US $88,301, with an accompanying reduction in remaining eligible consumption calculated based on a value of US $4.50/kg of HCFC phased out.

69. The second activity proposed by the World Bank is support for the development of hydrocarbon and CO_2 compressors and relates to the commercial refrigeration sector; therefore it is not linked to the activities under stage I in the air-conditioning sector. It is proposed to provide a compressor manufacturer with a technical facility (calorimeter) and some additional support to develop propane (HC-290) and CO_2 compressors for use in commercial refrigeration equipment. The objective is to establish a local supplier of CO_2 and HC-290 compressors in Thailand as a pre-condition for use of that technology by the local manufacturer and the local assemblers of HCFC-22 commercial refrigeration equipment. The World Bank sees this activity as a preparation for the conversion to low-GWP HCFC-22 replacements in the

future in the commercial refrigeration sector. The Secretariat discussed with the World Bank the feasibility of the development project foreseen, and the fact that the budget provided would predominantly establish the capability of the compressor manufacturer without resulting in an actual product. The Secretariat is somewhat sceptical about the prospects of CO_2 technology for commercial refrigeration equipment in Thailand, but can fully support the development of hydrocarbon compressors. As a consequence, with a view to ensure that the development is actually fully carried out, but at the same time avoiding premature and possibly unwarranted exclusion of alternative low-GWP technologies, the Secretariat and the World Bank agreed that the minimum objective of the compressor development would be to, at least, develop, manufacture and deliver prototypes for both technologies to customers of the compressor manufacturer, and that this should form an obligation for the compressor manufacturer to receive the full support under stage I. The Secretariat and the World Bank agreed on a reduced budget for this activity of US $452,630, with an accompanying reduction in remaining eligible consumption calculated based on a value of US $4.50/kg of HCFC phased out.

70. The Secretariat and the World Bank also discussed funding of and work within the PMU and agreed on a reduced funding level of US $1,637,360. With that, the overall cost for technical assistance including the PMU was agreed at a level of US $2,178,291. The activities related to the development of building codes and the development of hydrocarbon and CO_2 compressors lead to a reduction in remaining eligible consumption of 6.61 ODP tonnes, based on the assumption that these activities would eventually contribute to the replacement of HCFC-22.

Overall cost of the HPMP

71. The level of funding agreed between the Secretariat and the World Bank for the implementation of stage I of the HPMP for Thailand is US $24,932,522 with an overall cost-effectiveness of US $8.44/kg, as shown in Table 17; however, this figure might need to be amended depending on the decisions to be taken under Agenda item 11.

Table 17: Overall agreed cost of the HPMP

Activity	Total (mt) in HCFC consumption	Total (mt) in HCFC-141b imported pre-blended	Total ODP tonnes	Eligible incremental cost / funding requested (US $)
Foam sector				
Flexible foam water blown technology	24.8	0.3	2.76	176,076
Integral skin HFC-245fa technology	16.5	-	1.81	244,391
Integral skin water blown technology	7.7	-	0.84	63,236
Rigid foam hydrocarbon technology	559.3	80.4	70.36	6,261,816
Rigid foam HFC-245fa technology	760.1	54.4	89.59	5,482,420
Technical assistance to convert 53 micro-enterprises	1.3	3.1	0.48	150,000
Technical assistance to systems houses				88,301
Non-eligible enterprise	9.3	-	1.02	
Sub-total HCFC-141b (bulk)	1,378.9	-	151.68	
Sub-total HCFC-141b (contained in import pre-blended polyols)	-	138.1	15.19	
Total foam sector	1,517.0	-	166.86	12,466,240
Air-conditioning sector				
Manufacturing operations (without heat exchangers)	1,237.9		68.08	2,592,879
Incremental operating cost	-	-	-	7,343,728
After sales service operations	78.1	-	4.30	351,384
Total air-conditioning sector	1,316.0	-	72.38	10,287,991

Activity	Total (mt) in HCFC consumption	Total (mt) in HCFC-141b imported pre-blended	Total ODP tonnes	Eligible incremental cost / funding requested (US $)
Manufacturing of heat exchangers	n/a	-	n/a	[594,000]
Non-investment activities				
Related to refrigeration sector (commercial and industrial)				
Promotion of non-HFC refrigerant for large and small AC	19.6	-	1.08	88,301
Technical assistance for compressor development	100.6	-	5.53	452,630
Sub-total	120.2	-	6.61	540,931
PMU costs				1,637,360
Total non-investment	120.2	-	6.61	2,178,291
Total	2,953.2	-	245.86	24,932,522

72. The total reduction being proposed for the different sectors addressed under stage I is shown in Table 18.

Table 18: Total reduction and associated cost for all sectors

Activity	Cost (US $)	Phase-out			
		mt	ODP t	Share of total (ODP t)	Share of baseline
Foam sector conversion and TA (without imported pre-blended)	12,466,240	1,378.9	151.68	61.4%	16.4%
HCFC-141b contained in imported pre-blended		138.1	15.19		0.0%
Air-conditioning sector conversion and TA	10,376,292	1,335.6	73.46	29.7%	7.9%
Commercial refrigeration sector TA	452,630	100.6	6.61	2.7%	0.7%
PMU	1,637,360	-	-	0.0%	0.0%
Total	24,932,522	2,953.2	246.94	100.0%	26.6%

Impact on the climate estimated by the country in its HPMP

73. Implementation of the foam project would avoid atmospheric emission of some 768,179 tonnes of CO_2-equivalent associated with the conversion of the HCFC 141b-based enterprises to HC, reduced HFC and water-blown technology (based only on the GWP values of the different blowing agents), as shown in Table 19.

Table 19: Impact on the climate associated with the conversion in the foam sector

Substance	GWP	mt/year	CO_2-eq (tonnes/year)
Before conversion			
HCFC-141b	780	1,517.00	1,183,260
After conversion			
Hydrocarbon	20	416.70	8,334
HFC-245fa	1,030	394.90	406,747
Water-blown		n/a	0
Sub-total after conversion		811.60	415,081
Net impact			(768,179)

74. The Multilateral Fund Climate Impact Indicator (MCII) was used to calculate the climate impact of the conversion of the air-conditioning sector from HCFC-22 to HFC-410A. For comparison purposes, also the results for a conversion to Propane (HC-290) were provided. The results are shown in Table 20.

Table 20: Impact on the climate associated with the conversion in the air-conditioning sub-sector

Input	**Generic**		
	Country	[-]	**Thailand**
	Company data (name, location)	[-]	**14 Enterprises**
	Select system type	[list]	Air conditioning - on site assembly (split air conditioner)
	General refrigeration information		
	HCFC to be replaced	[-]	HCFC-22
	Amount of refrigerant per unit	[kg]	2.3011
	No. of units	[-]	537,950
	Refrigeration capacity	[kW]	7.72
	Selection of alternative with minimum environmental impact		
	Share of exports (all countries)	[%]	0
	Calculation of the climate impact		
	Alternative refrigerant (more than one possible)	[list]	HFC-410A, HC-290

NOTE
All data displayed is specific to the case investigated and is not generic information about the performance of one alternative; performance can differ significantly depending on the case.

Output	*Note: The output is calculated as the climate impact of the refrigerant systems in their life time as compared to HCFC-22, on the basis of the amount produced within one year. Additional/different outputs are possible*		
	Country		**Thailand**
	Identification of the alternative technology with minimum climate impact		
	List of alternatives for identification of the one with minimum climate impact	[Sorted list, best = top (% deviation from HCFC)]	HC-600a (-26%)
			HC-290 (-23%)
			HFC-134a (-6%)
			HCFC-22
			HFC-407C (0%)
			HFC-410A (6%)
			HFC-404A (23%)
	Calculation of the climate impact of the conversion		
	Alternative refrigerant 1		**HFC-410A**
	*Total direct impact (post conversion – baseline)**	*[t CO_2 equiv]*	*89,067*
	*Indirect impact (country)***	*[t CO_2 equiv]*	*845,761*
	*Indirect impact (outside country)***	*[t CO_2 equiv]*	*0*
	Total indirect impact	*[t CO_2 equiv]*	*845,761*
	Total impact	**[t CO_2 equiv]**	**934,828**
	Alternative refrigerant 2		**HC-290**
	*Total direct impact (post conversion – baseline)**	*[t CO_2 equiv]*	*-3,278,581*
	*Total indirect impact (country)***	*[t CO_2 equiv]*	*-115,584*
	*Total indirect impact (outside country)***	*[t CO_2 equiv]*	*0*
	*Total indirect impact***	*[t CO_2 equiv]*	*-115,584*
	Total impact	**[t CO_2 equiv]**	**-3,394,165**

*Direct impact: Different impact between alternative technology and HCFC technology for the substance-related emissions.
**Indirect impact: Difference in impact between alternative technology and HCFC technology for the energy-consumption-related emissions of CO_2 when generating electricity.

75. Table 20 indicates an increase in the climate impact of air-conditioning units manufactured in one year using HFC-410A of 934,828 tonnes of CO_2 equivalent over their lifetime; this would include

refrigerant used for subsequent service and the energy related emissions of the units. This increase would be larger than the offsetting impact of the activities in the foam sector, leaving an overall negative impact to the climate of 166,649 mt CO_2 equivalent. The additional burden on the climate calculated for the conversion to HFC-410A by the MCII is predominantly related to the poorer energy efficiency of HFC-410 air-conditioners as compared to HCFC-22 units. The efforts of the Government of Thailand and the World Bank under their GEF sponsored programme to improve the energy efficiency of the air-conditioners is likely to offset this disadvantage; however, in the view of the Secretariat these effects are external to the conversion funded by the MLF.

Co-financing

76. In response to decision 54/39(h) on potential financial incentives and opportunities for additional resources to maximize the environmental benefits from HPMPs pursuant to paragraph 11(b) of decision XIX/6 of the Nineteenth Meeting of the Parties, the World Bank explained that stage I of the HPMP will pursue other financing sources to facilitate co-financing. The group air-conditioning investment component and the technical assistance to promote non-HCFC based RAC equipment in green buildings will be implemented in pair with the proposed GEF project "green energy for low-carbon growth" in Thailand. The proposed US $10 million in GEF funds is hoped to leverage another US $20-25 million from the Government of Thailand. The GEF project will complement the investment project by transforming the demand side, through technical assistance to help scale up efficient use of energy and pilot the development of a low-carbon green city in Bangkok. The GEF project is currently considered and reviewed in the GEF Secretariat.

77. In addition, to assist small enterprises in the foam and air-conditioning manufacturing sectors to secure co-financing at a more favourable rate, the World Bank identified a financial agent interested in extending its on-going terms and conditions for environmental and social lending programmes to beneficiaries of stage I of the HPMP. Beneficiaries will receive a grace period on interest and loan repayment of up to one year, fee waivers and a concessional interest rate. This will be particularly helpful for small foam enterprises to be able to convert to HC technology instead of adopting HFC-245fa technology for which incremental operating costs are much higher. Loan repayments will be calculated on the basis of the savings gained from the difference of operating costs between hydrocarbon and HFC-245fa technologies.

2012-2014 draft business plan of the Multilateral Fund

78. The World Bank is requesting US $24,932,522 plus support costs for implementation of stage I of the HPMP. The total value requested for the period 2012-2014 of US $22,575,000 including support cost is about 38 per cent below the total amount in the draft business plan. The difference in the figures is because of a higher cost effectiveness in the agreed cost for the HPMP than assumed when establishing the business plan. The achieved phase-out under the project is with 245.9 ODP tonnes by about 5 per cent larger than the phase-out foreseen in the business plan.

Draft Agreement

79. A draft Agreement between the Government of Thailand and the Executive Committee for HCFC phase-out is contained in Annex I to the present document.

RECOMMENDATION

80. The Executive Committee may wish to consider taking into account overall reduction to be achieved by stage I as shown in Table 18 whether to:

(a) Approve, in principle, stage I of the HCFC phase-out management plan (HPMP) for Thailand for the period 2012 to 2015 to reduce HCFC consumption by 10 per cent of the baseline, at the amount of US $24,932,522, plus agency support costs of US $1,869,939 for the World Bank;

(b) Note that the Government of Thailand had agreed to establish as its starting point for sustained aggregate reduction in HCFC consumption the baseline of 927.6 ODP tonnes, calculated using actual consumption of 826.6 ODP tonnes and 1,028.5 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol; plus 15.7 ODP tonnes of HCFC-141b contained in imported pre-blended polyol systems, resulting in 943.3 ODP tonnes;

(c) Note the commitment of the Government of Thailand to ban imports of HCFC-141b, both pure and contained in pre-blended polyols, no later than 1 January 2016, except for spray foam applications;

(d) In relation to a planned ban of the use of HCFC-22 in manufacturing of air-conditioning equipment and imports of HCFC-22 based air-conditioning equipment with cooling capacity under 50,000 BTU (14.5 kW) by 1 January 2017 and a ban on the sales of HCFC-22 based air-conditioning units by 31 December 2017:

  (i) Note the commitment of the Government of Thailand to enact an according legislation or regulation; and

  (ii) Not to allow any disbursement under a future HPMP stage II until the Government of Thailand confirms the enactment of such legislation or regulation;

(e) Note the commitment of the Government of Thailand to make available for the purpose of monitoring the consumption of 14 air-conditioning manufacturers included in stage I of the HPMP in the years 2015 to 2017, and in addition to any other information to be collected to verify the country's consumption, the records of import quotas issued within each calendar year, and reports listing names of customers of each individual importer which will be filed by the respective importers as part of their requirements under the licensing and import quota system;

(f) Request the World Bank to ensure, through accordingly formulated contracts, that funds for compressor development foreseen in the technical assistance component of the HPMP would, as a minimum, lead to the production of prototypes and their delivery to refrigeration equipment manufacturers for testing;

(g) Deduct 245.86 ODP tonnes of HCFCs from the starting point for sustained aggregate reduction in HCFC consumption;

(h) Approve the draft Agreement between the Government of Thailand and the Executive Committee for the reduction in consumption of HCFCs, as contained in Annex I to the present document;

(i) Request the World Bank to submit, once the Executive Committee has taken a decision on the funding of conversion for heat exchanger manufacturing, a funding request for heat exchanger conversion as a component of the 2014 tranche of the HPMP for Thailand, and to further request the Secretariat to update Appendix 2-A to the Agreement accordingly; and

(j) Approve the first tranche of stage I of the HPMP for Thailand, and the corresponding implementation plan, at the amount of US $5,000,000, plus agency support costs of US $375,000.

Annex I

DRAFT AGREEMENT BETWEEN THE GOVERNMENT OF THAILAND AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROCHLOROFLUOROCARBONS

1. This Agreement represents the understanding of the Government of Thailand (the "Country") and the Executive Committee with respect to the reduction of controlled use of the ozone-depleting substances (ODS) set out in Appendix 1-A ("The Substances") to a sustained level of 834.8 ODP tonnes by 1 January 2015 in compliance with Montreal Protocol schedules.

2. The Country agrees to meet the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A ("The Targets, and Funding") in this Agreement as well as in the Montreal Protocol reduction schedule for all Substances mentioned in Appendix 1-A. The Country accepts that, by its acceptance of this Agreement and performance by the Executive Committee of its funding obligations described in paragraph 3, it is precluded from applying for or receiving further funding from the Multilateral Fund in respect to any consumption of the Substances that exceeds the level defined in row 1.2 of Appendix 2-A as the final reduction step under this Agreement for all of the Substances specified in Appendix 1-A, and in respect to any consumption of each of the Substances that exceeds the level defined in rows 4.1.3, 4.2.3, 4.3.3, 4.4.3, 4.5.3, 4.6.3 and 4.7.3 (remaining eligible consumption).

3. Subject to compliance by the Country with its obligations set out in this Agreement, the Executive Committee agrees, in principle, to provide the funding set out in row 2.1 of Appendix 2-A to the Country. The Executive Committee will, in principle, provide this funding at the Executive Committee meetings specified in Appendix 3-A ("Funding Approval Schedule").

4. The Country agrees to implement this Agreement in accordance with the HCFC phase-out sector plans submitted. In accordance with sub-paragraph 5(b) of this Agreement, the Country will accept independent verification of the achievement of the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A of this Agreement. The aforementioned verification will be commissioned by the lead implementing agency.

5. The Executive Committee will not provide the Funding in accordance with the Funding Approval Schedule unless the Country satisfies the following conditions at least eight weeks in advance of the applicable Executive Committee meeting set out in the Funding Approval Schedule:

(a) That the Country had met the Targets set out in row 1.2 of Appendix 2-A for all relevant years. Relevant years are all years since the year in which this Agreement was approved. Years for which no obligation for reporting of country programme data exists at the date of the Executive Committee meeting at which the funding request is being presented are exempted;

(b) That the meeting of these Targets has been independently verified, unless the Executive Committee decided that such verification would not be required;

(c) That the Country had submitted annual implementation reports in the form of Appendix 4-A ("Format of Implementation Reports and Plans") covering each previous calendar year; that it had achieved a significant level of implementation of activities initiated with previously approved tranches; and that the rate of disbursement of funding available from the previously approved tranche was more than 20 per cent;

(d) That the Country has submitted an annual implementation plan in the form of Appendix 4-A covering each calendar year until and including the year for which the funding schedule foresees the submission of the next tranche or, in case of the final tranche, until completion of all activities foreseen; and

(e) That, for all submissions from the 68th meeting onwards, confirmation has been received from the Government that an enforceable national system of licensing and quotas for HCFC imports and, where applicable, production and exports is in place and that the system is capable of ensuring the Country's compliance with the Montreal Protocol HCFC phase-out schedule for the duration of this Agreement.

6. The Country will ensure that it conducts accurate monitoring of its activities under this Agreement. The institutions set out in Appendix 5-A ("Monitoring Institutions and Roles") will monitor and report on implementation of the activities in the previous annual implementation plans in accordance with their roles and responsibilities set out in Appendix 5-A. This monitoring will also be subject to independent verification as described in paragraph 4 above.

7. The Executive Committee agrees that the Country may have the flexibility to reallocate the approved funds, or part of the funds, according to the evolving circumstances to achieve the smoothest reduction of consumption and phase-out of the Substances specified in Appendix 1-A:

(a) Reallocations categorized as major changes must be documented in advance either in an annual implementation plan submitted as foreseen in sub-paragraph 5(d) above, or as a revision to an existing annual implementation plan to be submitted eight weeks prior to any meeting of the Executive Committee, for its approval. Major changes would relate to:

(i) Issues potentially concerning the rules and policies of the Multilateral Fund;

(ii) Changes which would modify any clause of this Agreement;

(iii) Changes in the annual levels of funding allocated to the lead implementing agency for the different tranches; and

(iv) Provision of funding for programmes or activities not included in the current endorsed annual implementation plan, or removal of an activity in the annual implementation plan, with a cost greater than 30 per cent of the total cost of the last approved tranche;

(b) Reallocations not categorized as major changes may be incorporated in the approved annual implementation plan, under implementation at the time, and reported to the Executive Committee in the subsequent annual implementation report; and

(c) Should the Country decide during implementation of the agreement to introduce an alternative technology other than that proposed in the approved HPMP, this would require approval by the Executive Committee as part of an Annual Implementation Plan or the revision of the approved plan. Any submission of such a request for change in technology would identify the associated incremental costs, the potential impact to the climate, and any differences in ODP tonnes to be phased out if applicable. The Country agrees that potential savings in incremental costs related to the change of technology would decrease the overall funding level under this Agreement accordingly;

(d) Any enterprise to be converted to non-HCFC technology included in the approved HPMP and that would be found to be ineligible under the guidelines of the Multilateral Fund (i.e., due to foreign ownership or establishment post the 21 September 2007 cut-off date), will not receive assistance. This information would be reported to the Executive Committee as part of the Annual Implementation Plan;

(e) The Country agrees, in cases where HFC technologies have been chosen as an alternative to HCFC, and taking into account national circumstances related to health and safety: to monitor the availability of substitutes and alternatives that further minimize impacts on the climate; to consider, in the review of regulations standards and incentives adequate provisions that encourage introduction of such alternatives; and to consider the potential for adoption of cost-effective alternatives that minimize the climate impact in the implementation of the HPMP, as appropriate, and inform the Executive Committee on the progress accordingly; and

(f) Any remaining funds will be returned to the Multilateral Fund upon completion of the last tranche foreseen under this Agreement.

8. Specific attention will be paid to the execution of the activities in the refrigeration servicing sub-sector, in particular:

(a) The Country would use the flexibility available under this Agreement to address specific needs that might arise during project implementation; and

(b) The Country and the lead implementing agency will take full account of the requirements of decisions 41/100 and 49/6 during the implementation of the plan.

9. The Country agrees to assume overall responsibility for the management and implementation of this Agreement and of all activities undertaken by it or on its behalf to fulfil the obligations under this Agreement. The World Bank has agreed to be the lead implementing agency (the "Lead IA") in respect of the Country's activities under this Agreement. The Country agrees to evaluations, which might be carried out under the monitoring and evaluation work programmes of the Multilateral Fund or under the evaluation programme of the lead agency taking part in this Agreement.

10. The Lead IA will be responsible for ensuring co-ordinated planning, implementation and reporting of all activities under this Agreement, including but not limited to independent verification as per sub-paragraph 5(b). The Executive Committee agrees, in principle, to provide the Lead IA with the fees set out in row 2.2 of Appendix 2-A.

11. Should the Country, for any reason, not meet the Targets for the elimination of the Substances set out in row 1.2 of Appendix 2-A or otherwise does not comply with this Agreement, then the Country agrees that it will not be entitled to the Funding in accordance with the Funding Approval Schedule. At the discretion of the Executive Committee, funding will be reinstated according to a revised Funding Approval Schedule determined by the Executive Committee after the Country has demonstrated that it has satisfied all of its obligations that were due to be met prior to receipt of the next tranche of funding under the Funding Approval Schedule. The Country acknowledges that the Executive Committee may reduce the amount of the Funding by the amount set out in Appendix 7-A ("Reductions in Funding for Failure to Comply") in respect of each ODP kg of reductions in consumption not achieved in any one year. The Executive Committee will discuss each specific case in which the Country did not comply with this Agreement, and take related decisions. Once these decisions are taken, this specific case will not be an impediment for future tranches as per paragraph 5 above.

12. The Funding of this Agreement will not be modified on the basis of any future Executive Committee decision that may affect the funding of any other consumption sector projects or any other related activities in the Country.

13. The Country will comply with any reasonable request of the Executive Committee and the Lead IA to facilitate implementation of this Agreement. In particular, it will provide the Lead IA with access to the information necessary to verify compliance with this Agreement.

14. The completion of stage I of the HPMP and the associated Agreement will take place at the end of the year following the last year for which a maximum allowable total consumption level has been specified in Appendix 2-A. Should there at that time still be activities that are outstanding, and which were foreseen in the Plan and its subsequent revisions as per sub-paragraph 5(d) and paragraph 7, the completion will be delayed until the end of the year following the implementation of the remaining activities. The reporting requirements as per sub-paragraphs 1(a), 1(b), 1(d), and 1(e) of Appendix 4-A will continue until the time of the completion unless otherwise specified by the Executive Committee.

15. All of the conditions set out in this Agreement are undertaken solely within the context of the Montreal Protocol and as specified in this Agreement. All terms used in this Agreement have the meaning ascribed to them in the Montreal Protocol unless otherwise defined herein.

APPENDICES

APPENDIX 1-A: THE SUBSTANCES

Substance	Annex	Group	Starting point for aggregate reductions in consumption (ODP tonnes)
HCFC-22	C	I	716.57
HCFC-123	C	I	3.20
HCFC-124	C	I	0.08
HCFC-141b	C	I	205.25
HCFC-142b	C	I	0.12
HCFC-225, 225ca and 225cb	C	I	2.30
Sub-total			927.52*
HCFC-141b in imported pre-blcnded polyol	C	I	15.68
Total			943.20

*Lower than Article 7 baseline because of rounding of Article 7 data to one decimal

APPENDIX 2-A: THE TARGETS, AND FUNDING

Row	Particulars	2012	2013	2014	2015	2016	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	n/a	927.6	927.6	834.8	834.8	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	n/a	927.6	927.6	834.8	834.8	n/a
2.1	Lead IA (World Bank) agreed funding (US $)	5,000,000	7,500,000	8,500,000	1,439,270	2,493,252	24,932,522
2.2	Support costs for Lead IA (US $)	375,000	562,500	637,500	107,945	186,994	1,869,939
3.1	Total agreed funding (US $)	5,000,000	7,500,000	8,500,000	1,439,270	2,493,252	24,932,522
3.2	Total support costs (US $)	375,000	562,500	637,500	107,945	186,994	1,869,939
3.3	Total agreed costs (US $)	5,375,000	8,062,500	9,137,500	1,547,215	2,680,246	26,802,461
4.1.1	Total phase-out of HCFC-22 agreed to be achieved under this agreement (ODP tonnes)						78.99
4.1.2	Phase-out of HCFC-22 to be achieved in previously approved projects (ODP tonnes)						0.00
4.1.3	Remaining eligible consumption for HCFC-22 (ODP tonnes)						637.58
4.2.1	Total phase-out of HCFC-123 agreed to be achieved under this agreement (ODP tonnes)						0.00
4.2.2	Phase-out of HCFC-123 to be achieved in previously approved projects (ODP tonnes)						0.00
4.2.3	Remaining eligible consumption for HCFC-123 (ODP tonnes)						3.20
4.3.1	Total phase-out of HCFC-124 agreed to be achieved under this agreement (ODP tonnes)						0.00
4.3.2	Phase-out of HCFC-124 to be achieved in previously approved projects (ODP tonnes)						0.00
4.3.3	Remaining eligible consumption for HCFC-124 (ODP tonnes)						0.08
4.4.1	Total phase-out of HCFC-141b agreed to be achieved under this agreement (ODP tonnes)						151.68
4.4.2	Phase-out of HCFC-141b to be achieved in previously approved projects (ODP tonnes)						0.00
4.4.3	Remaining eligible consumption for HCFC-141b (ODP tonnes)						53.57
4.5.1	Total phase-out of HCFC-142b agreed to be achieved under this agreement (ODP tonnes)						0.00
4.5.2	Phase-out of HCFC-142b to be achieved in previously approved projects (ODP tonnes)						0.00
4.5.3	Remaining eligible consumption for HCFC-142b (ODP tonnes)						0.12
4.6.1	Total phase-out of HCFC-225, 225ca and 225cb agreed to be achieved under this agreement (ODP tonnes)						0.00
4.6.2	Phase-out of HCFC-225, 225ca and 225cb to be achieved in previously approved projects (ODP tonnes)						0.00
4.6.3	Remaining eligible consumption for HCFC-225, 225ca and 225cb (ODP tonnes)						2.30
4.7.1	Total phase-out of HCFC-141b contained in imported pre-blended polyol agreed to be achieved under this agreement (ODP tonnes)						15.19
4.7.2	Phase-out of HCFC-141b contained in imported pre-blended polyol to be achieved in previously approved projects (ODP tonnes)						0.00
4.7.3	Remaining eligible consumption for HCFC-141b contained in imported pre-blended polyol (ODP tonnes)						0.49

APPENDIX 3-A: FUNDING APPROVAL SCHEDULE

1. Funding for the future tranches will be considered for approval not earlier than the second meeting of the year specified in Appendix 2-A.

APPENDIX 4-A: FORMAT OF IMPLEMENTATION REPORTS AND PLANS

1. The submission of the Implementation Report and Plan for each tranche request will consist of five parts:

(a) A narrative report, with data provided by calendar year, regarding the progress since the year prior to the previous report, reflecting the situation of the Country in regard to phase out of the Substances, how the different activities contribute to it, and how they relate to each other. The report should include ODS phase-out as a direct result from the implementation of activities, by substance, and the alternative technology used and the related phase-in of alternatives, to allow the Secretariat to provide to the Executive Committee information about the resulting change in climate relevant emissions. The report should further highlight successes, experiences, and challenges related to the different activities included in the Plan, reflecting any changes in the circumstances in the Country, and providing other relevant information. The report should also include information on and justification for any changes vis-à-vis the previously submitted Annual Implementation Plan(s), such as delays, uses of the flexibility for reallocation of funds during implementation of a tranche, as provided for in paragraph 7 of this Agreement, or other changes. The narrative report will cover all relevant years specified in sub-paragraph 5(a) of the Agreement and can in addition also include information on activities in the current year;

(b) A verification report of the HPMP results and the consumption of the Substances mentioned in Appendix 1-A, as per sub-paragraph 5(b) of the Agreement. If not decided otherwise by the Executive Committee, such a verification has to be provided together with each tranche request and will have to provide verification of the consumption for all relevant years as specified in sub-paragraph 5(a) of the Agreement for which a verification report has not yet been acknowledged by the Committee;

(c) A written description of the activities to be undertaken until and including the year of the planned submission of the next tranche request, highlighting the interdependence of the activities, and taking into account experiences made and progress achieved in the implementation of earlier tranches; the data in the plan will be provided by calendar year. The description should also include a reference to the overall plan and progress achieved, as well as any possible changes to the overall plan that are foreseen. The description should cover the years specified in sub-paragraph 5(d) of the Agreement. The description should also specify and explain in detail such changes to the overall plan. This description of future activities can be submitted as a part of the same document as the narrative report under sub-paragraph (b) above;

(d) A set of quantitative information for all annual implementation reports and annual implementation plans, submitted through an online database. This quantitative information, to be submitted by calendar year with each tranche request, will be amending the narratives and description for the report (see sub-paragraph 1(a) above) and the plan (see sub-paragraph 1(c) above), the annual implementation plan and any changes to the overall plan, and will cover the same time periods and activities; and

(e) An Executive Summary of about five paragraphs, summarizing the information of the above sub-paragraphs 1(a) to 1(d).

APPENDIX 5-A: MONITORING INSTITUTIONS AND ROLES

1. The National Ozone Unit (NOU) of the Department of Industrial Works (DIW) is responsible for managing and co-ordinating Thailand's overall ODS phase-out programme, including all phase-out activities and measures controlling Annex C, Group I substances (HCFCs). The management and implementation of this Agreement will be undertaken by the HPMP Project Management Unit (PMU).

2. The HPMP PMU and the NOU will collaborate and co-ordinate with the Hazardous Substances Control Bureau and the Customs Department to institute and implement the import/control system for HCFCs; review annual HCFC import/export license applications to ensure that the list of end-users are provided by importers/exporters; and establish and publish the annual import quotas for HCFCs for the period 2012 through 2016.

3. In order to monitor and evaluate the progress of implementation, the PMU will assist the NOU to:

(a) Develop a management information system that captures and tracks all relevant and required data on the import of Annex C, Group I substances (HCFCs) on an annual basis;

(b) Update the data on the actual amount of imported HCFCs in cooperation with the Hazardous Substances Control Bureau and the Customs Department on a quarterly basis;

(c) Monitor and report any incidents of illegal import of HCFCs;

(d) Monitor progress of HCFC phase-out on the demand side by direct oversight of sub-project implementation;

(e) Compile periodic progress reports of HPMP implementation and HCFC phase-out achievements for sharing with the DIW, the Customs Department, and the Ministry of Industry and its local bureaus; and

(f) Prepare Tranche Implementation Reports and Plans according to the schedule set forth in Appendix 2-A.

4. The DIW will be responsible for reviewing PMU reports and data and instituting control and policy measures which facilitate HCFC control and reductions according to the Agreement.

APPENDIX 6-A: ROLE OF THE LEAD IMPLEMENTING AGENCY

1. The Lead IA will be responsible for a range of activities, including at least the following:

(a) Ensuring performance and financial verification in accordance with this Agreement and with its specific internal procedures and requirements as set out in the Country's HPMP;

(b) Assisting the Country in preparation of the Implementation Plans and subsequent reports as per Appendix 4-A;

(c) Providing independent verification to the Executive Committee that the Targets have been met and associated annual activities have been completed as indicated in the Implementation Plan consistent with Appendix 4-A;

(d) Ensuring that the experiences and progress is reflected in updates of the overall plan and in future annual implementation plans consistent with sub-paragraphs 1(c) and 1(d) of Appendix 4-A;

(e) Fulfilling the reporting requirements for the annual implementation reports, annual implementation plans and the overall plan as specified in Appendix 4-A for submission to the Executive Committee;

(f) Ensuring that appropriate independent technical experts carry out the technical reviews;

(g) Carrying out required supervision missions;

(h) Ensuring the presence of an operating mechanism to allow effective, transparent implementation of the Implementation Plan and accurate data reporting;

(i) In case of reductions in funding for failure to comply in accordance with paragraph 11 of the Agreement, to determine, in consultation with the Country, the allocation of the reductions to the different budget items; and

(j) Providing assistance with policy, management and technical support when required.

2. After consultation with the Country and taking into account any views expressed, the Lead IA will select and mandate an independent entity to carry out the verification of the HPMP results and the consumption of the Substances mentioned in Appendix 1-A, as per sub-paragraph 5(b) of the Agreement and sub-paragraph 1(b) of Appendix 4-A.

APPENDIX 7-A: REDUCTIONS IN FUNDING FOR FAILURE TO COMPLY

1. In accordance with paragraph 11 of the Agreement, the amount of funding provided may be reduced by US $205 per ODP kg of consumption beyond the level defined in row 1.2 of Appendix 2-A for each year in which the target specified in row 1.2 of Appendix 2-A has not been met.

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